The Communicative Competency of Boys With Attention Deficit Hyperactivity Disorder

by

Terry James Rennie
B.A., University of Victoria, 1984
M.A., University of Victoria, 1992

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Dr. M.I. Mayfield, Supervisor (Department of Curriculum and Instruction)

Dr. A. Preece, Departmental Member (Department of Curriculum and Instruction)

Dr. R. Fowler, Departmental Member (Department of Curriculum and Instruction)

Dr. J. Kess, Outside Member (Department of Linguistics)

Dr. L.E. Berk, External Examiner (Department of Psychology, Illinois State University)

Supervisor: Margie Mayfield, Ph.D. (University of Victoria)

ABSTRACT

Language is one of the features that define us as human beings. We use language to communicate with others. Children learn and develop competencies in different aspects of language that enable them to communicate in various social situations. In short, they develop communicative competency.

Learning in the classroom requires children to meet an accepted set of language and communicative competency standards described in the curriculum. Those children who do not meet expectations for language and communication are at a serious disadvantage in school. One group of children who experience difficulties in the classroom are those diagnosed with attention deficit hyperactivity disorder (ADHD).

The research literature on ADHD tends to focus on children's problems with attention span, self-regulation and impulse control. There is, however, growing recognition in the literature that language and communication are implicated in ADHD. While literature has examined important aspects of language in relation to ADHD, it has not looked at critical aspects of language with respect to children's ability to communicate effectively. The major objectives of this study were to examine the language of children diagnosed with ADHD to learn more about how they communicate by comparing their communicative competency with that of a group of Non-ADHD children.

This study examined the communicative competency of a sample of 10 boys aged 6 to 9 years (5 boys with ADHD and 5 boys without ADHD) using a purposive, typical case sampling procedure. The boys were video-taped through a one-way mirror engaging

the Researcher in conversations, building a Lego model, providing the Researcher with instructions regarding the Lego model they had built, and playing with the model and the Researcher.

Overall, participants in both groups were similar with respect to some components of grammatical competency: language production, phonology, and certain aspects of morphology and syntax. Substantial differences were found in the semantic components of grammatical competency, sociolinguistic and discourse competency. The ADHD participants were strongly connected to the immediate study context as indicated by their language and communication. They had difficulty making connections or references beyond the "here-and-now" and using complex and abstract concepts. The Non-ADHD participants did not demonstrate such difficulties. The ADHD participants also demonstrated more dependence on the Researcher to maintain the conversations. This finding suggests that the ADHD participants' reliance on the immediate sociocultural context may reflect problems with cognitive functioning for abstract relations. The results of this study indicated that cognitive functioning in relation to language was different for the ADHD participants than for the Non-ADHD participants.

The finding that the ADHD participants communicated differently than did the Non-ADHD participants has important implications for learning in the classroom. Implications for understanding ADHD and directions for future research are also discussed.

Examiners:

Dr. M.I. Mayfield, Supervisor (Department of Curriculum and Instruction)

Dr. A. Preece, Departmental Member (Department of Curriculum and Instruction)

Dr. R. Fowler, Departmental Member (Department of Curriculum and Instruction)

Dr. J. Kess, Outside Member (Department of Linguistics)

Dr. L.E. Berk, External Examiner (Department of Psychology, Illinois State University)

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Acknowledgments

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Chapter 1

INTRODUCTION

When children enter kindergarten they have had about five years of practice with language. Most are competent language users. They can converse with their family, use language to engage their friends in play and make their needs and desires known to others. Language is one of the features that define us as human beings. MacGinitie (1969) wrote "to all who contemplate human nature or human achievement, language must loom large as a key to that nature and as the basic instrument of that achievement" (p. 686). Language is necessary and critical to children's psychological and social development.

Children's language learning, up to the time they enter kindergarten, tends to be informal; their phonological, lexical, grammatical, semantic and pragmatic development are guided by their parents, caregivers, peers and others. Learning a language means more than knowing the basic elements of grammar. It also means learning how to use one's knowledge of language in different situations to send and receive messages appropriate to a given situation. Children, with the guidance and support of their parents, caregivers, peers and others, develop competencies in different aspects of language that enable them to communicate in various social situations. They develop, in short, communicative competency.

It is, however, in elementary school that children's language learning and parental (and social) expectations for their language development change. School represents the beginning of more formal, structured, and evaluated learning in the language arts (viz., reading, writing, speaking and listening.)

Learning in the classroom requires children to meet an accepted set of language and communication standards. Children are evaluated by teachers on established criteria related to expected levels of skills. A certain level of language competency is also essential for learning in content areas other than language arts, such as science and mathematics. Those children who do not meet expectations for language are at a serious disadvantage in school.

If language is, as MacGinitie states, a key to understanding human nature, then it is logically consistent to assume also that language is a significant factor in understanding all children, including those diagnosed with attention deficit hyperactivity disorder (ADHD). This assumption has not been tested with ADHD children (or adults). Cherkes-Julkowski, Sharp, and Stolzenberg (1997) point to a "lack of direct documentation of language-based temporal processes" (p. 8) in the research about ADHD. Language has not, typically, been identified as a significant issue for children diagnosed with ADHD (Dulcan, 1997; National Institutes of Health (NIH), 2000). However, children diagnosed with ADHD experience substantial difficulties in the classroom.

In the classroom, children diagnosed with ADHD are frequently viewed as problematic because of their behaviour, such as temper tantrums, problems remaining seated during class, including "fidgetiness and "squirming" and problems following instructions and completing their work (Weyandt, 2001; Zentall, 1993). They either display too much activity appropriate for the situation or not enough. Unless there is evidence of specific language impairment (e.g., significant limitations in language functioning), language is not the main emphasis in planning intervention strategies (Dulcan, 1997).

The professional standard for diagnosing ADHD is outlined by the American Psychiatric Association (APA) in the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV, 1994). The emphasis in the DSM-IV is on problems of inattention, overactivity and self-control, hence the label "attention deficit hyperactivity disorder". The symptoms for ADHD are described under the three cardinal categories of inattention, hyperactivity and impulsivity (or deficits in self-control). The focus is on manifest behaviours rather than communication or language. However, within the cardinal symptoms of ADHD, some aspects of language are described. These include productive language (e.g., "often talks excessively"), expressive language (e.g., "often blurts out answers before questions have been completed" and a related aspect "often interrupts or intrudes on others") and receptive language ("e.g., "often does not seem to listen when spoken to directly") (APA, 1994, pp. 83-84).

While the DSM-IV conceptualizes ADHD primarily as difficulties in attention span, self-regulation and impulse control, the productive, expressive and receptive language aspects described within it also suggest difficulties with communicative competency. Even though language aspects are listed in the diagnostic criteria for ADHD, it is the behavioural ones that receive the bulk of attention from the medical community, teachers and parents of children diagnosed with ADHD (Barkley, 1995; Weyandt, 2001; Zentall, 1993). There is, however, growing awareness in the literature that language, and thus, communication, is implicated in ADHD.

The research literature regarding the relationship between language and ADHD and other aspects of language, such as reading, narrative discourse and study strategies, has indicated a limited range of language difficulties. These difficulties are consistent

with the DSM-IV symptoms involving productive, expressive and receptive or language comprehension areas (Barkley, 1997; Riccio & Jemison, 1998; Rogers-Adkinson & Griffith, 1999; Weyandt, 2001).

Also consistent with the DSM-IV is the tendency in studies to examine separate aspects of the disorder, such as inattention or hyperactivity, resulting in a fragmented view of what children diagnosed with ADHD are capable of doing regarding communication and language. Studies examining language aspects also tend to utilize standardized language tests, which use quantitative measures, and are focused on individual components of language, rather than on language within the context of communication and learning. The research into language and ADHD has, generally, not looked at the critical aspects of language with respect to a child's ability to communicate effectively.

While we know ADHD children have problems communicating in and out of the classroom and these present barriers to their learning, we do not know the nature of those problems. The emphasis on the ADHD children's behaviour (as defined by the APA) and the lack of detailed information regarding the nature of the ADHD children's language difficulties represents a significant gap in our understanding of ADHD. It would seem prudent, then, to examine the language of children diagnosed with ADHD to learn more about how they communicate and to identify implications for learning in the classroom.

This study examines the communicative competency of two samples of boys ages 6 to 9, in grades 1 to 4, with and without a diagnosis of ADHD. This study attempts to go beyond an examination of individual language components by examining the communicative competency of children diagnosed with ADHD to identify those aspects

of language that may act as barriers to the development of communicative competency. By identifying those aspects of language that are problematic we may then move toward the development of strategies to assist children diagnosed with ADHD and their teachers and caregivers to communicate and learn effectively.

Initially, the literature regarding the development of language and its relationship to learning is reviewed. The next chapter, briefly, describes the major features of ADHD and the relationship between language and ADHD revealed in the research literature. Communicative competency is then discussed followed by the chapter describing the study methodology and data analysis techniques, including the rationale for the method and techniques used. The research findings are then presented and discussed. The final chapter outlines the implications of the findings, focusing on the issue of communicative competency within the context of learning and teaching in the classroom.

Chapter 2

LANGUAGE DEVELOPMENT AND LEARNING

Much of our language learning emerges during the preschool years (Bruner, 1975). The acquisition of language includes learning the rules of the language. Children must learn, at least implicitly, the sounds of a language and the rules for combining them into meaningful units (phonology). Children also learn the rules that deal with the internal structure and formation of words (morphology), rules that govern the way words are combined to form phrases and sentences (syntax), rules about the meaning of language (semantics), and how to use language in social contexts appropriately (pragmatics) (Hoff, 2001). Mastery of these processes begins in infancy and continues well into adolescence. As language develops so does children's ability to communicate their thoughts and desires to others and to understand the thoughts and desires of others.

Children's language learning develops from the relatively simple to the more complex as they interact with others. Language acquisition progresses from speech sounds (phonology) to combining the phonological elements into words (morphology) to ordering the words into sentences (syntax) to understanding the meaning of words and sentences (semantics) to using their words in different social contexts (pragmatics). Thus, communicative competency develops as language develops. The two are inextricably linked.

Language Development

There is a huge volume of literature regarding children's language development that is well beyond the scope of this study. The purpose in this section is to describe, briefly, the milestones in children's language development that provide the foundation for an informed discussion about communicative competency. The developmental milestones, discussed below, begin with newborns and end with eight year olds. This age range, which approximates the age range of the participants in this study, allows important developmental features to be elaborated to assist the reader in understanding the relationship between language development and communicative competency.

Newborn to Two-Year Olds

Newborns give evidence of being able to discriminate speech sounds (Lally, Griffin, Fenichel, Segal, Szanton, & Weissbourd, 1997). This ability to separate different speech sounds is a prerequisite for later learning, including learning to read. By nine months to one year of age, children have developed an inventory of the sounds that occur in their language and have learned, implicitly, the rules for combining those sounds into meaningful units (Hoff, 2001). Speech production is characterized as going from babbling to word production in the first year (Kent & Miolo, 1995). Children, at one year of age, are able (at least unconsciously) to conduct phonological analyses of word-level units (Vihman, 1996).

Morphological acquisition tends to follow a similar developmental path for most children (i.e., continually expanding and elaborating their repertoire of sounds and speech patterns). Simple content words (open-class root morphemes) are learned first (e.g., *dog*, *car*, *book*), followed by more complex function words (close-class morphemes), such as

pronouns *I*, *me* or articles *the*, *a* or *an*. The content (lexical) words carry the stable meaning of a word (e.g., meanings as defined in a dictionary). Function (grammatical) words provide the grammatical framework and do not carry the main semantic content. In addition to learning the individual morphemes, morphological development involves the acquisition of word-level inflectional and derivational rules (Plunkett, 1995). Inflectional rules signal grammatical information such as number, tense or possession. For example, adding the suffix (and bound morpheme) *s* to *book* indicates plural. Derivational morphemes derive a new word by being attached to root morphemes or stems. For example, the verb *sing* is changed to *singer* (a noun) by adding the suffix *er* (a bound morpheme). The Child Development Institute (CDI, 2002) lists the typical language development at 12 months: the child uses one or more words, understands simple instructions, practices inflection and is aware of the social value of speech.

Semantic and syntactic acquisition also follow a path similar to phonological and morphological development. Semantic acquisition begins in a child's first year with the mapping of words onto "simple" concepts. By one year of age most children have uttered their first word (typically a content word or free morpheme such as *cup* or *dog*). Syntactic development is characterized by an increase in the length of children's utterances. Around 18 months, children experience a growth spurt in their vocabulary development. Brown (1973) used the term "mean length of utterance" (MLU) to signify this type of language development. Beginning at 12 months the MLU moves through Brown's five stages from 1+ utterance to 4.50 utterances in Stage 5 (at 41 to 46 months). Early two-word utterances are made up of "content" words that are combined to express universal semantic relations. "Function" words appear later as sentences become longer and more

complex (Brown, 1970). Children at 18 months may, typically, have a vocabulary of 5-20 words comprised chiefly of nouns, use echolalia (i.e., imitation and repetition of a word or phrase, sometimes ad nauseam), use jargon with emotional content, and be able to follow simple commands (CDI, 2002).

Two to Four-Year Olds

During their second and third years, children are able to recognize and discriminate phonological contrasts in syllables and feature segments. They begin combining two words and produce sentences of three or more words by two years of age. A typical two-year old can name common objects, use at least two prepositions, usually chosen from the following: *in*, *on*, *under*, combine words into short sentences (noun-verb combinations), understand a vocabulary of approximately 150-300 words, can use the pronouns *I*, *me* and *you* correctly (but may sometimes confuse *me* and *I*). The possessives *my* and *mine* begin to emerge, volume and pitch are not, yet, well controlled and the child responds to commands (e.g., *show me your arm*) (CDI, 2002). In their third year, children refine their use of the pronouns *I*, *you* and *me* and can use them correctly, use some plurals and past tenses, know the prepositions *in*, *on* and *under*, and understand a vocabulary of approximately 900-1000 words. Verbs begin to predominate and children can understand simple questions regarding their environment and activities (CDI, 2002).

Between the ages of two and four years, complex sentences appear. A typical four-year old uses at least four prepositions, repeats words of four syllables, understands *over*, *under*, *longer*, *larger* when a contrast is presented, has most vowels and diphthongs and the consonants *p*, *b*, *m*, *w*, and *n* well established, repeats words, phrases, syllables and sounds, and uses extensive verbalization during their activities (CDI, 2002).

Five to Eight-Year Olds

Children's phonetic inventory continues to develop into the school years and most children attain phonetic competence by the age of seven or eight (Vihman, 1996). A typical five year old, for example, should use all the vowels and consonants, use descriptive words (adjectives and adverbs) spontaneously, use simple time concepts such as *morning*, *afternoon*, *while*, *yesterday* and *today*, use relatively long sentences that are a mix of compound and complex sentences and generally use grammar correctly (CDI, 2002). Six year olds continue to master phonetic sounds by producing consonant digraphs such as /sh/, /th/ and produce a connected narrative showing relationships between objects and events (CDI, 2002). By age seven most children master the consonants *s*, *z*, *r* and voiceless /th/, understand opposite analogies such as *girl-boy*, *sweet-sour*, and read simple text and print many words (CDI, 2002). An eight year old typically uses complex and compound sentences, is able to relate relatively complex accounts of events, which may have occurred in the past, use speech sounds, such as consonant blends, appropriately read with ease and write simple compositions, conduct a conversation similar to adult levels, follow complex directions and use established time and number concepts (CDI, 2002).

It should be noted that the acquisition of language does not follow a linear path. In each stage of a child's language development, different language features from an earlier stage will appear alongside newer, more complex features. For example, in the development of past tense, some children may over generalize a verb, such as *go* and use it in place of the past tense form *went* so that the child will say go-ed instead of went in

the sentence *I goed to the store*. Difficulties in any one or more of these developmental levels can have a negative impact on a child's ability to communicate effectively.

Language and Learning

The acquisition of language, which marks an individual's development, occurs within a social environment. Language acquisition is also social development.

From birth to age eight, a child is transformed by language and transforms their language to make the world their own. Language development, according to Vygotsky (1934/1987), is first social and through the process of internalization becomes individual, which then becomes social. Rahmani (1973) provides a succinct summary of the stages of speech in children's social development:

> In the first phase, words express the relation of the child to objects. In the next phase, the relation between word and thing is used by the adult as a means of communication with the child. In the final stage, words become intrinsically meaningful to the child. (p. 41)

According to Vygotsky (1934/1987), the "initial function of speech is social, that of social interaction or social linkage. Speech affects those in the immediate environment" (p. 74) and may be initiated by an adult or the child. Thus, the child's first form of speech is social. The child's social speech has multiple functions that separate, through maturation and development, into the different functions of "egocentric and communicative speech".

Egocentric speech, according to Vygotsky (1934/1987), develops in a social process that involves the transmission of social forms of behaviour to the child such as those taught in the classroom. The emergence of egocentric speech signifies the transition

to inner speech, the significance of which Vygotsky (1934/1987) emphasizes; "the phenomenon of inner speech is fundamental to both autistic and logical forms of thinking" (p. 75). Inner speech marks the development from "inter-mental functions to intra-mental functions" (p. 259), that is, the transition from the child's social, collective activity to individual activity. In the process of the cultural development of children, psychical functions occur twice: first, on the social level, then on the psychological level; first, as an interpsychical category in connection with relations between people, then as an intrapsychical category (Rahmani, 1973). At the individual level, language communicates one's thoughts, needs and desires to others, while at the social level language communicates the ideas, knowledge and relationships among people. Thus, language is necessary for individual human development and is the basis for communication that maintains and develops social relationships.

Children (i.e., babies) begin their lives as social beings and gradually grow to be individuals (i.e., adults) through higher mental cognitive processes acquired through learning and teaching. Higher mental functions are "deliberate, mediated, internalized behaviours" (Bodrova & Leong, 1996, p. 20). Higher mental functions are necessary for the development of abstract reasoning. As one's language skills and abilities develop, so do one's skills in abstract reasoning. As language moves from the concrete, "here-and-now" of infants to the more abstract, "there-and-then" of older children and adolescents, the ability to separate thought and action improves. This allows children to use language to direct their activities in the absence of concrete objects and in different circumstances. It is through the development of higher mental process that behaviours come to be voluntary or "more and more dependent on thought or intellect" (Vygotsky, 1934/1987,

p. 187). The development of higher cognitive functioning frees individuals from a direct stimulus-response relationship to another qualitatively different relationship in which language mediates the stimulus and the response. Language is, thus, implicated in the voluntary control of behaviour.

ADHD children, by definition, have problems voluntarily controlling their behaviour. Barkley (1997) argues that children with ADHD are delayed in rule-governed behaviour because they are delayed in the internalization of speech that is necessary for the "capacity to follow through on rules, instructions and commands" (p. 282). Consequently, children with ADHD "display too much public behavior and speech" (Barkley, 1998, p. 70). The ability to use self-directed speech allows one to "reflect to oneself, to follow rules and instructions, to use self-questioning as a form of problem solving and to construct 'meta-rules', the basis for understanding the rules for using rules" (Barkley, 1998, p. 70). These problems interfere with one's ability to communicate effectively with others. An important aspect of behaviour is how children learn to communicate their ideas, needs and desires to others and to themselves. The concept of communicative competency is key.

Chapter 3

LANGUAGE AND ADHD

The discussion, thus far, may be viewed as an inverted pyramid; initially introducing the broad topic of language. This topic was then refined further by identifying significant milestones in language development and learning as a precursor to the discussion about communicative competency. This chapter represents a further refinement by introducing another primary topic, namely, ADHD. In this chapter a brief description of the disorder is presented as a foundation for the discussion about the relationship between language and ADHD.

Characteristics of ADHD

Attention deficit hyperactivity disorder is recognized as the most common neurobiological disorder of childhood (Cantwell, 1996; Centers for Disease Control and Prevention, 2002; Fowler, 1990; National Institutes of Health (NIH), 2000; Pellegrini & Horvat, 1995; Sealander, Schwiebert, Eigenberger, Flahive, Hill, & Brumbaugh, 1995; Shaywitz, Fletcher, & Shaywitz, 1994a). It is usually a chronic disorder affecting 3 to 9% of all children (APA, 1994; Fowler, 1990; Pellegrini & Horvat, 1995; Sealander, et al, 1995). These prevalence estimates, however, vary. For example, Barabasz and Barabasz (1996) estimate a 15% prevalence rate in community samples and 50% and higher in children referred to clinics. Pineda, Ardila, Rosselli, Arias, Henao, Gomez, et al. (1999) present prevalence estimates of 19.8% for males and 12.3% for females. On average, at least one child in every classroom is affected by ADHD and 2 to 3 times more boys are diagnosed than girls. This ratio is, however, changing as more females are diagnosed with the disorder (NIH, 2000; White, 2000).

ADHD is a bipolar comorbid disorder. Bipolar refers to a continuum characterized by attention deficit disorder at one end (or pole) and hyperactivity disorder at the other end. Closer to the hyperactivity pole is another disorder called impulsivity. This triad, attention deficit, impulsivity, and hyperactivity identify the core behaviours that make up ADHD (see Appendix A for the DSM-IV diagnostic criteria). There are nine symptoms for inattention (e.g., "often has difficulty sustaining attention in tasks or play activities", "often has difficulty organizing tasks and activities" and "is often forgetful in daily activities"; APA, 1994, pp. 83-84). There are six symptoms for hyperactivity (e.g., "often fidgets with hands or feet or squirms in seat", "is often 'on the go' or often acts as if 'driven by a motor'", and "often talks excessively"; APA, 1994, p. 84). There are three symptoms describing impulsivity (viz., "often blurts out answers before questions have been completed", "often has difficulty awaiting turn" and "often interrupts or intrudes on others (e.g., butts into conversations or games") (APA, 1994, p. 84).

Comorbid refers to the existence of one or more co-existing disorders within the same individual. For example, disorders associated with ADHD may, depending on the individual, include behaviours such as: "low frustration tolerance, temper outbursts, bossiness, stubbornness, excessive and frequent insistence that requests be met, mood lability, demoralization, and dysphoria" (APA, 1994, p. 80). According to the APA (1994), a "substantial proportion of children referred to clinics with Attention-Deficit/Hyperactivity Disorder also have Oppositional Defiant Disorder (i.e., a pattern of uncooperative, defiant, and hostile behaviour toward authority figures) or Conduct Disorder (i.e., a pattern of repetitive behaviour in which the rights of others or social

norms are violated). There may be a higher prevalence of Mood Disorders, Anxiety Disorders, Learning Disorders, and Communication Disorders" (p. 81). Wade and Daniels (1994) report that 20% of ADHD children have two or more accompanying disorders; of all children with ADHD, 30% have conduct disorder, 35-60% have oppositional defiant disorder, 20% suffer from anxiety, 30% have mood disorder, and 20-25% have learning disabilities (p. 4). Language-based learning disabilities and ADHD frequently co-occur (Dulcan, 1997; Riccio, Hynd, Cohen, & Gonzalez, 1993; Riccio & Jemison, 1998; Shelton & Barkley, 1994; Weyandt, 2001).

Children with ADHD experience learning and behavioural difficulties (e.g., problems with mental processing and social interactions) most often manifested in distractibility and inattention (e.g., excessive daydreaming, forgetfulness, disorganization and losing things), hyperactivity (e.g., excessive running or climbing, fidgeting) and impulsivity (e.g., impatience, difficulty in delaying responses, blurting out answers in class, problems waiting turns).

The preceding description emerges from the considerable research that has been, and is being, conducted regarding a wide range of ADHD issues. The major research and theoretical issues regarding ADHD tend to revolve around (a) defining the disorder (Barkley, 1997; Cherkes-Julkowski, et al., 1997; Dykman & Ackerman, 1993; Greene, Biederman, Faraone, Ouellette, Penn, & Griffin, 1996; NIH, 2000; Shaywitz, Fletcher, & Shaywitz, 1994a, 1994b; Wood & Felton, 1994; Warner-Rogers, Taylor, Taylor, & Sandberg, 2000), (b) validating the definition (Gaub & Carlson, 1997; Lahey et al. 1997), (c) debating the type and amount of drug to administer to children (and alternatives if the first choice drug does not work) (Buitelaar, Van der Gaag, Swaab-Barneveld, & Kuiper,

1995; Spencer, Biederman, Wilens, Harding, O'Donnell, & Griffin, 1996), and (d) finding a neurobiological cause of the disorder (Kuperman, Johnson, Arndt, Lindgren, & Wolraich, 1996; Nopoulos, Berg, Castellenos, Delgado, Andreasen, Rapoport, 2000). One issue of particular relevance to this study is the search for a neurobiological cause.

The majority of medical and psychiatric professionals view ADHD as a neurobiological disorder caused by an abnormality in the brain either structural, or chemical, or both (Weyandt, 2001). The structural and/or chemical factors underlying ADHD are directly related to the areas of the brain that affect language, attention, and higher cognitive processes. Research into neurobiological causes has identified differences between people diagnosed with ADHD and those not diagnosed with ADHD.

Structural Differences in the Brain

Castellanos et al. (1996) found that the brains in a sample (n = 55) of ADHD boys (aged 5-18 years) were more physically symmetrical than those of a matched sample (n = 57) of controls. Typically, the right side of the brain is larger than the left so the symmetry of the ADHD brains was atypical. Furthermore, the size of the right cerebral hemisphere of the ADHD boys was 5.2% smaller than that of the control group.

Swanson, Castellanos, Murias, LaHoste and Kennedy (1998), using magnetic resonance imaging (MRI), found that some regions of the frontal lobes (anterior superior and inferior) and basal ganglia (caudate nucleus and globus pallidus) are about 10% smaller in ADHD groups than in control groups of elementary-aged children.

Schweitzer et al. (2000), using functional neuroimaging to investigate blood flow in a sample of 12 adults (six ADHD and six controls) related to working memory, found significant differences between subjects with ADHD and those without ADHD. The

subjects with ADHD showed increased blood flow during the performance of a mathematical calculation, involving serial addition, in the occipital region (near the back of the brain) while the controls showed increased blood flow in frontal part of the brain that is associated with attention. The ADHD subjects used a different part of their brain to process the calculation using, for some subjects, visualization of a blackboard to help them do the calculations. Schweitzer et al. (2000) conclude that the use of compensatory mental and neural strategies by the subjects with ADHD is in response to a "disrupted ability to inhibit attention to nonrelevant stimuli and the use of internalized speech to guide behavior" (p. 279).

Nopoulos, Berg, Castellenos, Delgado, Andreasen and Rapoport (2000), in a study examining brain scans of a group of ADHD children (mean age of 10.9 years) and a group of "healthy control children" (mean age of 11.7 years), found the ADHD group had an increase in brain anomalies: a gray-matter heterotopia and a posterior fossa abnormality (an excess of cerebrospinal fluid in the posterior fossa). Gray matter heterotopia is a collection of otherwise normal neurons (gray matter) in abnormal places occurring during gestation. The consequences of these abnormalities may include seizures and developmental delays. The posterior fossa, located at the back of the head just above the neck, houses the brain stem and the cerebellum. The cerebellum is the major organ of coordination for all motor functions, as well as mental activities of the brain. The authors argue that these findings support and extend the notion that ADHD is developmental and suggest, consistent with Castellanos et al. (1996) that aberrant brain development could occur in early gestation.

Teicher, Anderson, Polcari, Glod, Renshaw and Maas (2001) identified the putamen, in the basal ganglia, as showing diminished blood flow in children with ADHD. The putamen has been implicated in motor activity and some aspects of attention. The researchers point out that their study supports other research pointing to the putamen as an important region of the brain involved in ADHD. They claim that the diminished blood flow in the putamen may be another way to diagnose ADHD objectively.

The findings that children diagnosed with ADHD have structural differences in brain size lead some researchers to conclude that ADHD is developmental and propose that the aberrant brain development could occur in early gestation (e.g., Castellanos et al., 1996; Nopolous et al., 2000). This hypothesis implies that children with ADHD are different from the very beginning of their lives. The difference in brain size affects all aspects of brain functioning, including the production and functioning of neurotransmitters.

Neurochemical Differences in the Brain

The neurobiological model shows evidence of an imbalance in neurotransmitters (particularly dopamine and serotonin) as a result of the lower metabolic rates in the cortical lobe influenced by brain size. This imbalance affects a variety of behaviours including attention, inhibition, response of the motor system and motivation (Riccio, et al., 1993; Shaywitz, Shaywitz, Cohen, & Young, 1983; Teicher et al., 2001).

Gainetinov, Wetsel, Jones, Levin, Jaber and Caron (1999) investigated the neurotransmitter, serotonin. They found that Ritalin (a commonly prescribed stimulant medication) increased the levels of serotonin. Previous to this study, researchers had thought that Ritalin interacted with the dopamine transporter protein. This study suggests

that the proper balance between dopamine and serotonin is key to understanding the effects of stimulant medication. Serotonin is the predominant central inhibiting neurotransmitter. An inability to inhibit may underlie the observed impulsivity in children with ADHD.

Quist and Kennedy (2001), in a discussion of the serotonin hypothesis, argue there is "accumulating neurobiological evidence pointing toward a role for the serotonin system in ADHD. The strongest support from existing data suggests that serotonin is responsible, at least in part, for mediating the hyperactive and impulsive components of ADHD behavior" (p. 257).

The differences in brain size and the regions of the brain (i.e., the frontal lobes and basal ganglia) and the functioning of neurotransmitters in children diagnosed with ADHD are associated with motor activity, language processing, planning, organizing, problem-solving, selective attention and a variety of higher cognitive functions. These functions are precisely those required to concentrate, focus, select and shift attention.

Implications of Structural/Chemical Factors in the Brain

The neurobiological evidence helps account for the biological basis for ADHD. The studies showing structural differences suggest that children with ADHD are simply born different. This suggests that ADHD children may not follow the same developmental path as do "normally" developing children. Vygotsky (1934/1993) argued that a "child whose development is impeded by a defect is not simply a child less developed than his peers but is a child who has developed differently" (p. 30). This notion that each child develops through qualitatively different and unique stages (i.e., unique to the child) contrasts with the view that children with disabilities are "normal"

children minus some feature or characteristic, for example, hearing or vision. In the case of ADHD, the "defect" is not the absence of some feature but constitutes the very essence of a person, namely, the brain. That is, children diagnosed with ADHD are "normal" for the structural features and characteristics in their brains.

However, the findings from neurochemical studies support a notion that the chemical imbalances may be restored through medication. This view rests on the assumption that children with ADHD are "abnormal" with respect to the neurochemical transmitters that affect their behaviours. Children with ADHD may be developmentally "delayed" (Barkley, 1997) and may become "normal" through medication. This view has important implications for intervention and treatment.

The accepted, but controversial, intervention method is to administer stimulant medication to these children (Cantwell, 1996; Dulcan, 1997; Hoagwood, Kelleher, Feil & Comer, 2000; NIH, 2000). Methylphenidate (trade name Ritalin) is the most widely prescribed stimulant medication for ADHD. In Canada, IMS Health Canada (2000a) reports a 402% increase in Ritalin prescriptions from 1990 to 1998 and a 96% increase in Ritalin prescriptions from 1994 to 1998. IMS Health Canada (2000b) also reports that 92.9% of the methylphenidate prescriptions were for ADHD. IMS Health Canada (2000a) data shows that 41% of the Ritalin prescriptions (from July 1997 to June 1998) were for children aged 0-9 years, 49% for ages 10-19, and 10% for ages 20 or older.

Proponents of stimulant medications argue that they are "effective in improving behaviour, academic work, and social adjustment in anywhere from 50 to 95% of children with ADHD" (DuPaul & Costello, 1995, p. 249). Stimulant medication deals directly with the part of the brain that is under-active and gives rise to outward symptoms

of ADHD (Castellanos, 2000). DuPaul and Costello (1995) argue that "stimulants are the only treatment to date that normalizes the inattentive, impulsive, and restless behaviour in ADHD children" (p. 251). Similarly, Phelan (1993) states that "all ADD children deserve a trial of medication since there is absolutely no way to tell which children will respond and which children will not" (p. 127). Furthermore, Phelan adds that "unless there are contraindications for using stimulants, both Ritalin and Dexedrine should be tried with each ADD child, since many children respond to one better than the other" (p. 127).

Swanson et al. (1993) argue that stimulant medication is effective in the "*temporary* management of the diagnostic symptoms of overactivity, inattention, and impulsivity with *temporary* improvement in compliance and effort (deportment), decrease in physical aggression and verbal hostility, and increase in the amount and accuracy of academic work (but not overall academic achievement)" (p. 159). This interpretation is echoed by the National Institutes of Health (2000):

> These short-term trials [of stimulant medications] have found beneficial effects on the defining symptoms of ADHD and associated aggressiveness *as long as medication is taken* [emphasis added]. However, stimulant treatments may not 'normalize' the entire range of behavior problems, and children under treatment may still manifest a higher level of some behavior problems than normal children. Of concern are the consistent findings that despite the improvement in core symptoms, there is little improvement in academic achievement or social skills. (p. 184)

The argument that medications, while providing temporary relief of the symptoms, do not address core symptoms suggests that there may be more to ADHD than

inattention or developmental delay. There are basic structural differences, in brain size and the functioning of the basal ganglia and frontal cortex, for example, which means efforts to "normalize" children with ADHD through medications may be misguided. The ensuing emphasis on the behavioural aspects of attention, while providing important insights into the disorder, tends to discount its cognitive and affective aspects. Chief among the cognitive and affective aspects is language and communication.

While professional interest has been fixed on the cardinal, behavioural symptoms of ADHD, language and communication aspects are implicated in the DSM-IV diagnostic criteria (APA, 1994). These include productive language aspects (e.g., "often talks excessively"), expressive language aspects (e.g., "often blurts out answers before questions have been completed") and a related aspect (e.g., "often interrupts or intrudes on others") and receptive language aspects ("e.g., "often does not seem to listen when spoken to directly") (APA, 1994, pp. 83-84). Furthermore, language and its role in the development of higher cognitive functions are also implicated. The symptoms "has difficulty organizing tasks and activities" and "often avoids, dislikes or is reluctant to engage in tasks that require sustained mental effort (such as schoolwork or homework)" suggest relationships with cognitive aspects (e.g., organizing and planning and persistence). Thus, the DSM-IV conceptualizes ADHD as difficulties in attention span, self-regulation and impulse control. However, the productive, expressive, receptive and cognitive language aspects described within the DSM-IV also suggest difficulties with communication.

There is growing recognition in the field that ADHD is more than inattention and overactivity. For example, an expert scientific panel convened by the U.S. National

Institutes of Health to examine the impact of ADHD on society and families and to identify effective treatments and directions for future research, called ADHD a "mystery". Okie (1998) reports that the panel, after hearing expert testimony, concluded that ADHD is "inconsistently diagnosed and treated", "its true prevalence is unclear", the "cause of the disorder is unknown", and ADHD is a "major health problem" (p. A04). The NIH (2000) state:

> given the evidence about the cognitive problems associated with ADHD, such as deficiencies in working memory and language-processing deficits, and the demonstrated ineffectiveness of current treatments in enhancing academic achievement, there is a need for application and development of methods targeted to those weaknesses. (p. 185)

The NIH (2000) calls for future research to include "basic research to better define ADHD" in the areas of "cognitive development, cognitive processing, and attention/inattention in ADHD" and "brain imaging studies" (p. 186). In the cognitive aspects of ADHD, language and communication figure prominently.

Despite years of research and voluminous literature, our understanding of some of the fundamental features of ADHD is rudimentary at best. While children diagnosed with ADHD may display the symptoms of inattention or hyperactivity, these behavioural manifestations do not adequately account for problems they may also have in the classroom, such as difficulty organizing and finishing classroom assignments, getting along with their peers and/or adults and poor academic performance. The "language-processing difficulties" are part of the communication aspects of ADHD, thus far underemphasized in the research regarding ADHD.

Literature Review of Language and ADHD

The typical age of diagnosis for ADHD is age seven (Grade 2). This is a time of increasing expectations in the classroom for more sophisticated language use. For example, the B.C. curriculum (MoE, 1996) states that children are expected to "identify specific details in communications in response to tasks or questions" (p. 36) and "demonstrate abilities to use grammatically correct language when speaking and when writing simple sentences" (p. 42). Before entering Grade 2, children with ADHD may accommodate language expectations by focusing on tasks or activities they find rewarding or fun in a setting typically more unstructured than a Grade 2 classroom. However, in the classroom this may not be an option. The research literature reveals some insights into the language patterns of children diagnosed with ADHD and connections between those patterns and language use in the classroom.

The following review is organized according to features described, and implied, in the DSM-IV. Specifically, the review examines research regarding the amount of talk produced by children with ADHD (language production), grammatical aspects including planning, organizing and comprehending text and pragmatic aspects such as social competencies. There is an aspect of ADHD not described or implied in the DSM-IV but has been identified in the research, namely self-talk. Self-talk is "speech spoken out loud that is addressed either to the self or no particular listener" (Bivens & Berk, 1990, p. 443). Self-talk is implicated in the internal control of behaviours and, thus, warrants an examination.

Language Production and ADHD

Barkley, Cunningham and Karlsson (1983) examined the language production of hyperactive children (aged 9 years) and their mothers. During free play, in which the children and mothers interacted, the hyperactive children and mothers produced "significantly more utterances than the normal children" while the "mothers of normal children used more complex language relative to their children's complexity than did the mothers of hyperactive boys" (p. 107). Although the overall verbal production by the hyperactive boys and mothers was greater than the control group, the complexity of their expressive language, measured by mean length of utterance, did not differ from the control group. Mothers of the normal children spoke at a level that was approximately 50% more complex than that of their children. On the other hand, mothers of the hyperactive children spoke at a level approximately 13% more complex than their children (p. 109). A second experiment examined the effects of methylphenidate (a stimulant medication) on the verbal behaviour of the hyperactive children. Under these conditions, there was a "significant reduction in the number of utterances produced by the hyperactive children and their mothers" (p. 108). There were, however, no changes in language complexity (measured by syllables per utterance).

To assess the production of expressive language of hyperactive children, Zentall (1988) examined the differences in verbal output of hyperactive children (aged 9 years-old) and normal children (aged 8 years-old) under four elicited storytelling conditions and transitions between tasks and during a nonverbal, nonelicited task (Matching Familiar Faces Test – MFFT). She found the hyperactive children used more words than controls during transitions and the MFFT. Hyperactive children asked more nontask questions

than controls but did not differ in their use of task-related questions. The hyperactive children also displayed more exclamations, interruptions and subject changes during transitions and the MFFT. However, when asked to tell stories, the normal children talked more and longer than the hyperactive children. Hyperactive children used fewer words when asked to tell a story indicating, according to Zentall, that their production deficiencies might be attributable to deficiencies in organization and planning necessary for the task (p. 670). When the children were presented with a visual sequencing task (four word-cards and a series of pictures), there were no language production differences between the groups. Zentall suggests this lack of differences may be due to the "lack of immediacy, visual salience or organization of the stimuli" (p. 671). That is, when hyperactive children are required to organize and plan a story on their own they show production deficiencies but when a structure and sequence is provided they demonstrate no such deficiencies. Overall, Zentall found that hyperactive children were more talkative than normal children when they were asked not to talk (e.g., during transitions and during the performance of the nonverbal tasks) but were less talkative when they were asked to tell stories.

Zentall, Gohs and Culatta (1983) looked at the language and behaviour of hyperactive children (6 years-old) during listening tasks (which were similar to those required in the elementary classroom). They found that hyperactive children were verbally and nonverbally more active than controls during the listening tasks and during transitions. Hyperactive children also used more sentences and more words per sentences while receiving information. In applied tasks that required questions to be asked, the hyperactive children did not differ from controls although they used more words and

longer sentences. This suggests, according to Zentall et al., that in "language-eliciting tasks hyperactive children may not be as verbally productive" (p. 265). Analysis of the content of the verbalizations showed the hyperactive children made more verbalizations unrelated to the task (e.g., comments about the environment, self, and nontask related questions) while during tasks the hyperactive children engaged in "running commentaries about the task materials, repeated cues, and verbalized their selections" (p. 265). Zentall et al. thought this "running" commentary might "help guide attention and performance or simply maintained environmental contact" (p. 265). The hyperactive children also completed fewer statements, repeated and revised more statements and used more fillers only during communication tasks but not during transitions and the applied task. The hyperactive children also demonstrated more verbal impulsivity through their exclamations, interruptions and commands than did the control group.

Factors Influencing Language Production

The amount of talking by children diagnosed with ADHD, however, appears dependent on the situation. Under certain conditions their talking decreases. Barkley et al. (1983) found that when hyperactive children were administered a stimulant medication, such as Ritalin, the amount of talk decreased substantially. Furthermore, the "mothers of these boys also reduced their language productivity", indicating that "language productivity of both parent and child closely parallel each other in dyadic interactions" (Barkley, et al., 1983, p. 109). Zentall's (1988) study shows that when children with ADHD were given a task to do they tended to talk less, which suggests some reluctance on their part to engage in tasks requiring mental effort, another symptom described in the DSM-IV. Zentall also found that when children diagnosed with ADHD were asked to

retell a story, their talk also decreased relative to the non-ADHD controls. Zentall suggests this may "indicate more generally that production deficiencies are attributable to requirements for organization and planning" (p. 670). The organization and planning, Zentall points out, were affected by situational factors in the study. Zentall suggests that

> educational programming designed to remediate the production excesses and deficiencies of hyperactive children should be directed to situational factors (i.e., for production deficiencies the requirements for planning and organizing nonimmediate or nonsalient stimuli, and for production excesses the insufficiency in the quantity of input stimulation) rather than to remediate general motivational or other attributional factors. (p. 671)

Similarly, Zentall et al. (1983) found in "language-eliciting tasks hyperactive children were not as verbally productive" (p. 265) as the controls. Zentall et al. point out that "verbal impulsivity in the form of exclamations, interruptions and commands was observed more for the hyperactive children than the comparison group" (p. 265).

Roberts, Ray, and Roberts (1984) found no evidence of attention deficits in free play situations with their ADHD subjects, ages 6 to 13 years, but attention deficit emerged as the research conditions were modified to introduce a more structured academic situation (i.e., completing arithmetic problems at their desk). This finding suggests that children diagnosed with ADHD appear more sensitive to their surroundings than their Non-ADHD peers. Certain conditions, such as free play, appear to engender more talk than other more academically structured conditions.

Cunningham and Siegel (1987) examined, by videotape, peer interactions (divided in 5 to 8 and 9 to 12 year-old groups) between mixed dyads of ADHD and

normal controls and normal dyads during free-play, cooperative task and simulated classroom situations. During the 15-minute free play situation children played with a Lego construction set. During the 15-minute cooperative task, the children were instructed to pick up the Lego set. The 15-minute simulated classroom tasks consisted of using an Etch-a-Sketch to draw a picture together, then build a Lego house together, then, individually, copy a geometric design, and finally work on grade-level math problems.

Cunningham and Siegel (1987) found that the ADHD children in mixed dyads were more controlling than children in normal dyads. The ADHD children were also less compliant with peers than controls. Younger mixed dyads in the cooperative task and ADHD children in the simulated classroom setting asked "nearly twice as many questions as comparison groups" (p. 263). The ADHD children, during the simulated classroom tasks, spent less time on-task and scored lower on the drawing assignment than the controls. Older children in the mixed dyads were better able to "disengage from a potential conflict by responding positively to controls" (p. 264). Cunningham and Siegel point out that decreased controlling behaviour and increased cooperativeness among older children "may contribute to the improved likability" but the decline in controlling and uncooperative behaviour was also "paralleled by an increase in independent play and work rather than an increase in social initiative or responsiveness" (p. 264). Overall, Cunningham and Siegel, conclude that ADHD children in their study engaged their peers in interactions that were "more controlling, less cooperative, less academically productive, and more likely to violate situational rules" (p. 266).

Children with ADHD also appear to be easily distracted. This symptom is described in the DSM-IV as "often easily distracted by extraneous stimuli" (p. 84).

Lorch, Sanchez, van den Broek, Milich, Murphy and Welsh (1999) found the presence of toys in the study room affected the pattern of story recall of a Sesame Street episode and the visual attention for the children with ADHD (ages 4 to 6 years). When toys were not present, however, children in both groups recalled events central to the causal structure of the stories and the "effects of story-grammar category and hierarchical level" did not differ between the groups (p. 306). In a similar study, Sanchez, Lorch, Milich and Welsh (1999) examined the relationship between visual attention and story comprehension with children aged 4 to 6. They found that when toys were present in the study room the "attention of the ADHD children decreased significantly more than that of the comparison group" (p. 382). The control group were "strategic viewers" who were able to "systematically divide their attention between the television program and toy playing while maintaining their understanding of the story information" (Sanchez, et al., p. 383). The ADHD group, however, displayed difficulties with story comprehension in the presence of toys. Consequently, they also demonstrated less understanding of the causal connections than did the control group. Sanchez et al. suggest that the ADHD children understand factual information better than causal information regardless of viewing condition.

The findings of Lorch et al. (1999) and Sanchez et al. (1999) suggest that the distraction of toys represents a distinction between the concrete (i.e., toys) and the abstract (i.e., recalling a story and making causal connections). That is, the children with ADHD appear to be drawn to concrete objects when the alternative activity requires more abstract thinking. The distinction between concrete and abstract thinking was also identified by Sanchez et al. through the suggestion that ADHD children understand

factual information better than causal information. This is consistent with the DSM-IV symptoms of "often avoids, dislikes, or is reluctant to engage in tasks that require sustained mental effort (such as schoolwork or homework)" (p. 84) and "often has difficulty sustaining attention during tasks or play activities" (p. 83).

Grammatical Aspects of Language and ADHD

Children with ADHD appear to have more difficulty with tasks requiring organization and planning (Zentall, 1988). Purvis and Tannock (1997), using a story retelling task and two standardized tests measuring expressive vocabulary and semantic abilities, found that children with ADHD (aged 7 to 11 years) had difficulties organizing and monitoring their verbal productions in a story-retelling task. The ADHD group had more problems organizing the story and self-monitoring the accuracy of the information as reflected in their story errors. The ADHD group made more sequence errors that, according to Purvis and Tannock, reflect a breakdown in global organization of story theme. The ADHD group also made more ambiguous references that, Purvis and Tannock point out, result from a failure to organize and monitor the cohesion between sentences and a failure to take into account the needs of the listener. The ADHD group was also more likely to misinterpret information and use inappropriate word substitutions. The language deficits, Purvis and Tannock argue, "reflect difficulties with language *use* (i.e., pragmatics) rather than deficits in the basic subsystems of the language (e.g., phonology, semantics and syntax)" (p. 141).

The findings of Purvis and Tannock (1997), that children with ADHD have problems organizing and monitoring their verbal productions, are consistent with Zentall (1988) and the DSM-IV symptom for inattention "often has difficulty organizing tasks

and activities" (p. 84). Purvis and Tannock also indicate that problems appear to arise at the pragmatic level rather than the grammatical level. That is, the phonology, morphology and syntax used by children with ADHD do not appear to distinguish them from their peers. According to these findings, ADHD children appear, at least on the surface, to be similar to their non-ADHD peers in the use of these subsystems of language. However, at the level of pragmatics there appear to be differences. On the one hand, children diagnosed with ADHD appear "normal" and yet there is something different in their interaction that is not explained by their overactive or inattentive behaviour alone.

Conversely, Tannock, Purvis and Schachar (1993) found that a sample of boys with ADHD (aged 7 to 11 years) did not have difficulties comprehending and extracting the main themes from stories in a story-retelling task. The ADHD group did have problems "producing an organized, accurate and cohesive account when asked to retell fictional narratives" (p. 112). The ADHD group did show evidence of production deficits by producing less information overall. The ADHD group showed a higher frequency of sequence errors and errors of cohesion "which reflect breakdowns in the global organization of story theme and local organization of information across utterances" (p. 113). The ADHD group was more likely to misinterpret information, make more ambiguous references and use inappropriate word substitutions. Tannock et al. (1993) conclude that the children with ADHD "do not exhibit deficits in extracting and comprehending the main idea but rather underlying deficits in executive processes give rise to problems in organizing and monitoring the output or production of information (pp. 114-115). The findings of Tannock et al. (1993), while consistent with the DSM-IV

regarding difficulties organizing tasks and activities, appear to be more directly related to language difficulties than behavioural ones.

In a clinical study, Javorsky (1996) used a battery of seven standardized tests to examine the comorbidity (i.e., co-existing disorders) of ADHD children (aged 6 to 12 years) and adolescents (aged 13 to 17 years) with language learning disabilities. Participants were separated into four groups: language learning difficulties (LLD), ADHD, ADHD and LLD, and neither ADHD nor LLD. Javorsky found that the ADHD/LLD group performed poorly on measures of expressive and receptive phonology (spelling and decoding) and syntax (proofing and sentence writing) but not on semantics. On measures of semantics (i.e., picture vocabulary and oral language comprehension) and overall intelligence, there were no significant differences among the four groups. He found that "overall differences were apparent only on measures that assessed phonological and syntactic processes" (p. 255). However, he does point out that the "effects of syntactic and phonological difficulties may have impeded their [participants'] general communication skills" (p. 256).

The studies by Purvis and Tannock (1997), Tannock, Purvis and Schachar (1993) and Javorsky (1996) highlight the contradictory findings of the research into the relationship between language and ADHD. Children with ADHD may have difficulties performing a task, such as a story retelling, or they may not. They may exhibit difficulties with phonology or they may not. Inconsistencies such as these make it difficult to understand the essential relationship between language and the nature of ADHD. The findings of Purvis and Tannock and Tannock, Purvis and Schachar suggest that problems may be at the clause, phrase and word level, which would affect the general, global level

for story organization and retelling. Thus, the general world knowledge possessed by a child with ADHD may be expressed incompletely or ambiguously because of difficulties in making connections between utterances, or managing local coherence (Kintsch & van Dijk, 1978). The findings by Purvis and Tannock and Tannock, Purvis and Schachar, and implied in Javorsky's findings, point to difficulties at the pragmatic level.

Pragmatic Aspects of Language and ADHD

Bain (2000), in a study examining the receptive, expressive and pragmatic language abilities of ADHD children (aged 6 to 10 years) using eight standardized tests, found no deficits on general measures of cognitive screening (e.g., verbal reasoning), or measures of sustained and selective auditory attention, or two measures of receptive language (i.e., syntax and semantics). There were, however, differences on measures of language functioning. The ADHD group showed significant deficits on measures of expressive language and on a single measure of pragmatic language. The expressive language deficits were found to be related significantly to internalizing behaviours measured on the Child Behaviour Checklist. Bain (2000) suggests that the demonstrated deficits in language ability were related to social competency rather than to an underlying deficit in attention. ADHD appears to affect several language levels including the pragmatic, expressive and receptive.

Westby and Cutler (1994), in a discussion paper regarding conceptualizations of ADHD, identify "pragmatic deficits (difficulty in using communication patterns appropriate to persons and situations)" and "metacognitive deficits (difficulty in organizing, planning, monitoring and evaluating behaviour)" (p. 60) as significant.

Pragmatic deficits emerge because, according to Westby and Cutler, children with ADHD "lack self-talk" critical to controlling and organizing interpersonal behaviour. Pragmatic deficits indicate that children with ADHD lack rule-governed, self-regulatory behaviour resulting in isolation from their peers. This isolation, which was also observed by Cunningham and Siegel (1987), makes it difficult for children with ADHD to interact with others to "learn socializations skills critical to successful interaction" (p. 63). This point is supported by Gallagher (1993) who points out that children with "limited language skills also may find it difficult to establish and maintain the highest level of coordinated play, and therefore, may be less valued play partners" (p. 203).

Metacognitive abilities, Westby and Cutler point out, are critical to successful academic performance. Self-regulatory metacognitive abilities to organize, plan, monitor and evaluate are manifested when children are confronted with a structured task, as opposed to unstructured, free play situations, in which metacognitive skills are called upon. According to Westby and Cutler, in structured task situations children with ADHD typically become less talkative, produce less cohesive and coherent language, need more scaffolding (i.e., adult help), study less, and expend less effort on the task. These behaviours suggest to Westby and Cutler that children with ADHD have "significant deficits in executive processes – and language underlies much of executive processing" (p. 64). Westby and Cutler (1994) point to an important aspect of self-regulation, namely, self-talk or private speech.

Self-talk Aspects of Language and ADHD

Self-talk, also known as "inner speech" (Vygotsky, 1934/1987), "egocentric speech" (Piaget, 1923/1926; Vygotsky, 1934/1987) and "private speech" (Berk, 1986,

1994; Vygotsky, 1934/1987), signifies children talking to themselves, that is, "speech that is spoken out loud by children that is addressed either to the self or to no one in particular" (Berk, 1986, p. 671). In Chapter 2 (see pp. 11-12), the relations between speech, social interaction and communication were identified as a developmental process. Self-talk is one stage in the development toward higher cognitive functions.

Self-talk occurs as the result of the differentiation of speech functions. Vygotsky (1934/1987) explains that differentiation "involves the isolation of egocentric speech from social speech through a gradual process of abbreviation and the subsequent transformation of egocentric speech into inner speech" (p. 75). The general speech function of communication (social speech), according to Vygotsky, becomes progressively differentiated, by age seven, into "speech for oneself" and "speech for others" (p. 261).

During the process of the differentiation of speech functions, the external, concrete, objective, material world is internalized by a child by the transition from "inter-mental functions to intra-mental functions, [and] one aspect of the transition from the child's social, collective activity to his individual mental functions" (Vygotsky, 1934/1987, p. 259). The child, thus, makes the world her own.

Vygotsky (1934/1987) identified four stages in the transformation from the external plane to the internal:

1). Primitive or natural stage that corresponds to "pre-intellectual speech and pre-verbal thinking";

2). Naïve psychology stage is characterized by the development of "practical actions" through the use of "tools and the first operations of

his [the child] practical mind" in conjunction with speech development within which the "mastery of grammatical structures and forms precedes the mastery of the corresponding logical structures and operations" so that the "child masters the syntax of speech earlier than he masters the syntax of thought";

3). External sign and external operation stage in which the "child solves the internal mental task on the basis of external sign" that corresponds to the "appearance of egocentric speech"; and

4). "Rooting" stage is characterized by the "movement of the external operation to the internal plane, by the transformation of the external operation into an internal operation". In this stage "logical memory" emerges, as a "form of memory that utilizes internal relationships in the form of internal signs". (pp. 114-115)

In order to "solve internal mental" tasks, self-talk emerges as an organizing, problem-solving tool though which the external sign moves to the internal plane (i.e., moves from the "external sign and external operation" stage to the "rooting" stage). In a child's response to obstacles or problems, Vygotsky (1934/1993) notes, the

> greater part of a child's egocentric speech under such circumstances acquires an intellectual character. Speech does not just reflect the confusion arising from some activity; the child, as it were, asks himself questions, formulates his problems in words, as he gropes about for solutions. (p. 194)

Vygotsky (1934/1993) continues: "A child resolves a problem in words; with the help of egocentric speech, he identifies the path of his actions; consequently, he is thinking in

words, even if in a very primitive and extremely elementary form" (p. 195). Thus, self-talk fulfills a function and becomes a method of children's thinking out loud in a difficult situation. In doing so, it transforms an external sign and operation into a qualitatively different stage in which internal signs and operations predominate.

Inner speech, according to Vygotsky (1934/1987), has its own distinct syntactic and semantic structure in which the syntactic aspects of speech are reduced to a minimum and a word's "sense", that is, "all the psychological facts that arise in our consciousness as a result of the word" predominates over a word's lexical meaning (pp. 275-276). Consequently, inner speech is meant to communicate to oneself. Vygotsky (1934/1987) notes that it is "speech for oneself" and therefore "we should not be surprised by the fact that inner speech is incomprehensible but by the fact that we expect it to be comprehensible" (p. 278).

Research has found that children with ADHD appear to be deficient regarding internalizing behaviours, such as self-talk, that are critical to the control and organization of behaviour (Berk, 1994). Barkley (1991) emphasizes the critical role of rule-governed behaviour in the control of behaviour by linguistic stimuli (or words). Self-talk is associated with the development of higher mental functions (Berk, 1986; Vygotsky, 1987/1934) and the promotion of effective task-related behaviour (Bivens & Berk, 1990; Frauenglass & Diaz, 1985; Winsler, Carlton & Barry, 2000).

Giddan (1991) points out that "without the self-talk that mediates rule-governed behavior" children with ADHD "don't take stock of the situation, read the essential cues – verbal, nonverbal and situational – or make decisions based on that evidence in accordance with social expectations" (p. 47). They react to stimuli in their immediate

environment. Westby and Cutler (1994) also emphasize that children with ADHD are unable to "vary their communication strategies to the setting and task" (p. 62). They "tend to have a more external locus of control" (p. 62) which makes them less likely to feel in control and be active participants in the events in which they participate. The lack of self-talk by children with ADHD is, however, contradicted by the findings of Berk and Potts (1991).

In their study, Berk and Potts (1991) observed two samples of boys, with and without ADHD (aged 6 to 12 years), in the classroom while the boys were engaged in math seatwork. They found that the ADHD group used as much self-talk (or private speech) in general and more externalized, self-guiding speech in particular, than did the normal controls. The ADHD group did show more delays in private speech development. This delay, Berk and Potts suggest, is a consequence of the ADHD children's "highly unmanageable attentional system" that acts to prevent private speech from "gaining efficient mastery over behaviour and proceeding toward internalization" (p. 372). Self-guiding speech was associated with greater attentional focus for the least distractible ADHD boys. The most mature internalized speech was associated with self-stimulating behaviours for the ADHD group but not the controls. Berk and Potts (1991) note that "ADHD children appear to depend on externalized private speech over an especially long developmental period because their attentional system is less responsive to self-directed efforts to guide and channel it in the service of learning goals" (p. 374).

Summary of Language and ADHD

The research literature shows that ADHD children have the most difficulty with precisely those skills they are expected to demonstrate in the classroom. They have

difficulty planning and organizing stories in order to retell them (Zentall, 1988; Purvis & Tannock, 1997, Tannock et al., 1993), but are able to recall the main idea in stories (Lorch et al., 1999; Zentall et al., 1983). The ability to organize, sort and generate information is a key prescribed learning outcome emphasized from Grade 1 onward in British Columbia schools.

ADHD children also appear more likely to misinterpret information and use more ambiguous references and inappropriate word substitutions (Tannock et al., 1993) which indicates difficulties in self-monitoring. The ability to self-monitor not only one's language, but one's social interactions, is described in the B.C. curriculum. The prescribed learning outcomes call for children to demonstrate awareness of others (such as showing respect to others, listening actively and providing constructive feedback to others) as well as an awareness of their own language (such as revising the form, content, sentence structure of their work and using grammatically correct language). Cunningham and Siegel's (1987) findings suggest that children with ADHD may have more problems meeting the learning outcome of "showing respect to others" while engaging in controlling and uncooperative behaviours.

ADHD children are easily distracted by extraneous stimuli (Lorch et al., 1999; Sanchez et al., 1999). The typical elementary classroom is filled with "extraneous stimuli", from pictures on the walls to children talking to the teacher and amongst themselves. The children's textbooks also have pictures with the text that may be "extraneous stimuli" to ADHD children who have difficulty selecting information or using picture cues to enhance their comprehension. This may interfere rather than enhance the development of their reading skills.

ADHD children tend to talk more than their peers (Barkley, et al., 1983, Zentall, 1988) and engage in "running commentaries" unrelated to a task (Zentall et al., 1983). While there are no prescribed learning outcomes related to the quantity of language production, these findings are consistent with the DSM-IV symptoms characterizing hyperactivity. ADHD children tend to talk more within less structured tasks or when they have been administered medications (Barkley et al., 1983).

The studies cited above examined a range of topics including language production (Barkley, et al., 1983; Zentall, 1988), narrative abilities (Tannock et al., 1993), story comprehension (Lorch et al., 1999; Sanchez et al., 1999), listening comprehension (Zentall, et al., 1983), reading disabilities (Purvis & Tannock, 1997), comorbidity with LLD (Javorsky, 1996), expressive and pragmatic language abilities (Bain, 2000), the conceptualizations of ADHD (Westby & Cutler, 1994) and self-talk (private speech) (Berk & Potts, 1991). They demonstrate that the relationship between ADHD and language is complex and poorly understood. The research indicates that any attempt to try to understand that relationship must go beyond the surface manifestations of language and try to understand the underlying function of language, "communication".

Chapter 4

COMMUNICATIVE COMPETENCY

In Chapter 3, the relationship between language and AHD was described as complex. Learning a language is also a synthesis of complex processes (i.e., learning the rules of phonology, morphology, syntax, and semantics) that forms the basis for using language in social contexts. Thus, not only must children be relatively competent in knowing the rules of language, they must also be able to use their language competency in real life. Campbell and Wales (1970) argued, "by far the most important linguistic ability is that of being able to produce or understand utterances which are not so much grammatical but, more important, appropriate to the context in which they are made" (p. 247).

The review of the research literature on language and ADHD indicated that a number of language components have been studied. Few, if any, studies have looked at the relationship between language and ADHD within a framework emphasizing communication. These studies have added to our knowledge of ADHD but they have not helped us understand how and why language issues may impact the ability of children with ADHD to communicate effectively, that is, the "competency" of their communication.

This study uses a theoretical framework for communicative competency proposed by Canale and Swain (1979, 1980) that was developed for second language learning. The rationale for selecting this particular framework is discussed in the methods section in Chapter 5. Underlying their framework are the following assumptions:

> [Communication is understood to be] based in sociocultural, interpersonal interaction, to involve unpredictability and creativity, to take place in a discourse and sociocultural context, to be purposive behaviour, to be carried out under performance constraints, to involve use of authentic (as opposed to textbook-contrived) language, and to be judged as successful or not on the basis of behavioural outcomes. (Canale & Swain, 1980, p. 29)

Communicative competency is the "systems of knowledge and skill required for communication (e.g., knowledge of vocabulary and skill in using the sociolinguistic conventions for a given language)" (Canale, 1983, p.5).

Their framework consists of four interrelated aspects: grammatical, sociolinguistic, discourse and strategic competency. This framework also approximates the features described and implied in the DSM-IV that was used, in Chapter 3, as the organizing principle to review the research literature. Each of these four aspects works in concert with one another. Speakers use their communicative competency to choose what to say as well as how and when to say it. Canale (1983) points out that the theoretical framework is not a model of communicative competency "where model implies some specification of the manner and order in which the components interact and in which the various competencies are normally acquired" (p. 12). Instead, the framework adopts a modular view within which communicative competency is analyzed, consisting of "several separate factors (areas of competence) that interact" (Canale, 1983, p. 12). This framework "illustrates *what* communicative competence (minimally) includes: they are levels of analysis that can be distinguished as part of the theoretical framework" (p. 12).

There are advantages in using this framework. The modular view provides a method to analytically observe language and behaviours that are difficult to detect as they occur. There is a notion of levels inherent in the framework. The grammatical, sociolinguistic and discourse components may be viewed as an ever increasing spiral with grammatical competency at its core and extending outward to encompass sociolinguistic and discourse competency. There is also a notion of development. In Chapter 2, language development was described as moving from the relatively simple progressing to the more complex. This development is preserved within Canale and Swain's communicative competency framework. The most fundamental levels of communication are encompassed by grammatical competency. Grammatical competency focuses on one's ability to produce the sounds of the language, combine those sounds into words and connect the words into comprehensible sentences. More complex interactions of communication are embraced through sociolinguistic and discourse competency. Strategic competency permeates throughout the other three components by compensating for breakdowns in communication.

The framework emphasizes the naturalistic, functional and pragmatic aspects of communication. That is, communication is seen as an authentically social and creatively constructed activity within discourse and sociolinguistic contexts that affect how language is used and interpreted, under limiting conditions (such as memory constraints, fatigue and distractions), which is purposeful and evaluated on the basis of actual outcomes. Communication is a process in which "communication involves the continuous evaluation and negotiation of meaning on the part of the participants" (Canale, 1983, p. 4). Language is not viewed as stable or fixed. Conversational partners

are free to choose the words they use in any given context. Within this framework, an utterance is not the object of analysis but the process through which a communicative act emerges. Analysis and interpretation of the communicative act may then appeal to the actual talk, and its structures and patterns created by conversational partners in specific conditions in a specific relationship.

Although this framework has significant advantages, it also has some disadvantages. The primary disadvantage of this framework, pointed out by Canale (1983), is that it is a framework not a model. It does not specify the "manner or order in which the components interact and in which the various competencies are normally acquired" (Canale, 1983, p. 12). In short, the framework is a guide for examining communicative competency. The decision regarding which specific analytical tools are to be used to examine the communicative acts under the four components of communicative competency, and how the measures are to be operationalized, remain under the analyst's control. Canale and Swain's communicative competency framework was determined to be the best tool available to assist in studying and understanding the language and communication of boys diagnosed with ADHD. Chapter 5, in the Methods section, describes in more detail the specific analytical tools used in this study. The analysis of the participants' communicative competency in this study begins with grammatical competency, followed by sociolinguistic, discourse and strategic competency.

Grammatical Competency

Grammatical competency is the mastery (both verbal and non-verbal) of phonological, morphological, syntactic, and lexical, or semantic, features of the language and the ability to manipulate these to form words and phrases. These are the foundations for communication. This competency focuses on the knowledge and skill required to understand and express the literal meaning of utterances.

It will be recalled that children, typically, learn language from the simple to the more complex. Grammatical competency also develops in this fashion. Children develop their phonological and morphological understanding of the language (e.g., moving from simple content words to more complex function words) while at the same time expanding their knowledge and use of the parts of speech (including nouns, verbs, adjectives and adverbs) and increasing the size of their vocabulary. Grammatical competency is taught in the elementary classroom.

In Chapter 1, the elementary classroom was identified as an important site in the transition from informal language learning to more formal, structured and evaluated learning. The formal instruction in the elementary classroom provides children with opportunities and experiences that are qualitatively distinct from their earlier, more informal, development. While expectations for children's language development may vary from teacher to teacher, there is one common framework within which all teachers must work (viz., the curriculum). The curriculum guides teachers' daily activities in the classroom (thereby affecting the children) as well as providing the structure for reporting children's progress to parents (via report cards), to the school administration, to the school district and eventually to the Ministry of Education. The curriculum, then, is an

important source of expectations about children's language. Those expectations, in turn, influence what, how, and when children learn (or are taught) the concepts and skills necessary for developing communicative competency. To illustrate the language expectations for grammatical competency in the elementary classroom, the prescribed learning outcomes from the British Columbia Ministry of Education's (MoE) Integrated Resource Package (1996) are described for Grades 1 to 4, which correspond to the grade levels of the participants in this study.

The expectations for grammatical competency in the elementary classroom are expressed as:

- Describe the sequence of the main events in a story orally, in writing, or by using pictures (Grade 1; Semantics; MoE, 1996, p. 14).
- Identify explicit connections between works they have read, viewed or heard (Grade 1; Semantics; MoE, 1996, p. 16).
- Demonstrate abilities to use basic grammar when speaking (Grade 1; Morphology; Syntax; MoE, 1996, p. 20).
- Identify connections between ideas and information and their own experiences (Grade 1; Semantics; MoE, 1996, p. 22).
- Identify specific details in communications in response to tasks or questions (Grades 2-3; Semantics; MoE, 1996, p. 36).
- Demonstrate abilities to use grammatically correct language when speaking and when writing simple sentences (Grades 2-3; Morphology, Syntax; MoE, 1996, p. 42).

- Sort, organize, and represent specific information (Grades 2-3; Semantics; MoE, 1996, p. 44).
- Determine accurate pronunciation, meaning, and spelling of unfamiliar words through the use of print or electronic dictionaries (Grade 4; Phonology; Morphology; Syntax; Semantics; MoE, 1996, p. 56).
- Use grammatically correct language when writing and speaking, including consistent verb tenses and correct pronoun references (Grade 4; Morphology; Syntax; MoE; 1996, p. 64).

These skills require an understanding and cognitive awareness of the conventions of standard English, such as appropriate use of nouns, pronouns, verb tense and subject verb agreement. Children are expected to use the rules of grammar to build sentences that make sense to other people. Associated with an understanding of Standard English is the ability to detect and repair incorrect grammar and demonstrate knowledge of the parts of sentences, including verbs and pronouns. Grammatical competencies may be taught directly through lessons in grammar and writing. The curriculum also provides opportunities for children to practice their grammatical competencies through speaking.

Sociolinguistic Competency

Sociolinguistic competency is the speaker's knowledge of the social rules of language use. It requires an understanding of the roles and status of the participants, the information and the function of the interaction. The primary focus is the extent to which "certain propositions and communicative functions are appropriate within a given sociocultural context depending on contextual factors such as topic, role of participants, setting, and norms of interaction" (Canale & Swain, 1980, p. 30). A secondary focus is

the extent to which "appropriate attitude and register or styles are conveyed by a particular grammatical form within a given sociocultural context" (Canale & Swain, 1980, p. 30). Canale (1983) identifies two forms of appropriateness: one of meaning and one of form. Appropriateness of meaning is the "extent to which particular communicative functions (e.g., commanding, complaining and inviting), attitudes (including politeness and formality) and ideas are judged to be proper in a given situation" (Canale, 1983, p. 7). Appropriateness of form is the "extent to which a given meaning (including communicative functions, attitudes and propositions/ideas) is represented in a verbal and/or non-verbal form that is proper in a given sociolinguistic context" (Canale, 1983, p. 7). These are the social norms that govern any situation. In the elementary classroom, children are provided opportunities to develop their sociolinguistic competency by:

- Demonstrating appreciation for the work and ideas of others (Grade 1; MoE, 1996, p. 24).
- Interacting with others; speak in turn; listen actively, providing verbal and non-verbal responses appropriate to their stages of development and to their cultures (Grade 1; MoE, 1996, p. 30).
- Demonstrating an awareness of difference in the ways in which people use language in various contexts, including home, the playground, and the school (Grade 1; MoE, 1996, p. 32).
- Providing constructive feedback to others, showing appreciation and support (Grades 2-3; MoE, 1996, p. 46).

- Listening actively, responding verbally and non-verbally; seeking opinions and consider the responses of others; demonstrating a willingness to support others by offering compliments and encouragement (Grades 2-3; MoE, 1996, p. 52).
- Demonstrating an understanding that language changes in different contexts (Grades 2-3; MoE, 1996, p. 54).
- Demonstrating an awareness of how register and pacing should be adjusted according to content and audience (Grade 4; MoE, 1996, p. 64).
- Showing willingness to revise the form, content, sentence structure, and language of their work; responding formally and informally to the communications of their peers (Grade 4; MoE, 1996, p. 68).
- Demonstrating an awareness of how to use language to develop and maintain friendships and relationships in school (Grade 4; MoE, 1996, p. 72).
- Demonstrating respect for others by communicating their ideas and information in an orderly fashion (Grade 4, MoE, 1996, p. 74).

These skills require children to demonstrate ability to self-monitor their communications with their peers and to respond with the appropriate social conventions (e.g., politeness and active listening). This assumes that children are aware of social conventions, the needs of their listener and are aware of their own language.

An important aspect of sociolinguistic competency, and one that is emphasized in the curriculum, is competency in conducting conversations. There are general expectations about the behaviour of conversational partners such as speaking-in-turn, maintaining an equitable share of the conversation, maintaining or extending the topic

and providing the listener with enough background information to make an utterance or statement understandable. Conversations with different people in different relationships with the speaker require different forms of language, such as the expectations described for Grades 2 to 3.

Discourse Competency

Discourse competency connects grammatical forms and meanings into a meaningful whole in different genres. Genres may include oral or written narrative, a scientific report, a business letter, books, newspapers, television or a phone conversation. A unified text (written or oral) is achieved "through cohesion in form and coherence in meaning" (Canale, 1983, p. 9). Cohesion is how "utterances are linked structurally and facilitates interpretation of a text" (Canale, 1983, p. 9). Cohesion devices include: pronouns, synonyms, ellipsis, conjunctions, parallel structures that connect individual utterances and indicate how a group of utterances is to be understood as a text. Coherence is the "relationships among different meanings in a text, where these meanings may be literal meanings, communicative functions and attitudes" (Canale, 1983, p. 9). Children develop discourse competency by:

- Identifying connections between their thoughts and feelings and their reading, viewing, or listening experiences (Grade 1; MoE, 1996, p. 16).
- Distinguishing between make-believe and reality in print and non-print materials (Grade 1; MoE, 1996, p. 18).
- Identifying connections between ideas and information and their own experiences (Grade 1, MoE, 1996, p. 22).

- Demonstrating a willingness to experiment with written, visual, kinesthetic, dramatic, oral, and electronic forms of communication (Grade 1; MoE, 1996, p. 26).
- Predicting, retelling, and sequencing events and ideas from selections they have read, heard, or viewed (Grades 2-3; MoE, 1996, p. 36).
- Demonstrating an interest in using information from documents, news broadcasts, newspapers, and electronic sources (Grades 2-3, MoE, 1996, p. 40).
- Collecting specific information from a variety of sources, including print, oral discussions, electronic media, and computer technology; sorting, organizing and representing specific information (Grades 2-3; MoE, 1996, p. 44).
- Demonstrating a willingness to experiment with communication forms to respond to, inform and entertain others (Grades 2-3; MoE, 1996, p. 48).
- Interpreting their impressions of simple and direct stories, poetry, other print material, and electronic media; locating specific details in stories, poems, mass media, and audio-visual media; demonstrating an awareness of relationships among the elements of story structure, including plot, setting, and characters (Grade 4; MoE, 1996, p. 58).
- Managing and organizing information by grouping and sorting into charts, webs, subtopics, or logical sequences (Grade 4; MoE, 1996, p. 66).
- Showing a willingness to revise the form, content, sentence structure, and language of their work (Grade 4; MoE, 1996, p. 68).

- Creating and presenting a variety of personal and informational communications, including written and oral poems, stories, explanations, informal oral reports and dramas, personal letters, and illustrated charts or posters (Grade 4, MoE, 1996, p. 70).

These skills require children to be aware of their audience because different audiences have different expectations for communications, which requires organizing information accordingly.

Strategic Competency

Strategic competency involves the strategies used to continue to communicate, strategies that may be called upon to compensate for breakdowns in communication (e.g., memory lapse of an idea or grammatical form) or to "enhance the effectiveness of communication" such as using soft, slow speech for "rhetorical effect" (Canale, 1983, p. 11). Strategies may include: paraphrase, circumlocution, emphasis, repetition, guessing, avoidance (of words, structures, topics), hesitation or others, depending on the situation.

While the curriculum is silent regarding strategic competency per se it does provide opportunities for teachers to include this component of communicative competency. The curriculum learning outcomes that may include strategic competency include:

- Asking questions as an aid to understanding when reading, listening or viewing (Grade 1, MoE, 1996, p.12).
- Predicting unknown words by using picture clues, their knowledge of language patterns and letter-sound relationships (Grade 1, MoE, 1996, p. 12).

- Asking and responding to questions before, during, and after reading, viewing, or listening (Grades 2-3, MoE, 1996, p. 34).
- Predicting the meaning of unknown words by using structural analysis, context clues, and graphic clues (Grade 4, MoE, 1996, p. 56).

These learning outcomes assume that the questions students ask are relevant to the topic under study, that the children have cognitive awareness of some aspects of their language so they can predict unknown words, and that they have some knowledge of the language structure (e.g., grammar) to predict word meaning. These learning outcomes enable children to use language to compensate for either comprehension or production limitations by using intelligent guesses (predictions). Other strategies might include, for example, those described by Oxford (1990). She describes ten "compensation strategies" teachers might demonstrate for their students including circumlocution or synonyms, selecting the topic, mime or gesture, approximating the message and asking for help.

Summary and Implications

The British Columbia curriculum provides the framework within which children may develop and demonstrate their communicative competency in the classroom. Organization of information is a key skill that children in Grades 1 to 4 must learn. They must find, sort, and organize material (both general and specific) as well as organize this information into a coherent text. They need to know different types of discourse, such as narrative, and the features that distinguish them, such as plot, setting and characters. Other types of discourses (e.g., conversations and exposition) are implied in the curriculum through activities such as using language to interact (e.g., engaging others in

conversation) and providing constructive feedback to others, which entails explaining one's ideas and opinions (i.e., expository discourse).

Talk is the currency of the elementary classroom. It is a primary medium through which information and knowledge is conveyed to the children. In order to benefit from the knowledge conveyed through talk, children need to be skilled in the social conventions for conversation. They need to know when to talk, when to listen, and when to offer and accept advice from others. This means they need to be aware of others' communication needs. Children need to communicate in an orderly fashion, listen actively, respond appropriately, and ask for others' opinions. Children use and practice their communication skills by working with others. The British Columbia language arts curriculum moves children through increasingly more abstract concepts beginning in Grade 1 with predicting words, to asking and responding to questions before, during and after reading, viewing or listening, to predicting the meaning of words using structural analysis, context and graphic clues in Grade 4. Children, in part through formal language instruction, develop communicative competence and a metacognitive awareness of their own and others' language.

The key word is "develop". Children's comprehension of language concepts, such as noun, subject, preposition, and predicate, changes from its everyday use to another generalized structure (that of formal grammar) through instruction. Children move from elementary generalizations to higher forms of generalizations (Vygotsky, 1934/1987). For example, the word *truck* may initially signify a specific object (e.g., *that red truck*) that has limited generalization. It changes to a more abstract and generalizable concept when the child understands *truck* as part of a larger structure, as a specific part of speech

such as noun. *Truck*, as a noun, may be generalized into statements about a variety of trucks not only a specific object. This development of the concept of the word *truck* presupposes the development of a series of functions. Vygotsky (1934/1987) states "it presupposes the development of voluntary attention, logical memory, abstraction, comparison, and differentiation" (p. 170). Vygotsky argues that these "complex mental processes cannot simply be learned" (p. 170). The child does not merely memorize the complete concept "like a mental habit". Thus, concepts develop and change as the child is able to make transitions from one level of generalization to another more abstract level. The increasingly generalized and abstract forms of thinking further transform the child's thinking and language processes to higher levels of abstraction and comprehension. This qualitatively different level of abstraction is critical to being an effective communicator.

Teachers' language expectations help shape children's daily routine in the classroom. Within the context of the curriculum and the hierarchical structure of the language arts subject area, children learn the intricacies of the language and its appropriate application. Communicative competency is a critical component in synthesizing and transforming the skills, attitudes, personal knowledge and experiences and content knowledge so children may interact appropriately with others as they develop their own higher cognitive functions.

Chapter 5

RESEARCH QUESTIONS AND METHODS

The objective of the study is to investigate the communicative competency of a sample of boys diagnosed with ADHD within the framework proposed by Canale and Swain (1980). Given the dearth of information regarding the communicative competency of children diagnosed with ADHD and the methodological challenges inherent in this approach, this study is considered to be exploratory.

The research questions are:

1. How do the ADHD and Non-ADHD participants compare in their communicative competency within the study conditions?
2. What is the nature and extent of any observed differences in the communicative competency of the ADHD and Non-ADHD participants?
3. What aspects of language may affect the communicative competency of children with ADHD in the classroom?

Methods

One of the most challenging aspects of this study was developing a methodology that would facilitate the study of the communicative competency of boys diagnosed with ADHD. This proved to be a lengthy process. The methods described below are the result of three years of transcribing, observing video tape, researching source documents for the computer language analysis program, evaluating theoretical assumptions, learning to operate two computerized language analysis programs, and conducting data analysis, including several hundred false starts, twists and turns, to develop a methodology that

captured and accurately reflected the subtle nuances of the participants' language that may impact their communicative competency.

Sample

The sample originally consisted of 6 boys (aged 6 to 9 years) diagnosed with ADHD and 6 not diagnosed with ADHD roughly matched to the ADHD boys by age. Given that the study is exploratory, six participants was considered to be a sufficient sample size and one that would be manageable, given the large volume of data the Researcher anticipated the children would generate during the task.

The ADHD group was selected using a qualitative type of purposive sampling called typical case sampling procedure (Gall, Borg, & Gall, 1996). This technique uses "typical cases" as its selection criteria. While no child is "typical", and children with ADHD develop according to their unique abilities and problems, the objective of using this sampling procedure was to select participants that, in general, exhibited patterns of behaviour and responses thought to define ADHD (i.e., the DSM-IV criteria in APA, 1994). The analysis of the data may then be said to reflect features of "typical" ADHD cases.

According to the literature, the "typical" ADHD child is male between the ages of six and twelve who is experiencing difficulties with their behaviour at home and at school (APA, 1994; Barkley, 1995; Cantwell, 1996). However, the APA (1994) indicates that the typical case may also include other comorbid disorders, such as conduct disorders, oppositional defiant disorders, or language disorder. In this study it was important to rule out the potential impact of confounding language or other disorders. As such, potential ADHD participants were required to have a primary clinical diagnosis of ADHD by a

medical doctor, psychiatrist, or psychologist, without the confounding effects of an identified language or other comorbid disorder.

To solicit participants for the ADHD group, advertisements were posted with two organizations serving children with ADHD in and around Victoria, British Columbia. An advertisement was posted at the Queen Alexandra Centre for Children's Health and at Leger House, which is part of the Queen Alexandra Centre. Queen Alexandra Centre provides residential care and outpatient services for children and the families of children with physical, emotional, behavioural and intellectual difficulties. Leger House offers respite care and counselling for these children and youths. Advertisements were posted at the local office of the Learning Disabilities Association, at various locations around the campus of the University of Victoria, and in *Island Parent Magazine* for one month. In addition to the advertisements, personal contacts were used to solicit volunteers. As a result, 6 boys diagnosed with ADHD (according to the criteria described above) volunteered to participate: one obtained through the advertisement at Leger House, three from the advertisement in *Island Parent Magazine*, and two from personal contacts.

The Non-ADHD group was matched, approximately, to the ADHD group by age. Advertisements were posted at the university and local schools. No volunteers were obtained with this method. The Researcher then personally contacted friends and acquaintances to elicit six age-matched boys without a diagnosis of ADHD.

A videotape of the session for one of the Non-ADHD participants was inadvertently taped over by the Researcher. Consequently, that participant and his ADHD counterpart were removed from the study, leaving a final sample of 5 boys diagnosed with ADHD and 5 boys without a diagnosis of ADHD.

To further ensure that both groups did or did not have a diagnosis of ADHD, two rating scales were used. The parents of all participants were asked to complete independently the Home Situations Questionnaire-Revised (HSQ-R) (Barkley, 1991) and the participants' teachers were asked to independently complete the Vanderbilt AD/HD Diagnostic Teacher Rating Scale (VADTRS) (Wolraich, Feurer, Hannah, Baumgaertel, & Pinnock, 1998).

The HSQ-R is completed by parents of children (ages 4 to 18) and consists of 14 situations in which problematic child behaviours can occur. Parents rate whether the problem behaviour is present in that setting (e.g., mealtimes, watching television, or playing with other children); if so, they rate the severity on a 9-point scale (ranging from Mild = 1 to Severe = 9). The HSQ-R was selected because it is a commonly used scale for assessing situational variation for children with ADHD (McKinney, Montague & Hocutt, 1993). The reliability and validity of the HSQ-R is rated as "satisfactory" by Anastopoulos and Shelton (2001).

The VADTRS was developed to address limitations in existing scales. According to Wolraich et al. (1998), existing scales are not "specifically related to clinical diagnostic criteria as outlined in the psychiatric DSM nosology" (p. 141). The VADTRS consists of four behavioural dimensions, three of which correspond to the complete list of DSM-IV symptoms for ADHD, and the fourth behavioural dimension is a screening tool for other disruptive behaviour disorders (such as anxiety and depression). There are also two performance dimensions rating childrens' academic and classroom behaviour. The VADTRS modifies rating descriptors used in other scales; it uses the scale items "Never", "Occasionally", "Often", and "Very often" instead of the standard scale items

"Not at all", "Just a little", "Pretty much" and "Very much", which brings its terminology closer to the DSM-IV descriptors. Wolraich et al. (1998) report that the psychometric properties of the VADTRS show "strong internal consistency" between the behavioural dimensions, school years and known a priori DSM-IV diagnostic criteria supporting the validity of the scale. They also report that correlations between behavioural and performance dimensions and the diagnosis of ADHD ranged from .25 to .66. The VADTRS was selected because of its internal consistency, content and criterion-related validity and ease of completion by teachers.

To secure the assistance of the participants' teachers, letters were sent to the School District Superintendents (see Appendix B) seeking permission to ask the school principal (see Appendix C) for permission to approach the participants' teachers. After permission was granted at the district level and at the school level, the participants' teachers were contacted via letters and asked to participate in the study (see Appendix D).

Thus, three measures, a professional diagnosis, a parent rating scale and a teacher rating scale, were used to ensure that the ADHD group did have an appropriate diagnosis of ADHD and the Non-ADHD group did not have ADHD.

Sample Characteristics

Table 1 shows the ages and grades of the participants in both groups.

Table 1

Age (in years and months) and Grades of Participants

	ADHD (A)					Non-ADHD (N)				
	A1	A2	A3	A4	A5	N1	N2	N3	N4	N5
Age	6;10	7;9	8;0	9;3	9;11	6;11	7;9	8;1	8;7	9;6
Grade	1	1	2	3	4	1	2	2	3	4

The Non-ADHD participants were matched by approximate age to the ADHD group, i.e., A1 is matched with N1 and so forth. The purpose of the matching was to minimize the impact of age differences on the study results.

According to their parents, three of the ADHD group (A2, A3 and A4) were receiving medication; one received 15 mg of Dexedrine per day and two received 10 mg of Ritalin per day. All three of the boys had their usual medication schedule on the day of the study session. The other two ADHD participants were not receiving medication and, therefore, were unmedicated the day of the study session. None of the Non-ADHD group received medication according to their parents.

The participants represented a range of household living arrangements and parental occupations. In the ADHD group, two participants were living in single-female headed households and three in two-parent households. The parents of the ADHD participants were employed in a range of occupations including self-employed businessperson, secretary, municipal employee, and homemaker. In the Non-ADHD group four participants lived in two-parent households and one in a single female-headed

household. The parental occupations included teacher, civil servant, self-employed businessperson, postal employee, nurse, and university professor.

Group Status

As previously indicated, to help confirm ADHD and Non-ADHD status, all parents in both groups independently completed a Home Situations Questionnaire-Revised rating scale. Figure 1 shows the mean parent ratings for their child's behaviour at home (see Appendix E, Table E1 for the individual parent ratings).

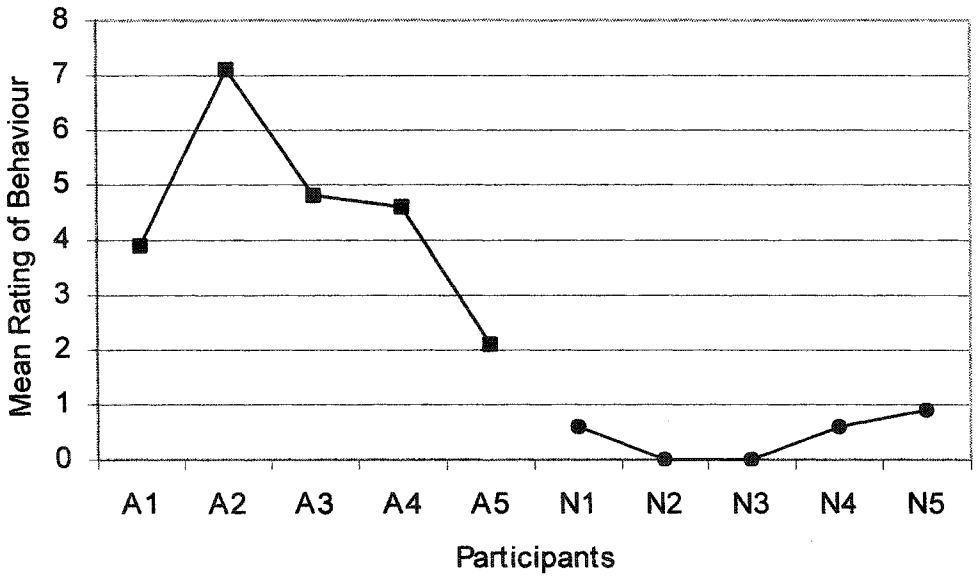

Figure 1. Mean parent ratings of participants' behaviours at home.

Parental ratings clearly identify the ADHD group as having more behavioural problems at home ranging from a mean of 2.1 to 7.1 on a nine-point scale ("Mild" = 1 to "Severe" = 9). The parents of Non-ADHD participants rated their child's home behaviour from a mean of 0 to 0.9 ("No problem" = 0 to "Mild" = 1). Parents of the ADHD participants rated their child's behaviour as more severe on every question than did the

parents of the Non-ADHD boys. These results further confirm the ADHD status of the participants with ADHD.

The participants' teachers were asked to complete independently the Vanderbilt AD/HD Diagnostic Teacher Rating Scale (VADTRS) rating scale of the childrens' behaviours at school. Two of the teachers of participants in the ADHD group (A1 and A4) did not feel comfortable completing the rating scale. Consequently, the ADHD group ratings consist of three teachers while all of the teachers in the Non-ADHD group completed the rating scale.

The teachers' rating of the participants' ADHD symptoms, behaviours at school and in the classroom and academic performance did not differentiate the two groups as clearly as did the parents' ratings. The teachers tended to qualify their rating of their students such as "*[A3] can be very 'dependent' if help is readily available – he does much more when he can't 'lean' on someone else*", "*[A5 disrupts the class] not intentionally. He doesn't seem to realize his calling out or getting out of his desk disrupts others*", "*[regarding N3's written expression] not a lot of quantity but creative*" and N1's teacher wrote "*I find these forms difficult to complete. So much depends upon individual circumstances, the way the classroom and program is set up, individual teacher expectations, etc. I did what I could*". Two of the ADHD participants (A2 and A3) reportedly take medication (Ritalin) during school while participant A4 does not take any medications at school.

Figure 2 shows the teachers' ratings for the DSM-IV symptoms (See Appendix F for individual ratings for each participant). They did rate the VADTRS items for the ADHD participants' inattentive behaviours as occurring more often than those of the

Non-ADHD participants (see Appendix F, Table F1). Three ADHD participants' hyperactive behaviours were rated as equivalent to, or slightly higher than, three of their Non-ADHD peers (participant N2's hyperactive behaviour was rated as occurring more often; see Table F2). The teachers' ratings for impulsive behaviours for all of the ADHD participants were the same as those ratings for the two Non-ADHD participants whose behaviours were rated as impulsive (see Table F3). The rating scale is "Never" = 0; "Occasionally" =1; "Often" = 2; and "Very Often" = 3.

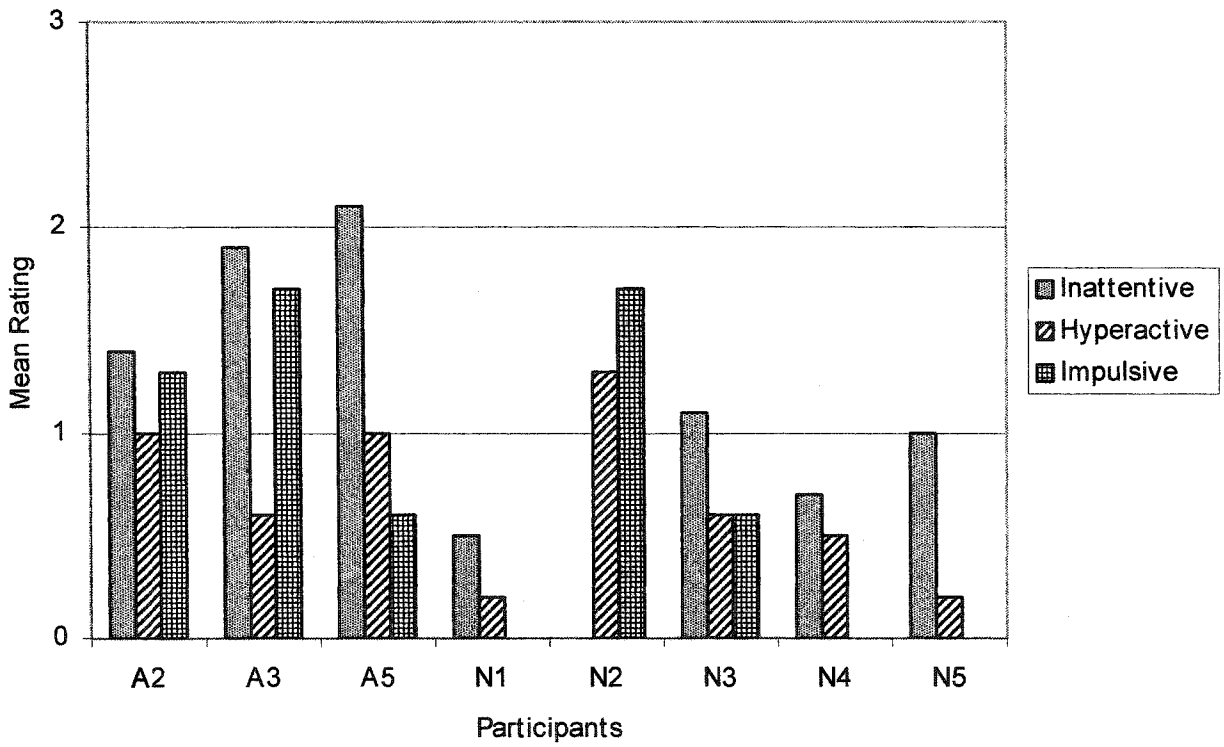

Figure 2. Teacher rating of DSM-IV symptoms at school.

Figure 3 shows the teacher ratings for the participants' behaviours at school (see Appendix F for ratings for each participant). The ADHD participants' behaviours, such as "loses temper", are rated slightly higher than those behaviours for the Non-ADHD participants (see Table F4).

The rating scale for the behaviours at school is the same as the scale for the DSM-IV symptoms.

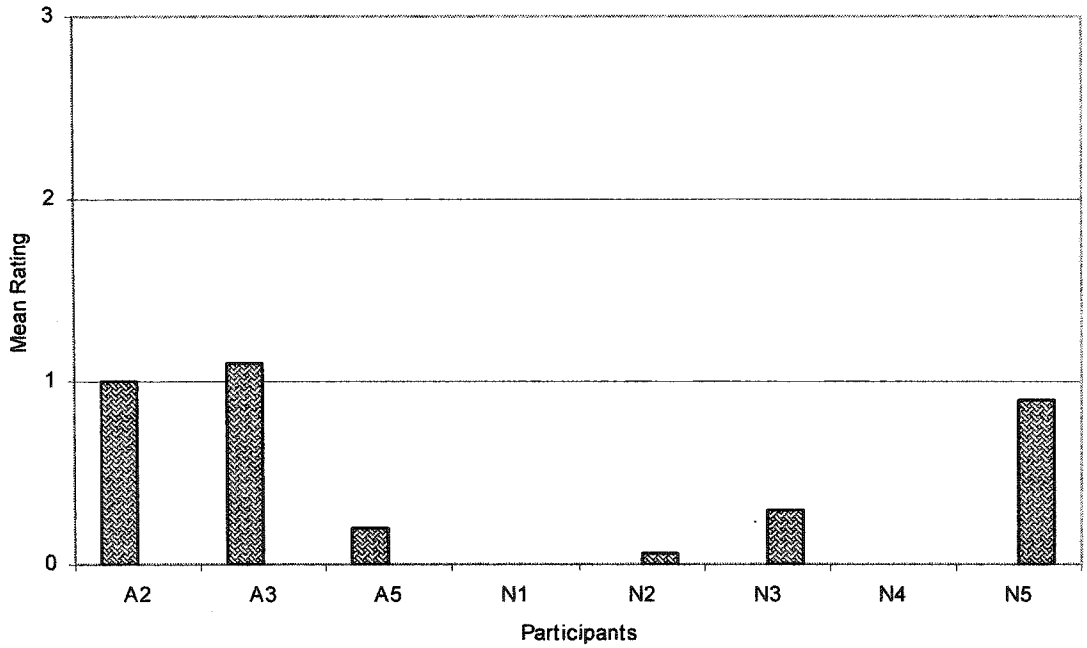

Figure 3. Mean teacher rating of participants' behaviour at school.

Figure 4 shows the teachers' rating for the participants' academic performance for reading, mathematics and written expression (Appendix F shows the ratings for each participant). Teachers of the ADHD participants rated their academic performance lower than did the teachers of the Non-ADHD participants. The scale rating for these items are: "Problematic" = 1 to 2; "Average" = 3; and "Above Average" = 4 to 5. All three ADHD participants were rated as below average, while one Non-ADHD participant received this rating (see Table F5).

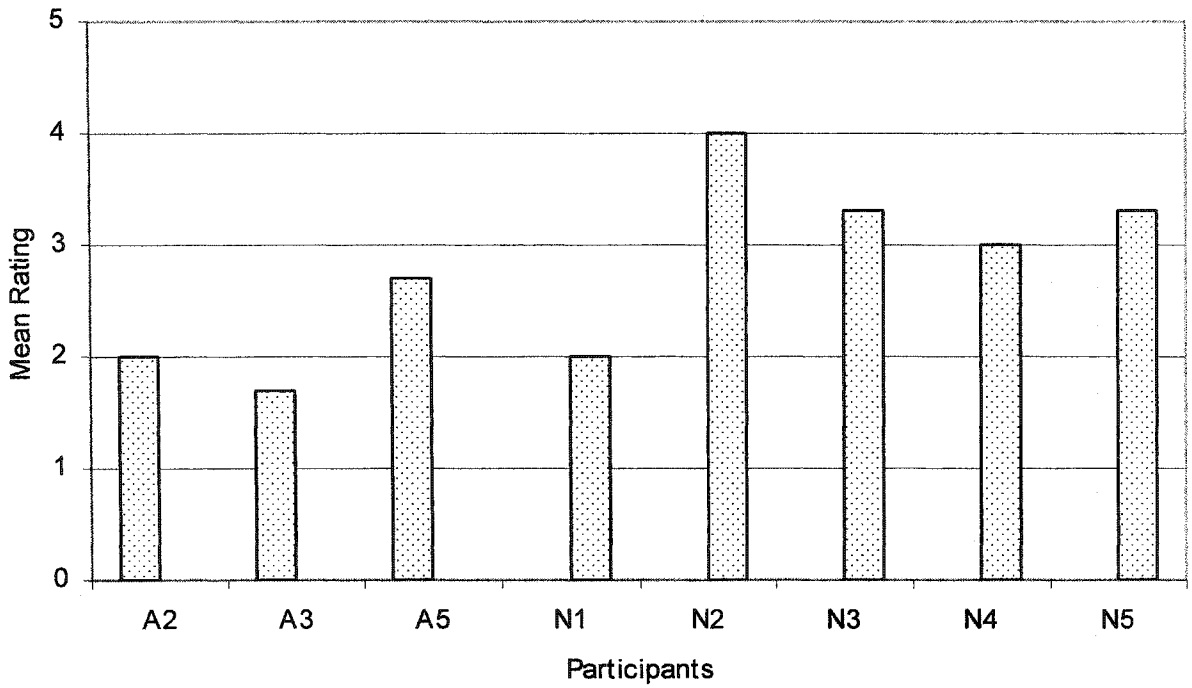

Figure 4. Mean teacher rating of participants' academic performance.

The remaining Non-ADHD participants were rated as either "Average" or above.

Figure 5 shows the ratings for the participants' classroom behavioural performance (see Appendix F for individual ratings). On all of the behavioural performance criteria, such as "relationship with peers" and "organizational skills", the ADHD participants were rated lower than the Non-ADHD participants. Three of the Non-ADHD participants were rated as "Average" or above while the remaining Non-ADHD and ADHD participants were rated below average (see Table F6).

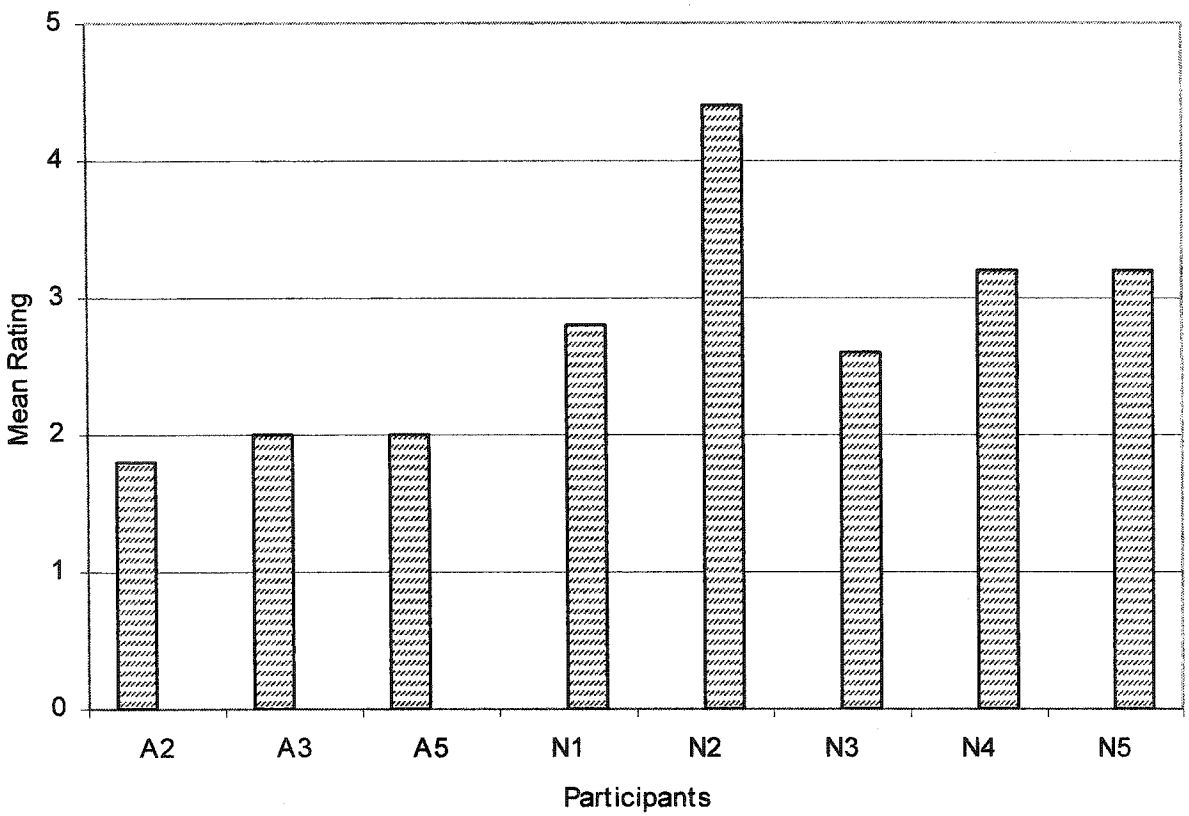

Figure 5. Mean teacher rating of participants' classroom performance.

Overall, the responding teachers' ratings, although somewhat more homogeneous than the parents' ratings, did indicate that the ADHD participants showed more difficulty at school with inattentive behaviours, general behaviour at school, academic performance and classroom behaviours. One reason for the homogeneous ratings by teachers may be that they are less likely than parents to make what may be perceived as a negative assessment of their students. Furthermore, teachers may be more likely to give the student the benefit of the doubt and look for indicators of development or positive performance as suggested in the remarks teachers made to qualify their ratings. Overall,

the parent and teacher rating scales confirmed that the participants were diagnosed as ADHD or Non-ADHD.

Study Conditions and Procedures

The review of the research literature identified several study conditions that affected the language and communication of children with ADHD. Those factors included the presence or absence of medication (Barkley et al., 1983), the task structure (Lorch et al., 1999; Roberts, Ray, & Roberts, 1984; Sanchez et al., 1999; Zentall, 1988) and organizing information (Purvis & Tannock, 1997; Tannock et al., 1993). These findings suggest that children with ADHD are more sensitive to their immediate conditions than their non-ADHD peers. As the primary goal of this study was to examine the communicative competency of children with ADHD, the creation of study conditions that facilitated and supported the talk and communication of all the children, with particular attention to the needs of the children with ADHD, was a critical aspect of the methodology. The creation of these conditions was based on the following premises.

The first premise is the notion that "children's concrete practical activity" is the basis for their thinking (Vygotsky, 1934/1987). The idea that children (or even adults) learn better when the material is meaningful to them is well established in education (Bredekamp & Copple, 1997; Cambourne, 1988, 1995; Gilles, et al., 1988; Wortham, 1998). The research regarding ADHD tends to employ artificial conditions, such as recall of nonsense words (Douglas & Benezra, 1990). In contrast to the recall of nonsense words, or retelling a story, activities that are meaningful to children tend to elicit more meaningful behaviours. An alternative to creating artificial conditions, such as rote

memorization or story recall, is to examine the language children with ADHD use in a natural setting.

Second, for children, play is a meaningful activity. This idea is well established in early childhood education (Berk, 1994; Bredekamp & Copple, 1997; Christie, 1991; Garvey, 1990; Isenberg & Jalongo, 1997; Piaget, 1962; Wood & Attfield, 1996). Children diagnosed with ADHD also appear to talk more in relatively unstructured conditions that provoke spontaneous conversation (Cunningham & Siegel, 1987; Roberts, Ray & Roberts, 1984; Zentall, et al., 1983). Thus, engaging children in an activity that is meaningful to them within conditions that are relatively unstructured provides a basis for examining children's meaningful communication.

Third, the idea of presenting children with a practical and familiar problem to solve is consistent with experiences they encounter in everyday life. This puts the particular problem-solving activity within the capabilities of the children. The study participants may, then, demonstrate their problem-solving skills with a possibility of succeeding.

Fourth, model building requires the use of both gross and fine motor skills. In conditions that permit only restricted movement (such as academic ones), ADHD children tend to become distracted (Cunningham & Siegel, 1987; Roberts, Ray & Roberts, 1984). The stimuli that tend to draw their attention are those that are novel, brightly coloured, and move (Butter, 1987; Zentall, 1989). Lego pieces are brightly coloured, different shapes, and are moveable. The Lego model, thus, carries all the elements that are designed to attract attention and generate interest, precisely those qualities that help elicit talking. The manipulation of the Lego blocks is an activity that

engages the children's attention while providing a challenge to their thinking and problem-solving capabilities. This, in turn, creates conditions that promote the talking and doing that are the focus of the study.

Accordingly, to facilitate talking and encourage the demonstration of communicative competency, participants were asked to build a Lego model and simply talk with the Researcher during the task. The Lego model building task was selected because it was considered to be of interest to the boys in the study, would provide them with a hands-on activity that was novel, colourful, moved, and was something the participants had some experience with in their past (determined during the initial interview with the participants in their home), thereby creating and maintaining their interest and attention levels. The participants were informed that they would be allowed to keep the model at the end of the study session, thus providing them with immediate reinforcement and a positive reward (Tripp & Alsop, 1999). In addition, the Researcher provided a snack for the participants (the participants selected the snack items with parental approval) providing a further reward for their participation and creating a relaxed, informal study environment.

The Lego model (number 2962) consisted of a rescue vehicle, a lifeguard stand, a male figure, a female figure and equipment such as binoculars and walkie-talkie reflecting a beach theme (from the Lego "RES-Q" series). This particular set was chosen because it reflected socially, educationally and age appropriate activities, relationships and theme. The overall theme of this particular model and of the series is providing assistance to others. The set included both male and female figures shown, on the box, to be in positions of responsibility in which the male is driving the rescue vehicle and the

female is the lifeguard. The beach theme reflects an activity and location with which all participants would have been familiar, given Victoria's ocean-side location.

The model contained 70 pieces and was designed for ages 6 to 10. The model was of sufficient complexity to be somewhat challenging even for the most experienced Lego builder but not so difficult that a participant would become discouraged and give up. The model was obtained through the Lego catalogue and was not available in stores. This reduced the possibility of a practice effect for this particular model and helped create a sense that the participants were special and deserved a distinctive model. The general goal was to create positive, supportative conditions that facilitated talking while the participants engaged in an activity they would find fun and rewarding.

The topics discussed during the study emerged as the Lego building progressed. The study sessions were structured to reflect different activiites but an agenda for topics was not pre-determined by either the Researcher or the participants. This helped create relatively unstructured "natural" conditions for conversations between acquaintances (i.e., the Researcher and the participant). Under these conditions, the study focus was on the participant's communication rather than their deficits or behavioural difficulties.

Prior to the study session, the Researcher met with the participant and his family at their home. This meant that during the study session the Researcher would not be a stranger but someone with whom the participants were at least marginally familiar. The underlying idea was that this would facilitate and support the participants' communicative patterns. During this initial meeting, the study objectives and procedures were explained to all family members. The participant was shown the audio recording equipment (Sony Cassette-Corder model TCM-453V), standard cassette (Maxell UR 120)

and tie microphone (Genexxa Tie Clip Microphone model 33-3003 with a 6 meter cord to allow participants some movement). The participant also recorded his voice using the equipment so he would be familiar with the equipment and the equipment would not interfere with his talking or activities during the study. During the initial home visit, the Researcher identified the participant's favourite snacks for the study session, with his parent's approval. After verbal agreement to participate in the study was given by the participant and his parent(s), the appropriate forms were signed by the parent(s) (see Appendix G) and a mutually convenient time was arranged.

All the study sessions were conducted at the University of Victoria Educational Psychology Foundations Laboratory Research room. The Lab consists of two rooms sharing a common wall with a one-way mirror. One room contained the camera (Panasonic OminMovie VHS) with recording equipment and television monitor and the other room was where the session was conducted. Figure 2 shows the floor plan of the study room. The room in which the Researcher and participants interacted was 3.9 meters long and 6.1 meters wide. A screen partitioned the room in half so the actual study area was 3.9 meters by 3.1 meters. Behind the screen was storage for chairs and boxes.

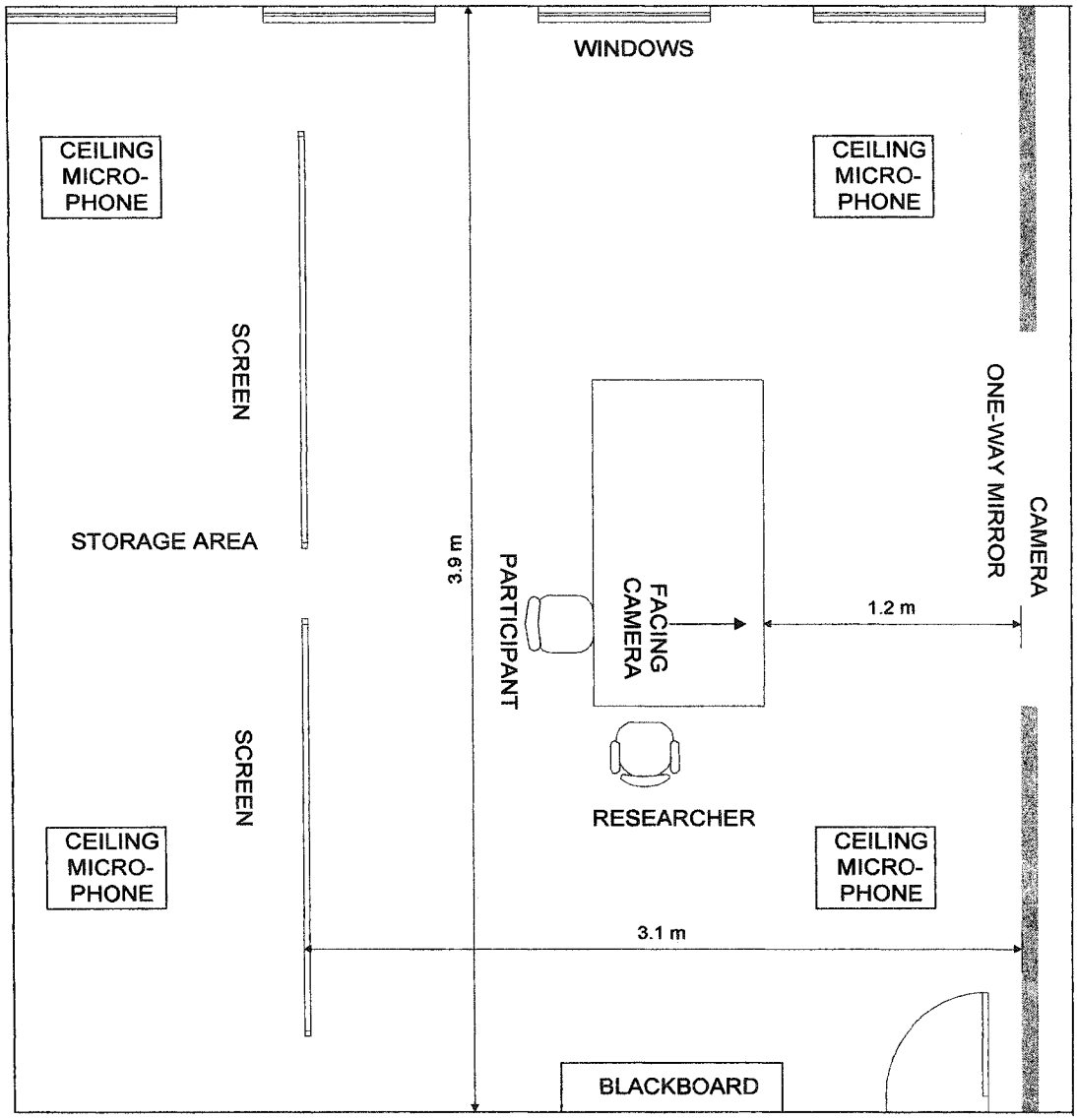

Figure 6. Floor plan of the study room.

Four microphones for the video camera were attached to the ceiling directly above and behind the Researcher and participant. A rectangular table (0.8 m by 1.5 m) was placed 1.2 meters from the wall with a one-way mirror (measuring 175.3 cm wide by 82.8 cm long). Behind the one-way mirror were the camera, camera operator, and the participant's parent(s). The participant sat facing the one-way mirror (and camera) and the Researcher

sat adjacent to the participant at the end of the table. To the participant's left was a window with the blinds drawn (to avoid distraction for the participant and too much light for the camera) and to the participant's right was a blackboard on the wall (with the chalk and eraser removed, again, to avoid distraction) and the door. Before each session, the Researcher ensured that the screens, table and chairs were arranged the same for all participants.

At the appointed day and time for the session, the Researcher met the participant and his parent(s) at the door of the study building and escorted them to the Lab. There the participants met the camera operator and were shown the camera room and the study room. The study session consisted of five different activities or phases: introductory, building, instruction, play, and an ending. This division represented a range of activities in which the participants could demonstrate their communicative competency. In addition, the Researcher had different expectations for the participants' behaviours in each of the five phases. These expectations were used to evaluate the appropriateness of the participants' behaviour and communication in the analysis of their communicative competency.

The Introductory Phase began when the Researcher and participant entered the study room and the camera operator started recording. In the Introductory phase, the Researcher expected the participants to become familiar with the observation room and its contents, to be hooked up to the microphone and microphone switch, to listen to the Researcher review the voluntary aspect of the study and to confirm their voluntary participation.

After the participant was shown the study room, including the microphones on the ceiling, the audio recording equipment (tie microphone) was attached. The Researcher then reviewed, with the participant, the voluntary nature of the study and that the participant could refuse to answer any question the Researcher might ask and/or refuse to do anything the Researcher might ask and at any time withdraw from the study without penalty and still receive the Lego model and the snack. The participants were then asked to reconfirm verbally their consent to participate in the study.

The Building Phase began when the Lego model was taken from the Researcher's bag and placed in front of the participants. In Building phase, the Researcher's expectation was that the participants would build the Lego model (or whatever else the participant decided to build) and to talk to the Researcher. The Researcher observed the participant building the model and asked questions, made comments or told stories as the participant built the model. The Researcher's questions and comments were intended to facilitate talking. For example, he asked A3, upon presentation of the Lego model, "*Have you seen one like that before?*" and when N2 opened the Lego box, the Researcher commented, "*Ah, there you go, bingo*". The Researcher assisted the participants when asked, for example N3, after struggling to open the box asked the Researcher "*Could you help me open it?*". Otherwise, the Researcher did not participate physically in the model building.

After the Building Phase, the Instruction Phase started when the model was complete or when the participant ceased building. During the Instruction phase, the participants were expected to provide the Researcher with instructions for building the Lego model they had just completed. The Researcher asked the participants to give

instructions about building the model for the other boys coming into the study session. The Researcher wrote down the instructions as provided by the participants. Snacks were offered to the participants at a time either at the end of or near the end of the building phase.

After the participants were finished giving building instructions, the Play Phase started when the Researcher presented his own Lego model. In the Play phase the participant was expected to play with the Researcher using their Lego model. The Researcher's model was much smaller and simpler than the one just completed by the participants. During the Play Phase the Researcher either initiated the play if the participant did not, or followed the participant's lead when the participant initiated the play session. For example, when A2 appeared reluctant to initiate play the Researcher commented, "*Hi, got a nice vehicle there, I like your vehicle*". A2 then proceeded to drive his vehicle over top of the Researcher's vehicle signalling the beginning of a play episode.

The Ending Phase began when either the time for the session was drawing near (approximately one hour) or the play had ceased. In the Ending phase, the participant was expected to pack up the Lego models and parts, unhook the microphone and the switch and leave the room with the Researcher. The Researcher thanked the participant for his participation, helped pack up the Lego model and unhooked the recording equipment. The session ended when the Researcher and participant left the study room.

The Building, Instruction and Play phases were intended to elicit different types of communication. During the Building and Play phases the participants were encouraged to engage in conversational discourse. The Instruction phase was meant to approximate

an expository type of discourse participants might have experienced in their classroom. The Introductory and Ending phases were included to provide a complete record of the activities and talk of the participants and the Researcher during the session. This division into different phases also provided the basis for some of the analysis of the data.

Analysis Procedures

The search for an appropriate methodology to examine communicative competency was inherently linked to the selection of analytical procedures. The review of the research literature indicated that using standardized tests to analyze the participants' language is a common research practice (Bain, 2000, Barkley et al., 1983; Javorsky, 1996; Purvis & Tannock, 1997). While these types of tests do reveal interesting aspects of language, they do not tell us specifically the kinds of language or communication features used by ADHD children. They only tell us that children with ADHD can do as well on some tests as their peers and do poorly on others. Westby and Cutler (1994) comment that "commercially available language tests are not adequate to assess pragmatic and cognitive language problems" (p. 64). An alternative to standardized tests is to use measures and instruments that capture the subtle, qualitative aspects of communication. Consequently, this study synthesized a variety of analysis procedures and instruments that did not include standardized tests.

Following Canale and Swain's (1980) framework, specific measures and analytical tools for this study were chosen from a wide range of available instruments. The selection criteria for specific measures were their consistency with Canale and Swain's underlying assumptions regarding communication and communicative competency (discussed in Chapter 4). This meant using measures that captured the

functional, pragmatic, concrete and structural aspects of participant's language and their communicative competency.

It is instructive to review briefly the historical development of the analysis procedures and tools selected for this study. Several attempts were made to examine the relationship between language and ADHD. This process informed the selection of procedures and tools and shaped the final form of this study. The development of the methodology and analytical procedures provides a background and rationale for the selection of specific instruments and measures discussed in the "Instruments/Measures" section of this chapter.

The original study proposal called for a linguistic analysis, using the Child Language Data Exchange System (or CHILDES) computer program (MacWhinney, 1995), to examine the participants' basic language structures including phonemes, morphemes, syntax, semantics and pragmatics. This linguistic approach was reflected in the original title for the study: *Literally Speaking: The Language of Attention Deficit Hyperactivity Disorder*. Semantic and pragmatic features of the language were to be examined using "speech acts" (Austin, 1962; Burkhardt, 1990; Searle, 1969) looking at illocutionary force, locution, and perlocution. This analytical framework was found to be unsatisfactory.

When the participants' talk was analyzed using the original proposed framework there was no theoretical thread linking the different aspects of language. Consequently, the linguistic aspects of the participants' talk and language were examined separately from other language aspects such as semantics and pragmatics. This separation resulted in an abstract and abstracted analysis in which the meaning of the participants' language

and communication was lost. It was difficult to re-combine the separate components into a meaningful whole using the original analytical framework. A thread uniting the different facets was needed. This thread was found in one aspect of the original proposed study, namely communicative competency. The study focus shifted from an analysis of language to an examination of communicative competency thereby providing a unifying concept that captured the essential function of language (viz., communication). The move to Canale and Swain's (1980) framework for communicative competency was the result of the search for a unifying theoretical and analytical concept to solve the problem of the separation and abstraction in the original linguistic and pragmatic analysis.

The originally proposed technology (i.e., the CHILDES program) was also found to be unsatisfactory for the purposes of this study. The CHILDES program required using a system for discourse notation and coding separated into "dependent tiers". There were separate coding systems for phonology, speech acts, speech errors, morphology and syntax. Given the sheer volume of data (or talk) produced by the Researcher and participants (i.e., well over 10,000 utterances), the CHILDES system was found to be cumbersome and unwieldy.

An alternative to the CHILDES program was found in the Computerized Profiling Program (CP) (Long, Fey, & Channell, 2000) that allowed the transcripts to be entered using any text editor or word processing program following simple rules for capitalization and punctuation. Once a transcript was entered into the program, several analyses could be performed on the data without further re-coding. This provided a more efficient method than the CHILDES for entering and analyzing the data.

Both the CHILDES and CP perform similar types of analyses for phonology, morphology, and syntax. The CHILDES program used "speech acts" as the basis for its discourse analysis whereas the CP program used "conversational acts" based on Fey (1986). Fey's conversational acts (CA) were easier to code, were consistent with the participants' talk and made intuitive sense whereas the components of speech acts, illocutionary force, locution, and perlocution were found to be abstract and difficult to apply to the participants' actual talk. The CP program includes components, such as Language Assessment, Remediation and Screening Procedure (LARSP) and the Profile in Lexical-Semantical (PRISM-L), that helped maintain the unity of the participant's communication while specific language aspects were examined. After such an examination, the overall meaning of the participants' talk was enhanced by the theoretical frameworks in the sub-programs included in CP such as CA, LARSP and PRISM-L. Although the CP program was chosen to use as a replacement for the CHILDES program, the practical utility of CP program was limited by several factors.

The CP program did not come with a user's manual, as did the CHILDES program. There are 123 instructional movies, downloaded from the CP web site, that demonstrate the use of each program module step-by-step. These movies are helpful, but a lot of time is required to download the movies and there were technical problems playing the movies on the Researcher's computer, which reduced their utility. The CP program also provides references to the source material for the sub-program. However, in order to understand a particular sub-program and its basic theoretical assumptions, considerable research to obtain and review the source documents was required.

There were technical glitches in the CP program that also reduced its effectiveness. The program allows 1,000 utterances per file. This meant that each study session had to be divided into segments. Fortunately, the sessions already had units embedded within them reflecting the different activities. Each phase of the session became a CP file, so that there were five basic files for each participant. A more serious problem occurred when different analytical procedures "miscoded" the data. Sometimes the Researcher's utterances were coded as a participant's and/or parts of an utterance were mysteriously converted into ASCII codes resulting, in both cases, in inaccurate results. A solution to the first problem was to exclude the Researcher's utterances and conduct analyses only on the participants' utterances. Different versions of each study session were created and used to overcome specific limitations in the CP program. The result was that a huge number of files (over 3,000) were created, which caused file management problems.

Another problem was the coding of the data by different CP modules. The coding of syntax and semantics, for example, had to be manually checked and often recoded when errors were discovered. Part of the problem was due to the nature of the natural language being analyzed. The participants and the Researcher did not speak in Standard English. Conjunctions and clauses were often replaced by tone units, pauses and smiles, none of which can be analyzed by the CP program. Some of the CP errors reflect these types of data being analyzed, but some errors were just that - errors. The result was often a doubling of the labour to check and re-check the coding, by watching the videotape, to verify accuracy. One benefit of this constant iteration of the data was that a saturation

point was reached and the Researcher was able to observe subtle nuances in the participants' language and behaviour that he might have otherwise missed.

The eventual development of the methodology for this study was a slow and painful process entailing countless hours of often mind-numbing intellectual and secretarial labour. The computerized analysis programs, both CHILDES and CP, were not the panacea they were originally, and naively, expected to be. The computer axiom, "garbage in-garbage out" pertains to language analysis as well. Researchers need to be cognizant of the fact that computer programs and analytical procedures select certain features and ignore others and are therefore, as Crystal (1979) reminds us, "appropriate for a limited range of applications" (p. 16). It is up to the researcher to decide which applications are appropriate and which are not.

Transcripts

A complete and verbatim transcript for each participant was created from the audio and videotapes. Two versions were then produced: one for analysis by the CP program, following CP protocols, and one for manual analysis for aspects, such as participants' behaviours, not captured by CP. For the manual analysis, a running transcript was produced following the suggestions of Lund and Duchan (1983). This transcript consisted of four columns. The first column was for timing the utterances and behaviours, the second for the Researcher's utterances, the third for the participant's utterances, and the fourth column for context notes (such as eye-gaze, or actions at the time of the utterance). In addition, the intonation patterns (e.g., tone units and stress) of the participants' utterances were also entered into the running transcript. The running transcript was checked by another person to verify independently the reliability and

validity of the transcription. Any discrepancies were checked and corrected. The running transcript was by far the most useful type of transcript for identifying language structures and communication patterns. As the analysis progressed, the running transcript became, in conjunction with the videotapes, the primary source document.

Instruments/Measures

This section describes the specific instruments and measures used to analyze the four communicative competency components: grammatical, sociolinguistic, discourse and strategic competency. The instruments and measures used were a combination of programs within CP and other instruments and measures that examined aspects of communication not included in the CP program.

Throughout the analysis, descriptive and percentage comparisons were used rather than other comparisons utilizing, for example, nonparametric statistics. This study is exploratory. There are no research precedents upon which to test or confirm hypotheses regarding the relationship between communicative competency and ADHD. In some of the analyses (e.g., morphological) the sample size was not sufficiently large enough to use comparisons other than percentages. For the purposes of this exploratory study, descriptive and percentage comparisons were deemed appropriate.

Grammatical Competency

Research has not shown a significant relationship between the grammatical aspects of language and ADHD. Javorsky's (1996) study suggested that children diagnosed with ADHD might have some difficulties with phonology. Purvis and Tannock (1997) argued that language deficits observed in children with ADHD did not reflect "deficits in the basic subsystems" such as phonology, semantics and syntax.

In light of these findings, this study examined only the most basic components of grammatical competency (viz., phonology, morphology, syntax and semantics) to provide a rudimentary description of these language subsystems and their relationship to ADHD.

Grammatical competency was examined using a synthesis of procedures and tools from the Computerized Profiling (CP) program (Long, Fey, & Channell, 2000), including, Crystal (1979), Crystal, Fletcher, and Garman (1989) and Scarborough (1990) in conjunction with other tools following from Crystal (1988), Garvey (1984), and Lund and Duchan (1983) for the analysis of grammatical items.

General measures of language production.

The literature shows that children diagnosed with ADHD talk more than non-ADHD children (Barkley, et al., 1983; DSM-IV, 1994; Zentall, 1988; Zentall et al., 1983). To determine if this finding occurred in this study the CP program was used to calculate Mean Length of Utterance and the Syntactic Complexity Score.

1. Mean Length of Utterance (MLU) in morphemes. MLU is a commonly used measure of linguistic proficiency (Brown, 1973). It is the average number of morphemes produced in a meaningful sequence (Harris & Hodges, 1995). The MLU was calculated by the CP program using a 100-utterance sample (beginning with the 51st utterance from the participant's initial utterance in the session). The procedure to use the 51st utterance was based on Fletcher (1985). MLU, however, has been criticized as being too broad and insensitive to developmental changes (Blake, Quartaro & Onorati; Lee, 1974; Scarborough, 1990, 1991). Another measure of linguistic proficiency was also used to accommodate the criticisms levelled at the MLU.

2. Syntactic Complexity Score (SCS). This measure is calculated only for multiword utterances "since single-word utterances do not involve syntax" (Blake, Quartaro & Onorati, 1993). The measure is based on the number of grammatical categories, namely, subject, verb, object and complement. The SCS was calculated using the CP program for a 100-utterance sample (beginning with the 51st utterance from the participant's initial utterance in the session).

Phonological analysis.

Initial observations of the participants by the Researcher at their homes revealed that all participants were able to produce and articulate the sounds of the language. However, given the possibility that this initial general assessment of the participants' phonology might have missed some phonological features, a substitution analysis, a common form of phonological analysis (Ingram, 1976), was conducted following from Lund and Duchan (1983). An inventory of the participant's sounds was constructed using a 100-utterance sample (beginning from the 51st utterance). From this inventory of sounds, the analysis looked for instances of misarticulation by the participants.

Morphological analysis.

For the purposes of this study, morphology was defined as the study of the little words and word endings that carry subtle meanings and "serve special grammatical and pragmatic functions in language" (Lund & Duchan, 1983, p. 111). The morphological analysis in this study examined the structure and forms of words including derivations, inflections and compounding.

Because there is little information in the literature regarding the morphological features of language of children diagnosed with ADHD, an analysis of the basic forms was conducted. The morphological analysis was conducted using the CP program with a 100-utterance sample (beginning with the 51st utterance) to identify noun forms (including common, proper, personal pronouns - first, second and third person and other pronouns), main verb forms (including inflections, tense, modal and copular verbs), adjective and adverb forms.

The CP program was used to calculate the type, token and type-token ratios for each of the categories. Type token ratio (TTR) is defined by Harris and Hodges (1995) as the "number of times a particular linguistic item (token) occurs in a text in relation to the linguistic class (type)" (p. 262). The TTR is computed by dividing the total number of different words (types) in a speaker's sample by the total number of all words produced (tokens) by the speaker in the sample. TTR indicates lexical diversity (Klee, 1992).

The TTR tends to be negatively correlated to the size of the language sample because as "sentence length increases, grammatical function words tend to make up a greater proportion of the total sample" (Nelson, 1998, p. 316). Consequently, older children who produce more complex grammatical constructions may have lower TTRs. For this reason, the TTRs were calculated in this study using the 100-utterance sample (Fletcher, 1985). According to Fletcher, a TTR of .50 tends to be constant across all age groups for both genders (p. 47). If the TTR falls "well above or below .50, we can conclude that the lexical diversity is not normal" (p. 47). A low TTR indicates restrictions in the range of use of vocabulary by the child.

Syntactic analysis.

Syntactic analysis examined regularities for combining words into larger units. The findings of Javorsky (1996) and Purvis and Tannock (1997) suggest that children with ADHD have few difficulties with syntax. Accordingly, an analysis of only the basic features of syntax was conducted.

Lund and Duchan (1983) suggest that syntax is comprised of different systems (viz., clause structure, noun phrases, pronouns, questions and negative system). Each of these sub-systems has its characteristic structure and syntactic rules. Two of these systems were examined, clause structure and noun phrases, as these sub-systems comprise the basic features of syntax.

The analysis examined the participant's clause structure and noun phrases. A general measure of grammatical complexity, Index of Productive Syntax (IPSyn; Scarborough, 1990; Scarborough, Rescorla, Tager-Flusberg, Fowler, & Sudhalter, 1991), was used to provide an overall picture of each participant's syntax. Clause structure and noun phrases were examined using Language Assessment, Remediation and Screening Procedure (LARSP; Crystal, 1979; Crystal, Fletcher, & Garman, 1989).

1. General measure of grammatical complexity.

The CP program calculated the IPSyn (Scarborough, 1990; Scarborough, Rescorla, Tager-Flusberg, Fowler, & Sudhalter, 1991), a measure of grammatical complexity. The IPSyn quantifies the grammatical complexity of children's spontaneous utterances and serves as a "summary scale of grammatical complexity" (Scarborough, 1990, p. 1). IPSyn scores are derived from a 100-utterance sample (beginning with the 51st utterance) of children's intelligible utterances by reviewing the utterances for the

presence of 56 syntactic and morphological forms. The IPSyn awards points for the use of noun and verb phrases, questions and negations, and sentence structures according to criteria specified in the coding manual (Scarborough, 1990). The higher the IPSyn score, the more complex the structures present in the sample, indicating the degree of grammatical complexity.

2. Clause and phrase structures.

Using the LARSP analysis within the CP program, imperative, interrogative and declarative sentences in a 100-utterance sample were analyzed structurally at the clause, phrase and word level to create a snapshot of the participant's syntactic and morphological forms. The analysis identified:

- Clause structures (e.g., subject-verb, subject-verb, object),
- Phrase structures (e.g., adjective-noun, noun-noun),
- Mean clausal complexity, and
- Mean phrasal complexity.

The LARSP program created a profile for each participant that included the frequency and percentage of clauses and phrases they used. This profile is organized according to seven syntactic stages that are summarized by Crystal (1981a):

- Stage I: single-element sentences, (e.g., *no, okay, one, sometimes*);
- Stage II: Two-element sentences, defined in terms of clause elements (e.g., *now what, I know*) or phrase elements (e.g., *big person, black one*);
- Stage III: Three-element sentences, defined in terms of clause elements (e.g., *get on there, I see something*) or phrase elements (e.g., *in the bag*); the stage includes the beginning of hierarchical development, with phrase units being

incorporated into clause structure; associated developments, such as pronouns and the copula are also placed at this stage;

- Stage IV: Four-element sentences, defined in terms of clause elements (e.g., *I put that here, I usually make those*) or phrase elements (e.g., *in the small bag*) along with any associated developments (e.g., the development of phrasal coordination);
- Stage V: Complex sentence formation, defined in terms of clausal coordination (e.g., *I take things apart and I play with them*), clausal subordination (clauses as subjects, objects, or adverbials, (e.g., *the chair broke when he sat on it*) and phrasal subordination (especially relative clauses, e.g., *the man who came in sat down*)
- Stage VI: Consolidation of the grammatical systems operating at different points in phrase and clause structure (e.g., quantification structures in the noun phrase, more complex verb phrase and complementation structures);
- Stage VII: Remaining structures (e.g., patterns of sentence connectivity, patterns of emphatic expression) (p. 101).

The stages are developmental with Stage I containing the least complex forms (e.g., single words) and Stage VII containing the most complex forms (e.g., sentence-connecting devices related to discourse structure). LARSP does not, however, attempt to explain these stages in nonlinguistic terms; for example, the basis for the development between Stages I and IV is best viewed in terms of a child's increasing memory or cognitive processing. LARSP provides a profile of an individual's syntactic structures from which clinicians may devise remediation protocols (Crystal, Fletcher, & Garman,

1989). As Crystal (1981b) points out, the "developmental framework is simply being used as a yardstick against which individual variation can be plotted" (p. 45).

The LARSP profile contains more information for Stages I to V because "some points in the language development are pivotal, hence they need more attention" Crystal (1979, p. 5). Stages VI and VII, according to Crystal (1979) are "included to remind people that several important grammatical features are still in the process of acquisition" (p. 5) but may not necessarily require the same amount of remediation as would difficulties arising in Stages I to V.

The clause structure is examined across the seven stages while phrase structure is examined across Stages I to VI. Phrase structure is analyzed as far as Stage VI, or the consolidation stage. The reason is that Stage VII profiles discourse structures consisting of sentence-connecting devices, word-order patterns and the use of intonation to control relationships between parts of the sentence that do not directly pertain to phrase structures (as defined by Crystal, et al., 1989).

The analysis examined the clause and phrase structures within each of the syntactic stages. The LARSP profile is used in this study as a general indicator of the participants' patterns of syntax.

Semantic analysis.

The semantic, or lexical, analysis deals with the meaning of words and word combinations. The literature shows that it is at this level that children diagnosed with ADHD appear to have difficulties. The findings by Purvis and Tannock (1997) and Tannock et al., (1993) suggest that difficulties at the semantic level may contribute to deficits in story organization and retelling.

This analysis, following from Lund and Duchan (1983), examined three aspects of semantics: lexical meaning, contextual meaning and conceptual domains. These aspects of semantics reflect qualitatively different levels, moving from the narrowest to the broadest levels of meaning. Lexical meaning is the dictionary meaning of content words. Contextual meanings are words that depend primarily upon the context rather than the linguistic structure for their meaning. Conceptual domains extend beyond an individual word to link common meanings among words.

1. Lexical meaning.

Meanings change for children as they gain more experience with their words (Lund & Duchan, 1983; Luria, 1982; Vygotsky, 1934/1987). Their semantic patterns are not stable. Words convey multiple associations. Lexical meaning gives the characteristics of the category, such as beings, objects, events, to which the word applies (Lund & Duchan, 1983). Children may use a word with a referent that is different than the listener's referent or they may have difficulties finding the appropriate word. These types of difficulties with lexical meaning can affect the participants' communicative competency. Lexical meaning is analyzed by looking for instances of the wrong referent, or wrong word, and word deficits, or substituting another word or phrase in place of a known word.

2. Contextual meaning.

The analysis of contextual meaning looked for the influence of context and the ways that context relates to lexical meaning. Two important aspects of contextual meaning are referencing and perspective taking. Referencing is the ability to use words to identify events, objects or relationships that distinguish the event, object or relationship

from other competing alternatives (Garvey, 1984). Appropriate referencing "aligns another person's attention" with that of the speaker's (Garvey, 1984, p. 62). Speakers and listeners understand each other better when both parties know the referents in the topic. Words, however, may have stable meanings but the object, person, or event to which they refer can change. Thus, the context influences those words with shifting referents. The speaker must adapt her choice of words to accommodate, for the listener, those words with shifting referents. Failure to do so may result in ambiguous communication, thus reducing the listener's understanding of the topic under discussion. In this study, participants' references were examined by looking for deviations in which participants (a) fail to recognize the need for anaphoric or shared situational reference and (b) use incomplete sentences without anaphoric reference.

Perspective taking allows the speaker or listener to understand or direct their attention to events, objects or relationships from the other person's perspective. This helps align the referent for both conversational partners and facilitates communication. Referents for words may shift depending on who is speaking. These are deictic words. Deictic words, such as *here* and *this* provide a verbal shortcut for highlighting aspects of a situation without naming them. Three classes of deixis are examined: personal, place (or location) and time deixis. Garvey (1984) notes that a "prerequisite to understanding person deixis is self-awareness, the concept of self as a separate entity" (p. 73). That is, personal pronouns specify a certain relationship between the speaker and the listener. First person personal pronouns, such as *I*, *me* and *my*, include the speaker but exclude the listener. These pronouns may be viewed as the psychological center for the speaker. When the 2nd person personal pronoun *you* is used, the relationship shifts away from the

speaker to include the listener but exclude the speaker. There is more distance, psychologically, from the speaker. The relationship between the speaker and the listener is further changed when 3rd person personal pronouns, such as *he*, *her* and *them* are used. These pronouns exclude both the listener and the speaker and refer to third parties. Thus, the use of 1st, 2nd and/or 3rd person personal pronouns may reflect the ability of the speaker to separate herself from the situation.

Place deixis, using terms such as *here-there*, are chosen by the speaker according to the proximity of the referent or listener to the speaker and/or the direction of motion indicated by the deictic terms relative to the speaker. Place deixis links information that is located outside the text of talk, for example, *It's here*, links a referent that lies outside the text of the talk to the text of the talk. It helps orient the speaker and listener to the same referent thus enabling a better understanding of the topic for the listener and the speaker.

Time deixis, such as *today* and *next*, connect temporal concepts to the text of talk. The appropriateness of a particular temporal deictic term (e.g., *tomorrow*) depends on the moment it is spoken rather than on the relationship between the speaker and listener (as is the case with person and place deixis). Time deixis is used and understood in relation to a more abstract understanding of time and its relation to the speaker in the moment the deictic term is used.

To analyze participants' contextual meaning for perspective taking, the following deictic terms were examined: (a) person deixis for the use of personal pronouns; (b) place deixis that distinguished the proximity of the speaker and/or the direction of motion relative to the speaker (i.e., *here/there*, *come/go*, *this/that*); and (c) time deixis that looked

for the use of tense markers and words for which the reference in time depends on the moment they are spoken (e.g., *yesterday*, *next*).

3. Conceptual domains.

Words have meaning beyond their denotation; they share common meanings. Some of those meanings may be related through sensory (e.g., colour and taste), logical (e.g., size and shape), function (e.g., objects are related through their function or activity), and affective (e.g., happy and sad) qualities. The general procedure underlying this analysis of conceptual domains was to look for the different types of meaning the participants were using, rather than analyzing their specific words for denotation. Conceptual domains were assessed using Lund and Duchan's (1983) categories for adverbs, adjectives, verbs and nouns (see Appendix H for a list of the categories). In a 100-utterance sample, the participant's adverbs, adjectives, verbs and nouns were examined and coded according to the items listed in Appendix H.

The concept domains for adverbs are relatively straightforward. For example, the category "Temporal" relates to reference about time, "Location" to place and so forth. The meaning of the category "State-Quality" is less obvious. "State-Quality" refers to more abstract relations than the domains of "Location" and "Temporal". The category "State-Quality" refers to relations that express a state that is qualitatively distinct from other states (such as those regarding a person), expressed by the adverbs *cheerfully* or *sadly*. The "State–Quality" category contains adverbs, such as *barely*, *really* and *very*, that perform a wide range of functions within the sentence. Some adverbs, such as *very* (i.e., intensifiers), indicate the degree to which a verb is modified. For example, the word *very* is an adverb of degree that emphasizes the verb *tired* in "*I am very tired*".

"State-Quality" adverbs, then, intensify or add a qualitative aspect to the meaning of a verb or verb phrase.

The meaning of the adjective concept domains is relatively clear. Sensory qualities relate to adjectives described by the senses, while logical qualities are related through some characteristic such as "size", "number" or "condition". Under the "Relations" domain, the category "Inclusivity" reflects the opposite of the category "Exclusivity". Where "Exclusivity" is related to a specific adjective, such as *only* that restricts the referent and the meaning, "Inclusivity" refers to a general reference, such as *any*, that expands the referent.

Within the concept domains for verbs, the categories "Sensory Stative" and "Sensory Process" refer to similar but distinct domains. "Sensory Stative" refers to verbs that relate to passive sensory experiences (e.g., *hear* and *see*) while "Sensory Process" refers to active sensory experiences (e.g., *look* and *think*). The stative and process categories distinguish between active and passive processes identified through the different verbs.

Nouns were analyzed using only basic categories because the domains covered by nouns are far too numerous to catalogue. The categories selected for this study, following Lund and Duchan (1983) and Crystal (1988), were: "animate", "inanimate", "concrete", "abstract", "count" and "noncount" nouns.

Sociolinguistic Competency

Sociolinguistic competency is the ways in which utterances are appropriately produced and understood. The literature suggests that children diagnosed with ADHD are more sensitive to their immediate environment than are Non-ADHD children (Lorch et

al., 1999; Sanchez, et al., 1999). Accordingly, the study examined how the participants' language reflected sensitivity to their immediate environment. There are also indications in the literature that children diagnosed with ADHD demonstrate difficulties with their conversational interactions, such as interrupting (Zentall et al., 1983), misinterpreting information (Tannock et al., 1993) and demonstrating pragmatic deficits (Westby & Cutler, 1994). Analyses were done to look for such difficulties in the participants' conversational interactions with the Researcher.

The analysis of the extent of the participants' sensitivity to their immediate environment and their conversational interaction was based on Fey (1986). Fey proposed a coding scheme to profile children's levels of social and conversational participation (see Appendix I). This scheme examines utterance and discourse level statements. Within the utterance level, children's statements are divided into assertive and responsive conversational acts. There are three types of assertive conversational acts: (a) "requestives", which are statements that solicit information or actions, (b) "assertives", which are statements that "label, report facts, state rules and explanations" and (c) "performatives", which are "claims, jokes, teasing, protests and warnings" (Fey, 1986, p. 72).

This study made a significant modification to Fey's definition for one type of "assertives". Fey defines assertive comments (ASCO) as "identifications and descriptions of observable objects and events, for example, 'We go [went] our grandma's today," "Have birthday party," "That Vincey," "They hanged up." (p. 72). In this study, Fey's definition of "observable objects and events" was interpreted quite literally. Participants' comments that referred to objects and/or events that were directly observable within the

study room were coded as ASCO. Other participant comments about objects and/or events that *may* have been observable to the participant, such as "We go [went] to our grandma's" or "Have birthday party", but were not directly observable in the study room, were coded as statements that were not directly observable (ASST). This modification helped identify the influence of the immediate context on the participants' language.

Fey defines seven responsive conversational acts that "provide information requested or acknowledge assertives and performatives" (p. 72). These responsive acts are linked to the "requestives", "assertives", and "performatives" by the fact that a conversational partner chooses to respond to the speaker's requests, assertive or performatives.

The discourse level coding focuses on the child's "willingness and ability to initiate new topics when appropriate and to maintain and extend topics that are already established" (Fey, 1986, p. 71). Within the discourse level there are four categories: initiate, maintain, extend topic and extend topic tangentially (See Appendix I).

Each of the participants' utterances was coded twice, that is, as a conversational act and for its discourse function, to determine the child's "assertiveness and responsiveness in a variety of social contexts" (Fey, 1986, p. 73). For most utterances, only one conversational act and one discourse function were applied to an utterance. There were some utterances, however, in which multiple codes were applied, such as "Yeah, I have that one", which would be coded as a "response to a request for information" and a "statement of directly observable objects/events".

The analysis of the extent to which participants were sensitive to their immediate environment examined the types of assertives expressed by the participants and the extent

to which the participants' topics reflected a psychological distance that was closer to the individual (e.g., topics regarding immediate family members) or topics that were more psychologically distant (e.g., topics about computers or volcanoes).

The analysis of the conversational interaction looked at six components: (a) responding to the conversational partner, (b) semantic contingency, (c) turn-taking, (d) interruptions, (e) eye contact and (f) listener context.

Within the component "responding to the conversational partner", the analysis used three indicators of the participants' responsiveness: (a) conversational assertiveness, (b) responses to the Researcher's questions and (c) responses to the Researcher's non-question utterances.

In a conversation, both parties must contribute. The level of the participants' conversational assertiveness indicates their relative contribution to the conversation. A measure of conversational assertiveness was calculated by dividing the number of assertive acts produced by each participant by the number of assertive conversational acts produced by both the participant and the Researcher (Fey, 1986). Proportions near 50% indicate symmetry in the conversation with each partner contributing equal numbers of self-selected conversational acts. Proportions closer to 100% indicate dominance of the participant over the Researcher (i.e., high assertiveness) and proportions closer to 0% indicate that the participant played a "more subordinate role in the conversation (i.e., low assertiveness)" (Fey, 1986, p.74). A measure of the participants' overall assertiveness was calculated as well as the participants' conversational assertiveness for each of the five study phases.

According to Fey (1986), responding to questions is one of the earliest aspects of conversational discourse to develop. There is a social obligation on the part of the listener to respond to a requestive (i.e., a question). It is also an indicator of the extent to which participants were paying attention to the conversation or were distracted by another activity, such as building the Lego model. The measure of participants' responses to the Researcher's questions was calculated by summing all the Researcher's "requests for information (RQIN)" and "requests for clarifications (RQCL)". All the participants' "responses to requests for information (RSIN)" and "responses to requests for clarification (RSCL)" were also summed. A proportion was computed by "dividing the number of the participant's RSIN's and RCSL's" by the number of the Researcher's RQIN's and RQCL's (Fey, 1986, p. 76).

Participants' responses to the Researcher's nonquestion utterances indicate the extent to which the participants attend to the details of the Researcher's utterances and consider those details in formulating a response. The participants' responses to the Researcher's non-question utterances were calculated by summing the number of the Researcher's non-question utterances (e.g., assertives, performatives and responses) that are followed by the participants maintaining or extending the topic. The number of maintaining or extending utterances was divided by the total number of nonquestion utterances. Higher percentages of maintaining and extending utterances indicate the participants' willingness to attend to the details of the Researcher's conversational acts and to consider those details in formulating his own responses. A participant who typically "fails to respond to nonrequestives or who initiates new topics or extends topics

tangentially is less aware" of his responsibility to cooperate with the Researcher in the sharing of meaning and the creation of text (Fey, 1986, pp. 77-78).

There are indications in the literature that children diagnosed with ADHD have difficulty connecting their utterances (Tannock et al., 1993). Conversations in which utterances are connected are easier to understand. The participant's ability to relate their utterances (i.e., their semantic contingency) was examined. Indictors of semantic contingency used in this study were instances of repetition of another's utterances, expansions of utterances to include missing forms or new information, and answers to current questions and questions related to previous utterances that are contingent.

An important aspect of a conversation is taking turns-at-speaking. This aspect is implied in the DSM-IV symptoms for impulsivity (i.e., "often blurts out answers before questions have been completed"; "often has difficulty awaiting turn"; and "often interrupts or intrudes on others", APA, p. 84). An equitable distribution of turns-at-speaking indicates that each partner is contributing equally to the conversation. This study looked at the number of sentences per turn for each participant and the Researcher.

Another important aspect of a conversation related to turns-at-speaking is interruptions. The literature does indicate that children diagnosed with ADHD tend to interrupt more than their Non-ADHD peers (DSM-IV, 1994; Zentall, 1988). The frequency of each participant's interruptions was calculated.

An important method of knowing when to speak-in-turn is to watch the speaker for nonverbal cues. Eye gaze, then, is a component of taking-turns-at-speaking that helps the listener not interrupt the speaker, which tends to be a violation of a social conversational norm. Accordingly, this study calculated the participant's average number

of eye gazes per minute as another indicator of turn-taking. The frequency of the participants' eye gazes was counted by observing them on the videotape and then dividing them by the number of minutes to obtain an average per minute.

Another aspect of sociolinguistic competency not dealt with in the literature on language and ADHD is the extent to which children diagnosed with ADHD take listener context into account during a conversation. The ability to take in account the listener context, discussed previously under "Perspective taking", helps align the listener and speaker to the same referent thereby facilitating communication. Following Lund and Duchan (1983), the existence of relative clauses, the presence of identifying adjectives and the use of orienting and transition indicators, such as "remember I told ya about", were used as indicators of the participant's ability to take the listener's perspective.

Discourse Competency

Discourse competency is the ability to connect grammatical forms and meanings into a meaningful, unified text. Text includes various genres such as oral, written, a dissertation, a poem, a newspaper or a telephone conversation. Discourse competency is manifested in two forms: through cohesion in form and coherence in meaning. Cohesion in form links the utterances structurally and promotes interpretation of the text. Cohesion devices may include pronouns, synonyms, ellipsis and conjunctions. Coherence in meaning links the "relationships among the different meanings in a text, where these meanings may be literal meanings, communicative functions, and attitudes" (Canale, 1983, p. 9). The literature indicates that children diagnosed with ADHD have difficulty with discourse competency (DSM-IV, 1994; Tannock, et al., 1993; Tannock & Purvis,

1997). This study examined participants' topic management as a prerequisite for the construction of a coherent conversation.

The analysis of participants' topic management used Fey's (1986) coding for conversational acts in conjunction with Mentis' (1994) assessment framework for topic management. Two aspects of topic management were examined: topic introduction and topic maintenance.

Within topic introduction, two aspects were analyzed: (a) identification of topic management components, including the number of topics/subtopics introduced, topic shifts and inappropriate tangential shifts, the type of topic/subtopic introduced and the type of conversational act used to introduce a topic and (b) the contribution of linguistic factors such as adverbial conjuncts, discourse particles, questions, relative clauses and conjunctions.

Topic maintenance followed a similar framework: (a) identification of topic management components including the length of topic/subtopic sequence, type of conversational acts used to maintain, extend or extend a topic tangentially and (b) the contribution of linguistic factors, such as pronouns, comparative adjectives, determiners, ellipsis, conjunctions and verb tensing. To illustrate the relative contributions of the participants and the Researcher to introducing and maintaining topics, samples of the discourse from three participants were analyzed in detail. The level of detail in this analysis precluded examining all participants. The discourse from these three participants was selected because they exemplified the qualitative aspects of topic maintenance, such as topic introduction and topic shifts.

Two different types of discourse were examined: self-talk, or private speech, and expository discourse, from the "Instruction" Phase of the sessions. Some of the literature (e.g., Westby & Cutler, 1994) indicates that children diagnosed with ADHD do not engage in a type of discourse, self-talk or private speech. Other studies (e.g., Berk and Potts, 1991) indicate that children with ADHD do engage in self-talk similar to their Non-ADHD peers. Instances of participants' private speech or self-talk were examined for any patterns. During the "Instruction" phase of each session the participants provided instructions to the Researcher regarding their building methods. This expository discourse, which approximated the participants' classroom experiences, was examined for the level of detail in the instructions.

Strategic Competency

Strategic competency is the verbal and non-verbal strategies that may be called upon to "compensate for breakdowns in communication due to performance variables or to insufficient competence" (Canale & Swain, 1980, p. 30). The findings of Zentall et al., (1983) indicated some strategies used by children with ADHD, including using more fillers and repeating and revising more statements. For the purposes of this study, breakdowns were defined as any interference of a communicative act(s) by one or both of the conversational partners. A null response is an example of a breakdown in a communicative act.

The analysis identified the type of communicative breakdown and showed the strategies the participant used in their attempts to compensate for the breakdown. This study examined strategies used by participants under three conditions: (a) self-initiated repairs, (b) other-initiated repairs, and (c) abandoned utterances and null responses.

Within each of these conditions, patterns or regularities used to compensate for breakdowns were identified.

Summary of Methods

A primary consideration in this study was to create conditions that encouraged the participants to talk and were supportative of the participants' aptitudes and abilities. The emphasis was on facilitating the contribution each participant could make to the study. The instruments and measures selected were those that assisted in a comprehensive examination of communicative competency that would provide specific qualitative and quantitative information regarding participants' communicative strengths and weaknesses.

The reliability and validity of the measures and instruments used were examined to ensure accurate evaluation of the four components of communicative competency. In those cases where reliability and validity information regarding the instruments was lacking, the interrelationships among the four components in the communicative competency framework and the use of multiple measures helped to verify the results of the analysis. These interactions between and among the four components help to ameliorate the effects of any coding, program or other errors that may have occurred. For example, the influence of pronouns examined within the morphological analysis also appears in the analysis of reference under semantics. Thus, within the grammatical component, one aspect (i.e., pronouns) is analyzed at least twice at different levels. The analysis of sociolinguistic and discourse competency also looks at the influence of pronouns on participants' communicative competency. This pattern holds for other aspects of communicative competency.

In addition to the use of triangulation and multiple measures, all of the codes and procedures for the instruments and measures were interpreted and applied the same way for all participants. Thus, any observed differences should be valid. The use of a variety of relevant instruments and measures helps ensure that the analysis accurately reflects the participants' communicative competency within the study context.

Limitations of the Study

The exploratory nature of this study imposed certain restrictions. First, the study participants were selected using a typical case sampling technique. This means the sample, drawn from a specific population (i.e., boys aged 6 to 9 years), was not randomly selected or randomly assigned to the groups. Thus, the conclusions can not be generalized beyond the specific sample used in the study. Second, the observations were conducted over a relatively short period. The study, in essence, was a snapshot of the children's language and communicative competency rather than a longitudinal study. Therefore, changes in language and communicative competency patterns over time cannot be examined. Third, this study does not rigorously control for factors other than ADHD and comorbid language disorders. Thus, the study can not rule out the possibility that other disorders may impact the results. Finally, the study created a controlled environment for the participants. The participants' behaviour, then, may not be considered "natural". That is, the participants may exhibit different behaviours in environments to which they are more accustomed, such as at home or school. The absence of a naturalistic setting limits any generalizations beyond the study conditions. As a result of these limitations, the study conclusions must be considered to be suggestive rather than definitive.

Chapter 6

RESULTS

The results of this study are described within the four components of communicative competency: grammatical, sociolinguistic, discourse and strategic competency. Inherent in this order is the notion of levels. Grammatical competency is the most fundamental level that provides the foundation for using language in social contexts (sociolinguistic competency) and connecting grammatical forms and meanings into a meaningful whole in different genres (discourse competency). Strategic competency permeates throughout the other levels and serves to compensate for breakdowns in communication. Given the interrelationships among the four components, there are some results that overlap or extend across more than one component.

Grammatical Competency

Grammatical competency focuses on the knowledge and skills necessary to understand and express the literal meaning of utterances. It includes phonological, morphological, syntactical and semantic features of the language. To assess the overall language of the participants, general measures of language production and complexity were also used.

General Measures of Language Production

The literature indicates that children with ADHD talk more (DSM-IV, 1994; Barkley et al., 1983; Zentall, 1988; Zentall, et al., 1983). The Mean Length of Utterance (MLU) and Syntactic Complexity Score measured the participants' language production. Both measures used a 100-utterance sample beginning with the 51st utterance.

Mean length of utterance in morphemes was used as a general measure of language production indicating the amount of talk produced by the participants. Figure 7 shows that both groups have similar MLUs with the exception of N4.

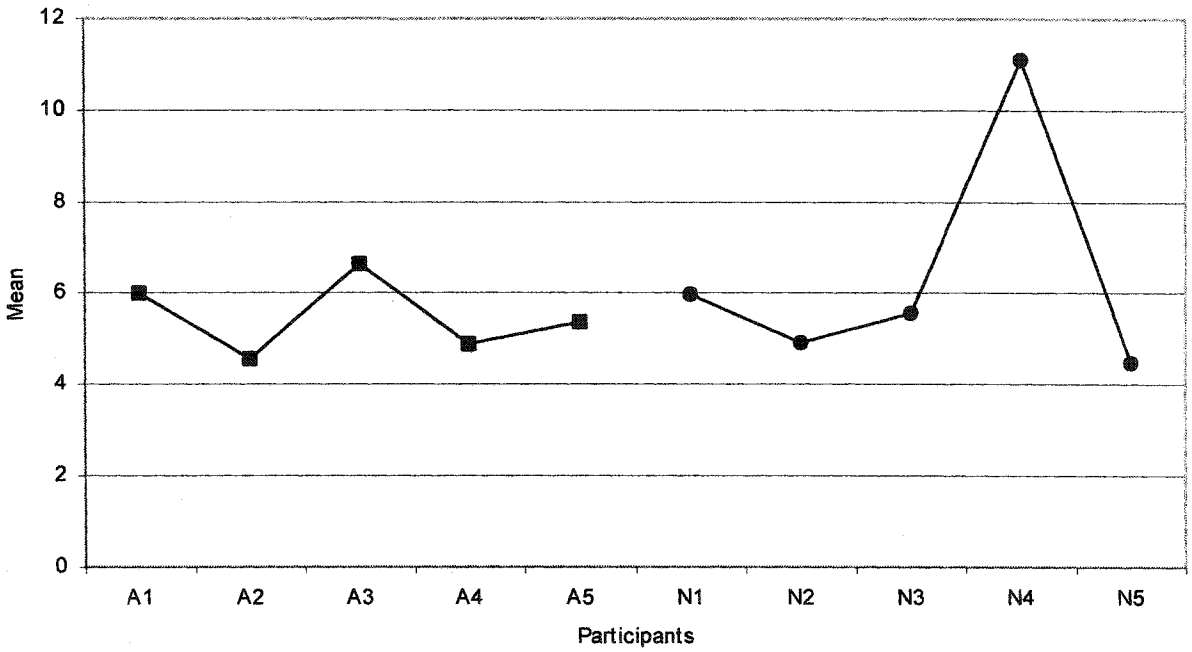

Figure 7. Mean length of utterance (morphemes).

The similar average MLU indicates that the ADHD participants did not talk more than the Non-ADHD participants within the study conditions.

To provide an additional measure regarding the volume of participants' talk and, given technical difficulties with MLU (see the discussion in Chapter 6 under Morphological Analysis), a Syntactic Complexity Score was also calculated. Figure 8 shows the syntactic complexity for both groups.

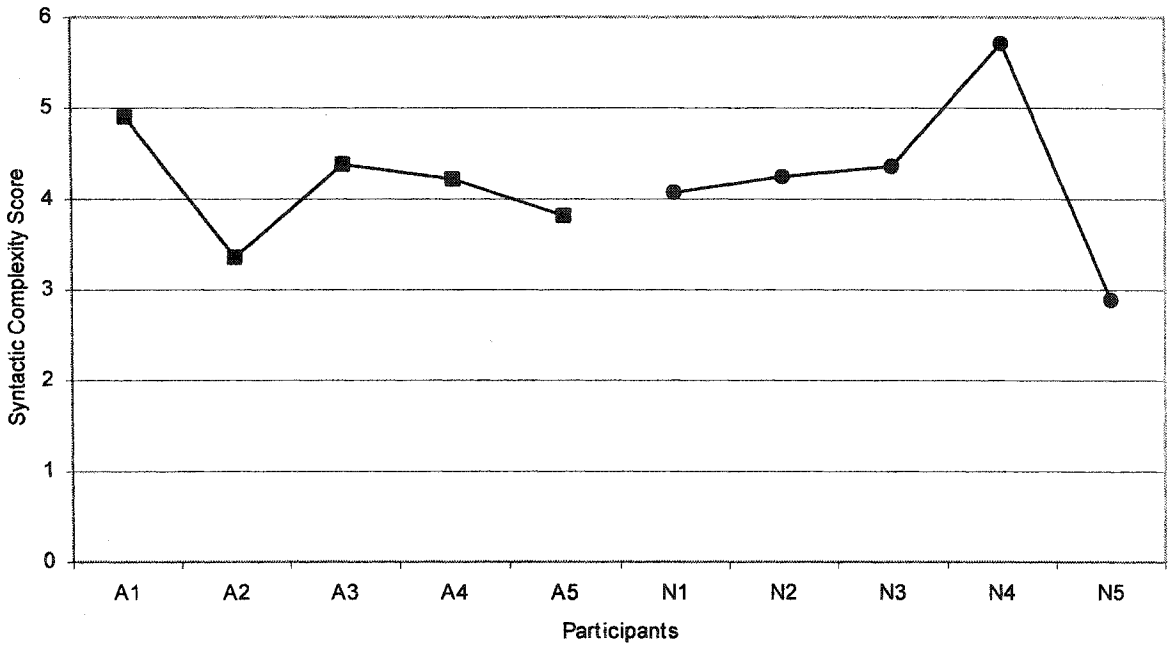

Figure 8. Syntactic Complexity Scores for the ADHD and Non-ADHD groups. The Syntactic Complexity Scores of the two groups are similar overall, although there is greater variation within Non-ADHD group.

Summary of the General Measures

The MLU shows that the ADHD participants produced approximately the same amount of talk, in this study, as did their Non-ADHD peers. The Syntactic Complexity Score also shows that both groups produced talk within a similar range of syntactic complexity with the exception of N4 who produced more utterances. Overall, the two general measures indicate that both groups were similar in the amount and complexity of talk they produced.

Phonological Analysis

The phonological analysis examined the ways in which the participants produced the sounds of the language. At the most general level, all the participants made the sounds appropriate to the language and were able to use those sounds to form words. The

Researcher did not have difficulty understanding any of the participants at a phonological level. There were, however, interesting patterns of sounds common to both groups.

Participants in both groups dropped the initial sound in the following words: because ("*'cause*"), about ("*'bout*"), except ("*'cept*"), okay ("*'kay*"), him ("*'im*"), and them ("*'em*"). Two ADHD participants also said "*member*" rather than "remember" and "*round*" instead of "around". One Non-ADHD participant used the following: "*flect*" instead of "reflect", "*truders*" in place of "intruders" and "*vasion*" instead of "invasion". These words were single use words.

Another common pattern consisted of dropping the final consonant "g". Three ADHD participants and three Non-ADHD participants dropped the final "g" in the "-ing" ending in the following words: "*going*", "*putting*", "*making*", "*taking*", "*doing*", "*talking*", "*trying*", "*learning*", and "*thinking*". These shortened words did not interfere with listener comprehension.

In addition to the general patterns shared by all or a majority of the participants, there were also sound patterns more typical of one group than the other. One pattern, substituting the sound /d/ for sound /th/, was shared by four ADHD participants and one Non-ADHD participant. The Non-ADHD participant and two ADHD participants consistently substituted the stop /d/ for the voiced fricative /th/ in the word "that" ("*dat*") and "other" ("*odder*"). Three ADHD participants made similar substitutions for the words "brother" ("*brudder*"), "another ("*anodder*"), "these" ("*dese*"), "this" ("*dis*") and "there" ("*dere*"). One ADHD participant (A3), however, switched between the substituted /d/ for /th/ and the standard form of /th/. For example:

A3: People there or these'll be mixed up. [A3 sorts out the Lego pieces].

Researcher: *You're a well organized person.*

A3: *Wheels over there.*

A3: *Dat over dere.*

A3: *Dat over dere.*

In this episode, A3 appropriately uses the /th/ sound in "*there*" and "*these 'll*" but adopts the /d/ sound in his last two utterances "*dat*" and "*dere*". The switch between /th/ and /d/ suggests that A3 is substituting the sounds to add an emphasis to his utterance rather than reflecting any impairment in his phonological ability. Throughout the study, A3 substituted the /d/ sound for the /th/ sound when he emphasized a word or his actions with an object. This may be a dialect particular to A3. There is also the possibility that the phonological patterns demonstrated by the other participants have their roots in the particular dialect spoken at home.

Another pattern was to substitute the fricative /f/ for the fricative /th/. One participant from each group demonstrated this pattern. One participant said "*wif*" for "with"; one said "*nofing*" for "nothing" and both participants said "*free*" for "three".

Finally, one Non-ADHD participant consistently substituted the fricative /s/ for the fricative /th/ as in "*everysing*" ("everything"), "*sink*" ("think"), "*sing*" ("thing"), "*anysing*" ("anything"), and "*sank*" ("thank").

There were two other miscellaneous forms of substitution. One Non-ADHD participant substituted the fricative /v/ for the stop /b/ in "*probisional*" ("provisional") one time and one Non-ADHD used /a/ instead of /in/ for "*avaded*" ("invaded).

There were other miscellaneous forms that were expressed only once during the session by individuals in both groups. From the ADHD group one participant said

"*posta*" for "supposed to", "*edervything*" for "everything" and "*ptoon*" for "pontoon". Another said "*binoclars*" for "binoculars", "*oldden*" for "olden", "*git*" for "get" and "*s'like*" for "it's like". From the non-ADHD group, one participant said "*cell-a-phone*" for "cellphone" and "*evapchrated*" for "evaporated" and "*sumthin*" for "something".

Summary of the Phonological Analysis

All participants demonstrated phonological competency appropriate to the study situation. There were similar patterns shared by participants in both groups by dropping the initial sound in words and ending sounds in verbs. Another pattern shared by some participants involved substituting /d/ for /th/. There was, however, no single pattern of phonology that distinguished one group from the other.

Morphological Analysis

The morphological analysis looked at the structure and forms of words. The morphological analysis examined the four major parts of speech: nouns (including pronouns), verbs (including inflections, modal and copular verbs), adverbs, and adjectives. These are the words that can change their form to give grammatical information. All measures were taken from a 100-utterance sample beginning with the 51st utterance.

Noun Forms

Table 2 shows the different types of nouns (types), the frequency with which the participants used those words (tokens) and the type-token ratio for the ADHD and Non-ADHD groups. The number of different types of forms indicates a lexical range from which the participants may draw upon to make their lexical choices. The tokens indicate how often a particular type is used. A low TTR indicates more homogeneous vocabulary

range and higher TTRs indicate more heterogeneity in the vocabulary range. According to Fletcher (1985), a TTR of 0.50 is a "useful yardstick" to assess TTRs that fall "well above or below 0.50, we can conclude that the lexical diversity is not normal" (p. 47).

Table 2

Noun Forms By Types, Tokens and Type-Token Ratio

	ADHD			Non-ADHD		
	Types	Tokens	TTR	Types	Tokens	TTR
Common Nouns	133	284	0.47	164	292	0.56
Proper Nouns	11	27	0.41	33	69	0.48
Personal Pronouns	17	334	0.05	13	474	0.03
Pronouns	28	213	0.13	26	195	0.13

The Non-ADHD group used more different types of common nouns and proper nouns while the ADHD group used slightly more personal nouns and pronouns. Not only did the Non-ADHD group demonstrate more variety in their common and proper nouns, they used these nouns more often than did the ADHD group. With respect to pronoun use, the two groups were similar and their type-token ratios were identical.

The Non-ADHD group had a somewhat higher TTR for common and proper nouns than did the ADHD group, indicating slightly more heterogeneity in their vocabulary. The Non-ADHD group had a higher TTR for personal pronouns, indicating slightly more heterogeneity in their use of personal pronouns.

The common nouns were also categorized according to singular, plural, definite, and indefinite forms. Table 3 shows the percentages of singular, plural, definite, and indefinite common noun usage.

Table 3

Percentage of Common Noun Forms by Type

	ADHD		Non-ADHD	
	%	N	%	N
Singular	37.9	97	37.0	112
Plural	12.5	32	12.5	38
Definite	39.4	101	41.9	127
Indefinite	10.2	26	8.6	26
Total	100	256	100	303

The two groups are virtually identical in their use of common noun forms. The Non-ADHD participants used relatively more definite common nouns, such as "ladder" and "horse", but fewer indefinite nouns, such as "thing" and "stuff", than did the ADHD group.

Further analyses of personal pronouns (1st, 2nd and 3rd person) were conducted to reveal the relationship between the speaker and the listener (see Table 4).

Table 4

Personal Pronouns by Type, Token and Type-Token Ratio

	ADHD			Non-ADHD		
	Types	Tokens	TTR	Types	Tokens	TTR
1st Person	5	155	0.03	5	231	0.02
2nd Person	3	31	0.1	1	60	0.02
3rd Person	9	147	0.06	7	183	0.04

Both groups used the same number of types of 1st person personal pronouns, but the Non-ADHD group used their 1st person personal pronouns much more than did the ADHD group. The ADHD group used more types of 2nd and 3rd person personal pronouns but, again, used them less frequently than did the Non-ADHD group.

Table 5 shows the percentage breakdown of personal pronouns used by type. The ADHD group used relatively more 3rd person personal pronouns than did the Non-ADHD but the Non-ADHD group used relatively more 1st and 2nd person personal pronouns.

Table 5

Percentage of Personal Pronouns

	ADHD		Non-ADHD	
	%	N	%	N
1st Person	46.6	155	48.7	231
2nd Person	9.3	31	12.7	60
3rd Person	44.1	147	38.6	183
Total	100	333	100	474

The relative use of specific forms of 1st, 2nd and 3rd person personal pronouns was examined. Table 6 shows the percentage of the specific 1st person personal pronouns used by each group.

Table 6

Percentage of First Person Personal Pronouns by Type

	ADHD		Non-ADHD	
	%	N	%	N
"I"	86.5	134	88.3	204
"we"	6.5	10	9.5	22
"my"	4.5	7	0	0
"me"	1.9	3	1.4	3
"us"	0.6	1	0.4	1
"ours"	0	0	0.4	1
Total	100	155	100	231

First person personal pronouns include the speaker of the utterance. Overall, both groups were very similar in their use of the 1st person personal pronouns, with "*I*" being by far the most frequent 1st person personal pronoun used by both groups. The most substantial

difference between the two groups occurs for the pronouns "*we*" and "*my*". The Non-ADHD group used "*we*" about 50% more often than did the ADHD group, but did not use the personal pronoun "*my*" at all in this sample.

Table 7 shows the specific forms of 2nd person personal pronouns used by the two groups.

Table 7

Percentage of Second Person Personal Pronouns by Type

	ADHD		Non-ADHD	
	%	N	%	N
"you"	93.6	29	100	60
"your"	3.2	1	0	0
"yourself"	3.2	1	0	0
Total	100	31	100	60

The 2nd person personal pronouns include the listener but exclude the speaker. The only 2nd person personal pronoun used by the Non-ADHD group was "*you*". In addition to "*you*", the ADHD group also used the pronouns "*your*" (3.2%) and "*yourself*" (3.2%).

Table 8 shows the specific forms of 3rd personal pronouns used by the groups.

Table 8

Percentage of Third Person Personal Pronouns by Type

	ADHD		Non-ADHD	
	%	N	%	N
"it"	64.9	96	55.2	101
"they"	12.2	18	21.9	40
"he"	10.8	16	10.4	19
"them"	5.4	8	7.7	14
"him"	2.0	3	1.6	3
"she"	2.0	3	2.7	5
"her"	1.3	2	0.5	1
"their"	0.7	1	0	0
"its"	0.7	1	0	0
Total	100	148	100	183

Third person pronouns exclude both the speaker and the addressee and refer to third parties. The two groups differed somewhat in their use of 3rd person personal pronouns. For the ADHD group, "*it*" constituted almost two-thirds of 3rd person personal pronoun use, compared to 55% for the Non-ADHD group. On the other hand, 22% of the 3rd person personal pronoun use by the Non-ADHD group involved the pronoun "*they*", compared to only 12% by the ADHD group.

Table 9 shows the specific "Other" pronouns used by the groups.

Table 9

Percentage of Other Pronouns by Type

	ADHD		Non-ADHD	
	%	N	%	N
"that"	40.5	68	28.1	39
"this"	25.6	43	29.5	41
"one	16.1	27	25.9	36
"these"	11.9	20	8.6	12
"something"	5.9	10	7.9	11
Total	100	168	100	139

There were some differences in the use of "Other" pronouns. The most substantial difference involved the use of the pronoun "*that*". Of the "Other" pronouns, "*that*" was used most frequently by the ADHD group (40.5%), compared to 28.1% for the Non-ADHD group. Interestingly, 88% of the "Other" pronouns used by the ADHD group were the pronouns "*that*", "*this*" or "*these*"; this compared to 66% for the Non-ADHD group.

In summary, both groups' overall use of noun forms was similar. The groups were also similar in their use of 1st and 2nd person personal pronouns, but differed somewhat in their use of 3rd person personal pronouns and other pronouns.

Verb Forms

Table 10 shows the types, tokens and type-token ratios for verbs in the 100-utterance sample.

Table 10

Verb Forms by Type, Token and Type-Token Ratio

	ADHD			Non-ADHD		
	Types	Tokens	TTR	Types	Tokens	TTR
Verbs	153	494	0.31	163	529	0.31

The groups were very similar in their use of verbs. While there were minor variations in the types and frequency of verbs used, the TTRs were identical.

Table 11 shows the types of inflections used by participants in the 100-utterance sample. Inflection changes a word (e.g., plural or verb tense) without changing the word's grammatical class. For example, adding *–s* to *run* results in the word *runs*.

Table 11

Percentage of Total Inflections by Type

	ADHD		Non-ADHD	
	%	N	%	N
3rd Singular	49.1	57	37.7	60
Irregular Past	25.0	29	27.7	44
Regular Past	11.2	13	11.9	19
-ing	11.2	13	13.8	22
-en	3.5	4	8.8	14
Total	100	116	100	159

The groups were similar except for their use of 3rd singular (e.g., "*goes*", "*comes*"). About 49% of the total inflections of the ADHD group were 3rd person singular forms, compared to 38% for the Non-ADHD group.

Table 12 shows the different modal verbs used by each group. Modals give special shades of meaning when attached to a verb. Modal verbs "express a range of judgments about the likelihood of events" (Crystal, 1988, p. 53). For example, the word "can" implies the possibility of an event occurring or it may be an expression of an ability.

Table 12

Percentage of Modals by Verb

	ADHD		Non-ADHD	
	%	N	%	N
"can"	38.5	20	30.6	11
"could"	17.3	9	5.6	2
"would"	17.3	9	19.4	7
"can't"	15.4	8	27.8	10
"might"	3.8	2	8.3	3
"must"	3.8	2	0	0
"should"	3.8	2	2.8	1
"won't"	0	0	5.6	2
Total	100	52	100	36

There was some variation in the modal verbs used by the two groups. About 15% of the modal verb usage by the ADHD group involved the word "*can't*" compared to 27.8% for the Non-ADHD group. "*Could*" was used 3 times as much by the ADHD group (17.3% versus 5.6%).

Table 13 shows the copular verbs used by the groups. Copular verbs link a subject and a complement (i.e., words that complete the action of a verb) so that the complement describes the subject; as *is* in *Chris is a leader.*

Table 13

Percentage of Copular Verbs by Type

	ADHD		Non-ADHD	
	%	N	%	N
Contracted copula	69.2	81	64.2	70
"is"	19.6	23	19.3	21
"was"	7.7	9	4.6	5
"are"	2.6	3	11.9	13
"were"	0.9	1	0	0
Total	100	117	100	109

Overall, the groups are similar in their use of copula verbs. Both groups used contracted copulas (e.g., "*I'm*", "*it's*" and "*there's*") the most frequently. The only substantial difference involved the copula verb "*are*". "*Are*" represented almost 12% of copula verb usage for the Non-ADHD group, compared to only 2.6% for the ADHD group. None of the participants used the verb "*am*" in its word form but instead used it in its contracted form.

In summary, the analysis of verb forms showed that both groups were similar in their use of verb forms. Some differences were noted for specific types of inflections, modals and copular verbs.

Adjective Forms

Table 14 shows the types, tokens and type-token ratios of adjective use.

Table 14

Adjective Forms by Type, Token and Type-Token Ratio

	ADHD			Non-ADHD		
	Types	Tokens	TTR	Types	Tokens	TTR
Adjectives	48	134	0.36	55	105	0.52

The ADHD group used somewhat fewer types of adjectives than did the Non-ADHD group, but they used them more often. There were some differences in the use of comparative and superlative adjectives. The Non-ADHD participants used the superlative adjectives "*biggest*" and "*smallest*", while the ADHD participants did not use superlative adjectives at all. Both groups were similar in their use of comparative adjectives, using the word "*more*" most frequently. There was no apparent pattern for the remaining adjectives.

Adverb Forms

Table 15 shows the types, tokens and TTR of adverb use.

Table 15

Adverb Forms by Type, Token and Type-Token Ratio

	ADHD			Non-ADHD		
	Types	Tokens	TTR	Types	Tokens	TTR
Adverbs	56	249	0.22	60	327	0.18

Again, both groups were similar. The Non-ADHD group used slightly more adverbs and used them more often than did the ADHD group. None of the participants used comparative or superlative adverbs in the sample. There appeared to be no other patterns regarding use of adverbs.

Summary of the Morphological Analysis

Overall, both groups show substantially more similarities than differences. Both groups demonstrated similarities in the number of types and tokens of personal pronouns, adjective and adverb form used. The Non-ADHD group showed more variation in their use of common and proper nouns and verb forms. The Non-ADHD group also showed more frequent use of common and proper nouns, personal pronouns, verbs, and adverbs than did the ADHD group. This indicates that the Non-ADHD group exercised their lexical choices more than did the ADHD group. Overall, at the morphological level, both groups appear to be competent in using the four parts of speech.

Syntactic Analysis

Syntactic analysis examined regularities in the way in which words were combined into larger units. The Index of Productive Syntax (IPSyn), a general measure of grammatical complexity, was used to provide a snapshot of the participants' syntax.

General Measure of Grammatical Complexity

Figure 9 shows that, overall, the ADHD group had a higher IPSyn score than did the Non-ADHD group. Similar to earlier morphological analyses, N4 was the outlier of the Non-ADHD group, with the highest IPSyn score of all participants.

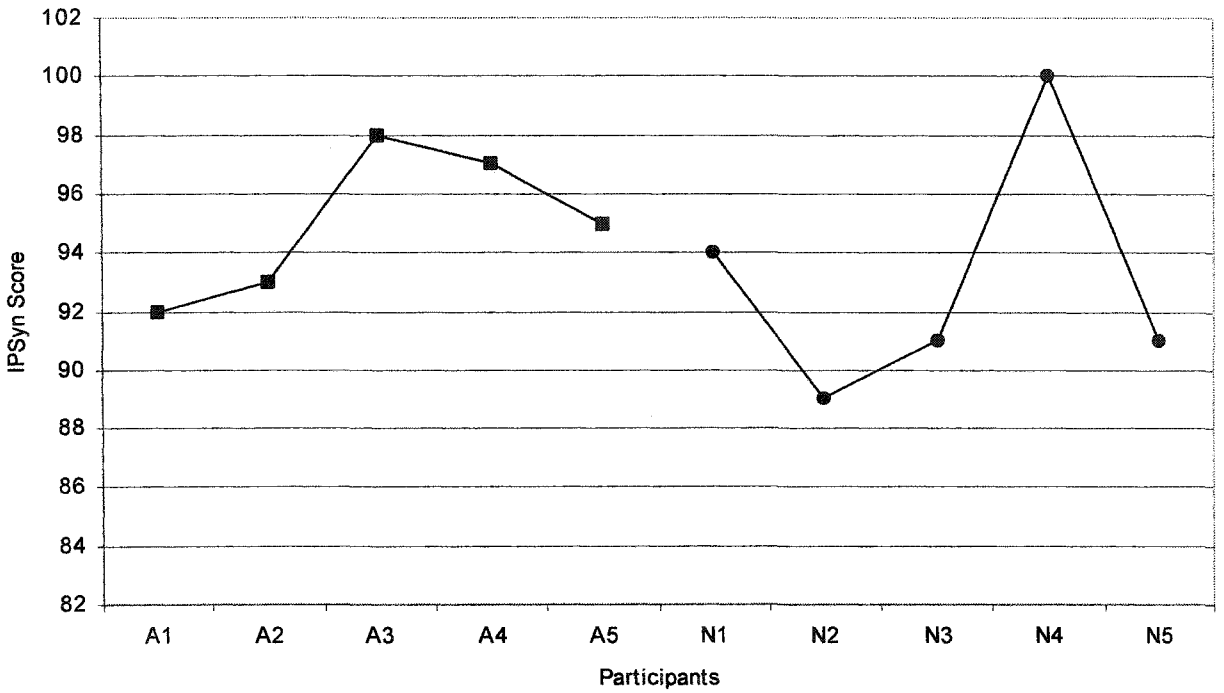

Figure 9. Index of Productive Syntax for the ADHD and Non-ADHD groups.

The Non-ADHD participants showed greater variability within their group than did the ADHD participants. The ADHD group had an IPSyn range of 6 points (from 92 to 98) and the Non-ADHD group had almost twice the range (from 89 to 100). While the participants' grammatical complexity showed some differences between groups, the ADHD participants were within the range of IPSyn scores of the Non-ADHD participants.

Clause Structures

The LARSP analysis using the 100-utterance sample showed that, overall, the groups shared more similarities than differences in the use of clause structures and in the form of

the clause structures (see Appendix J, Table J1 for a breakdown of clause structures by stages, percentages and frequencies).

Figure 10 shows the distribution of clause structures across the stages. The percentage distribution of clauses used by both groups were similar across the stages with the exception of Stage III and Stage V.

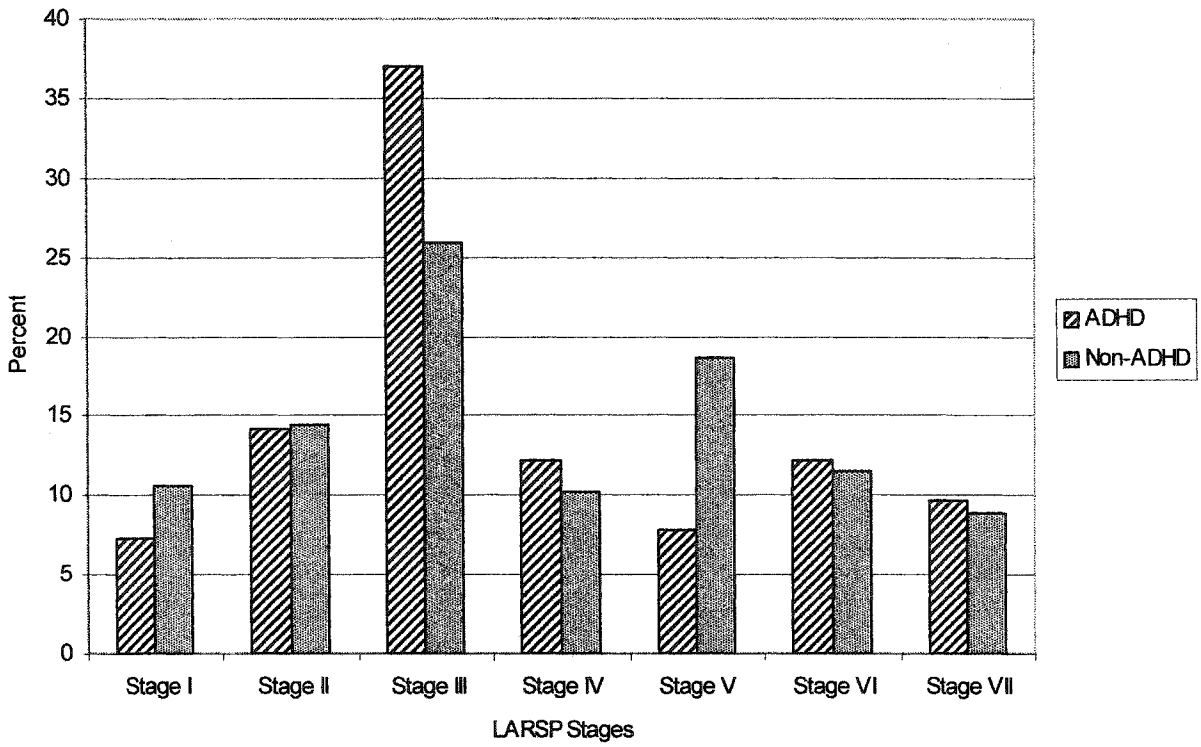

Figure 10. Distribution of clauses across the LARSP stages.

Stage I clauses are comprised of single word utterances, either in response to the Researcher's question or spontaneously uttered. Stage II examined two-element sentences, such as subject-verb. Stage III examined 3-element sentences, such as subject-verb-object (SVO). In Stage III, the ADHD group used relatively more 3-element clauses than did the Non-ADHD group. Stage IV examined sentences of four elements or more, such as subject-verb-object-adverbial. Stage V looked at clause patterns that produced

clause sequences that are linked in various ways (e.g., using "and" or "because"). The Non-ADHD group used relatively more clauses at Stage V than did the ADHD group. Stage VI looked at consolidation or "system completion" features (Crystal, et al., 1989) in which grammatical patterns become more stable and morphological errors are reduced. Stage VII examined remaining patterns such as sentence connectivity.

The analysis also looked at the complexity of the clauses. Figure 11 shows that, overall, both groups had similar mean clausal complexity, although the Non-ADHD group tended to use slightly more complex clauses.

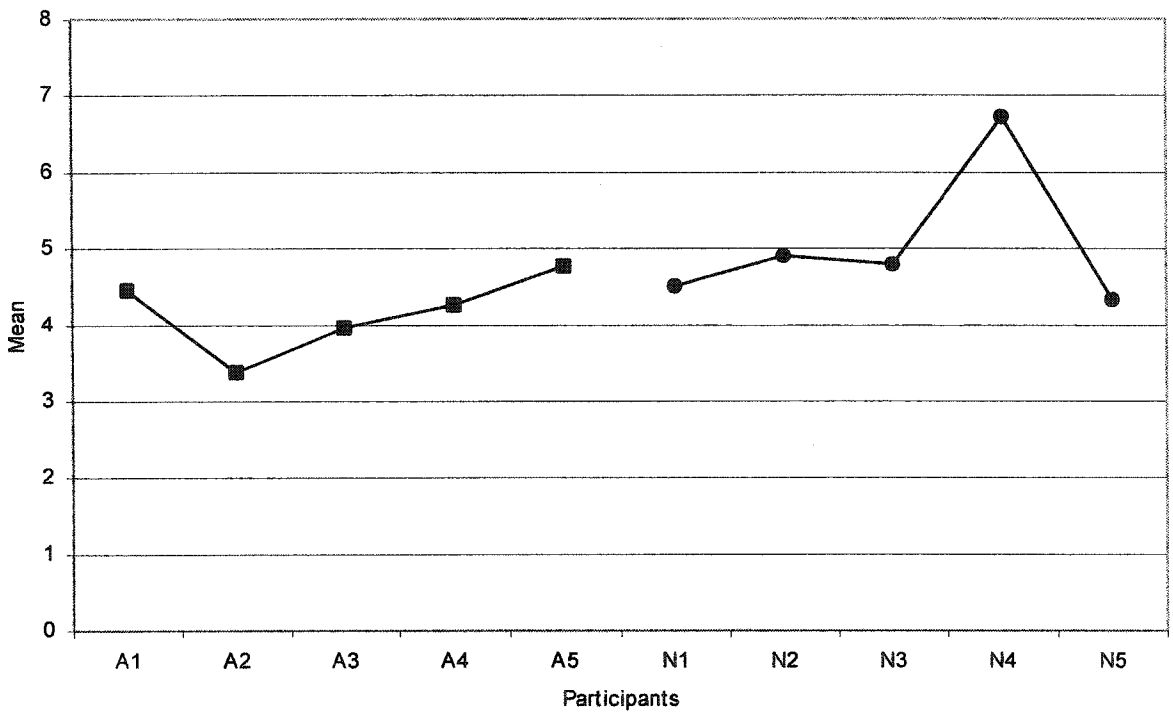

Figure 11. Participants' mean clausal complexity.

With the exception of N4, there was little variation in mean clausal complexity within either group. The mean clausal complexity for the ADHD group ranged from 3.4 to 4.8 (a difference of 1.4) while the Non-ADHD group ranged from 4.3 to 6.7 (a difference of 2.4).

In summary, the participants showed some variation in the complexity of their syntax, as indicated by the LARSP analysis, but were very similar in their use of clause structures, including the complexity of the clauses they used.

Phrase Structures

The analysis of phrase structures was conducted in conjunction with the analysis of clause structure. Figure 12 shows the distribution of phrase structures across the LARSP stages (see Table J2 in Appendix J for a breakdown by stages, percentages and frequencies).

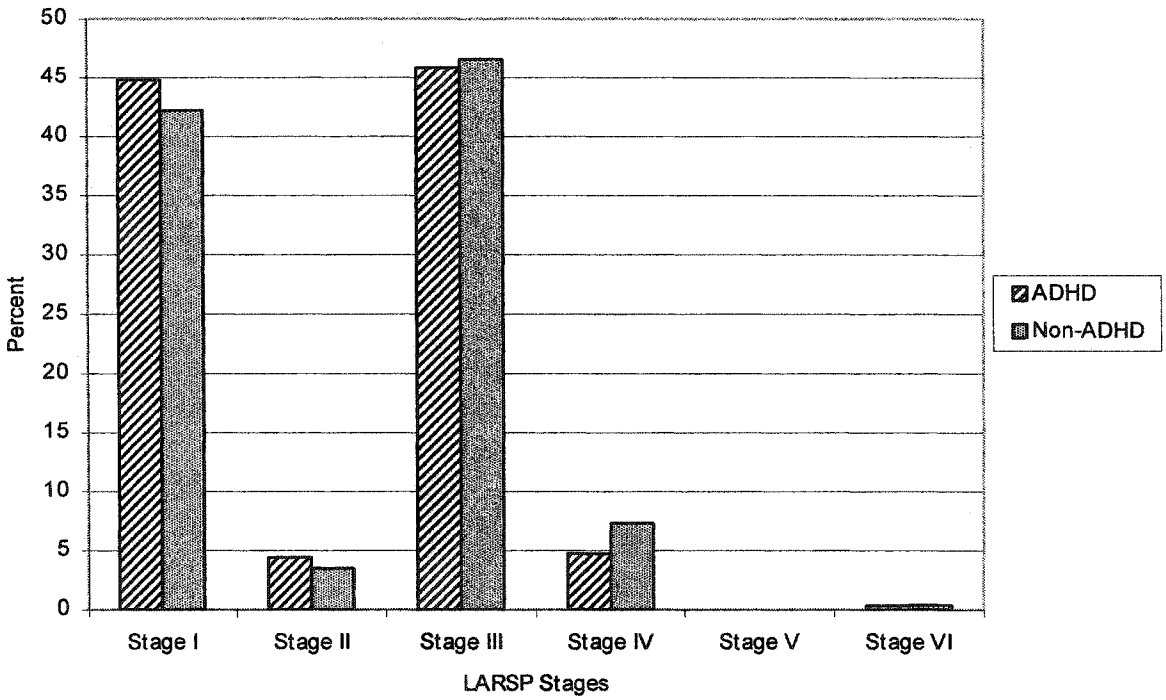

Figure 12. Distribution of phrases across the LARSP stages.

There was a concentration of phrase structures, for both groups, in Stages I and III. Both groups are essentially the same in their use of phrase structures across the different stages.

The analysis, similar to the clause structures, also examined the complexity of the participants' phrases. Figure 13 shows the mean phrasal complexity for both groups.

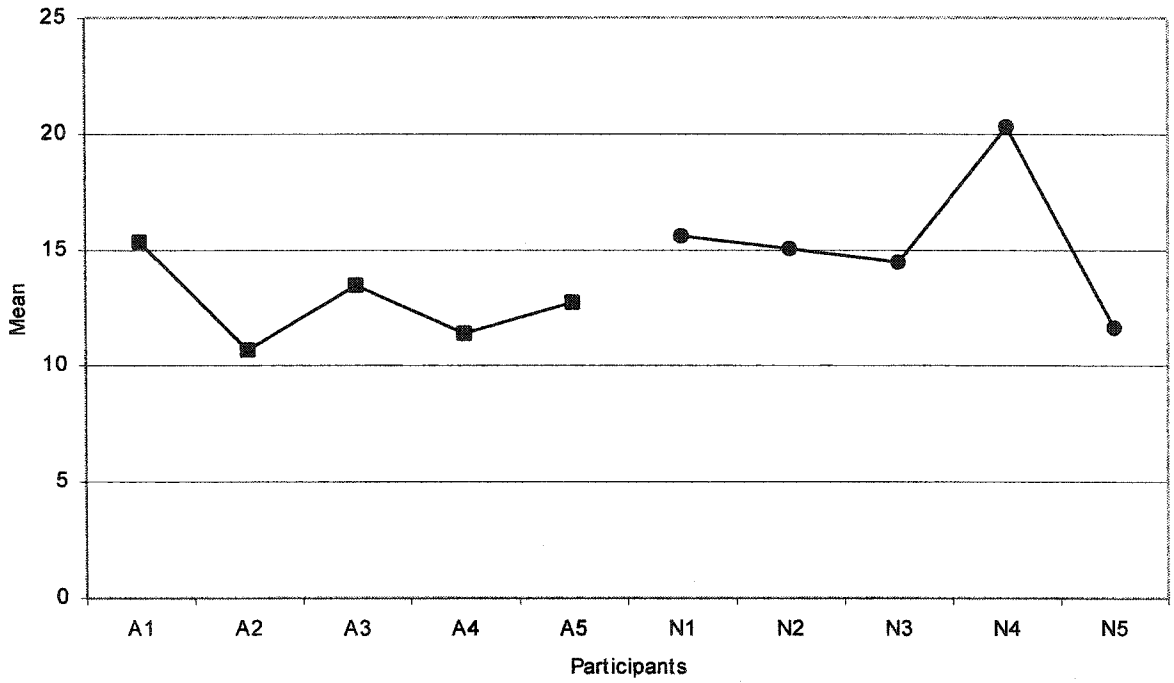

Figure 13. Participants' mean phrasal complexity

The Non-ADHD group shows slightly higher mean phrasal complexity than the ADHD group. Again, both groups appear more similar than different in their phrasal complexity.

In summary, both groups are similar in the types of phrase structures they expressed in the 100-utterance sample.

Summary of Syntactic Analysis

The analysis of syntax showed that overall the groups were very similar. The Non-ADHD participants showed a tendency to use slightly more complex clause and phrase structures.

Semantic Analysis

The semantic analysis examined the meaning of words and word combinations. Three aspects were examined: lexical meaning, contextual meaning, and conceptual domains.

Lexical Meaning

The analysis of lexical meaning looked for instances of the wrong referent (or wrong word) and word deficits (or substituting another word or phrase in place of a known word). In the 100-utterance sample, there were no instances in which any of the participants used a wrong referent or wrong word, such as calling a "helmet" a "jacket".

The participants were, however, most likely to substitute a filler or another word for a known word. The most common pattern was to substitute pronouns for an object's name. The most common pronoun for both groups was "*it*" followed by "*thing*" (or "*things*" or "*thingy*") and "*those*". The ADHD and Non-ADHD group were similar in their use of "it" and "those" but the ADHD group used "*thing(s/y)*" more often than the Non-ADHD group.

There were differences between the pronouns "*it*" and "*thing*". "*It*" tended to be used as a referent for an object, whereas "*thing*" tended to be used as a substitute for a missing word. For example:

Researcher: *How do you know that's the wheel part?*

A2: *'Cause. [A2 puts the rims into the tire]*

Researcher: *I see. [Researcher watches A2 put the rims into the tires]*

A2: *It's easier.*

In this episode, the pronoun "*it*" refers to the action of putting the rims into the tires. The pronoun, in this case, is a shorthand way of referring to an action. A2 also uses "*thing*" as a substitute. For example:

> ***A2:*** *Oh, oh, I don't wanna break this thing that's why I not put^ putting on. [A Lego piece falls off the vehicle]*

In this episode, "*thing*" is used to substitute for a missing word such as "vehicle", "car" or "part". Participant A3 provides another example:

> ***Researcher:*** *Do you do a lot of Lego at home?*
>
> ***A3:*** *Yeah.*
>
> ***Researcher:*** *Yeah?*
>
> ***A3:*** *I'm tryin' to build a Star Wars thing but it's too hard.*
>
> ***Researcher:*** *Oh, Star Wars, there's lots of complicated pieces.*

A3 uses the pronoun "*thing*" to substitute for another word, such as "model" or "space ship". The Non-ADHD participants also used the pronouns "*it*" and "*thing*" as a referent and substitute for known words, similar to the ADHD participants. For example:

> ***N3:*** *Just that on. [N3 puts pieces onto his Lego model]*
>
> ***N3:*** *Half of it fell off. [Lego pieces fall onto the floor and N3 reaches down and picks up the pieces].*

In this episode, the pronoun "*it*" refers to the Lego pieces that fell off the model N3 was building. In another episode, N3 uses "*thing*" as a substitute word:

> ***N3:*** *It's only people that are driving all the things on these two people. [N3 looks at, and shows the Researcher, the Lego advertisement page]*

In this episode, N3 uses the pronoun "*thing*" as a substitute for another word, such as "vehicles", or "cars".

Overall, the analysis of lexical meaning showed that all participants used the pronouns "*it*", "*thing*" and "*those*" to substitute for known words and none of the participants used a wrong word referent or word in the 100-utterance sample. The use of the pronouns "*it*" and "*thing*" differed. "*It*" was typically used to refer to some object and/or action while "*thing*" was used as a substitute for a known word. While all participants substituted pronouns for a known word, the ADHD participants did so more often than did the Non-ADHD participants.

Contextual Meaning

Contextual meaning refers to the ways that context relates to lexical meaning. The analysis examined two aspects of contextual meaning: reference and perspective taking. Following Lund and Duchan (1983), the influence of context was examined by looking for referent words with shifting referents. Two types of deviations were examined for shifting referents: (a) failure to recognize the need for anaphoric or shared situational references, particularly for pronouns and articles and (b) the use of incomplete sentences without anaphoric reference. Perspective taking looked at three classes of deictic terms: (a) person deixis using personal pronouns, (b) place deixis using "here/there", "come/go" and "this/that" and (c) time deixis including tense markers and words for which the reference in time depends on the moment they are spoken (e.g., "yesterday", "next").

Reference.

There were relatively few instances of reference words with shifting referents for either group, although the ADHD group had twice as many occurrences (ADHD = 15;

Non-ADHD = 7). The ADHD participants also had more instances of failure to recognize the need for anaphoric references (n = 8) than did the Non-ADHD group (n = 4) and the ADHD participants used more incomplete sentences, excluding self-talk utterances, (n = 7) than did the Non-ADHD group (n = 3).

Under the category of "failure to recognize the need for anaphoric reference", four of the five ADHD participants failed to make anaphoric references while only two of the Non-ADHD group failed to make anaphoric references. The ADHD group tended to use nouns, pronouns and personal pronouns that required some type of anaphoric or shared reference to make the terms understandable. For example:

Researcher: *Your brother play with Lego? Your Lego?*

A1: *No.*

Researcher: *He's not a Lego>*

A1: *He used to.*

Researcher: *Ah, yes.*

A1: *But now not he's a Kinet guy and a Kinet guy like me.*

Researcher: *Oh, right.*

Researcher: *We have some K'nex at home, but not as much as Lego.*

In A1's last utterance he talks about the noun "*Kinet*" without any anaphoric or shared reference to help the Researcher understand the term. In this case, the Researcher was familiar with this type of construction toy, called "K'nex" and was able to continue the topic based on his prior knowledge of the K'nex construction toy. Similarly, A4 responds to the Researcher's question without any reference markers:

Researcher: *Who's your favourite? [Referring to the previous utterances about Pokemon]*

A4: *I don't know.*

Researcher: *Yeah, do you have a favourite?*

A4: *Um, 150.*

Researcher: *150.*

A4: *Sometimes they get all greasy. [Refers to the Lego pieces]*

In this episode, A4 makes a reference to a number, a noun, without any accompanying references. The result is an ambiguous utterance. A4 then introduces a new topic. The topic about his favourite Pokemon character ends without clarification of the term "*150*".

Pronouns and personal pronouns were also used, predominantly by the ADHD participants, without appropriate anaphoric or shared references. For example:

A3: *If I'm correct, I'll need this to hook into the middle like this like that way.*

A3: *Yea, I'm right if I can get it in.*

In this episode, A3 uses the pronouns "*this*", "*that*" and "*it*" without referencing the objects to which these pronouns refer, either in his utterance or through his actions. The listener is left without any guides regarding the objects A3 is talking about. A3 also uses a personal pronoun to refer to an object without making the listener aware of the object:

A3: *That's^ that's a little light.*

Researcher: *That, this little light?*

A3: *Yup, now she gets up, now let's see.*

A3: *Her hand goes down like this.*

In this episode, the personal pronouns "*she*" and "*her*" refer, obviously to a female, but A3 does not provide references in his utterance or through his actions. The listener is left to infer that the female referent to which A3 is referring to is the female Lego figure.

The two Non-ADHD participants who made utterances that did not recognize the need for anaphoric or shared references used the pronouns "*they*" (or "*they're*"). For example:

> ***N1:*** *The pirates one are kinda weird. [Refers to the Researcher's previous utterance about the number of pieces in the Lego pirate ship model]*
>
> ***Researcher:*** *How come?*
>
> ***N1:*** *They just are.*
>
> ***N1:*** *I don't know why except they had to made them be kinda stupid.*

In this episode, the last "*they*" is used without a clear reference. The listener must surmise that the referent, to which N1 is referring, may be the Lego Company who manufactures the pirate ship model. N4 also uses the pronoun "*they*":

> ***Researcher:*** *You think there's any similarities between Lego and chess?*
>
> ***Researcher:*** *Besides playing any way you like to play or building anything you like to build?*
>
> ***N4:*** *Yeah, yes some, ah, when they^ they're starting to figure out new things since I guess, they keep figuring out like some people they're^ yeah, right, oh, what's this?*

In this episode, the identity of "*they*" remains unclear. There were no previous references to "*they*" nor does N4 clarify his referent in his subsequent utterances. The failure to

provide the listener with anaphoric or shared references results in ambiguous utterances, which makes the participant's contribution to the topic more difficult to understand.

None of the participants showed difficulty using the article "*the*" appropriately. The typical pattern for both groups was to use the article "*the*" as a definite article preceding a noun as in "*the helmet*" or "*the cats and dogs*". However, the ADHD participants appeared to have difficulty distinguishing between "*a*" and "*an*". Three of the ADHD participants used the articles "*a*" and "*an*" inappropriately, compared to none of the Non-ADHD group. For example:

A3: *I thought it was a ear thing.*

A5: *I'm lookin' for a other piece like this.*

In these examples, the appropriate article for the words "*ear*" and "*other*" is "*an*" rather than "*a*". Another type of inappropriate use is in regard to plurals. For example:

A3: *If I can find a pieces I can show you what I built.*

A3, in this illustration, uses the indefinite article "*a*" preceding a plural noun "*pieces*" which requires the definite article "*the*" to be consistent with the plural noun.

While the participants' surface meaning shown in the examples above is clear, there is an underlying disjunction between the article and the word that sounds odd to a listener. The articles used by the participants provide the listener with a specific marker or signal that changes with the next word. Over a number of utterances, and over a number of topics, the disjunction tended to distract the listener away from the propositions a participant was trying to express and shifted his attention to the consistency between the article and the word it was intended to modify. The result is an interruption in the flow of the conversation for the listener.

Another pattern emerged in which participants would interrupt the Researcher's utterance to complete the Researcher's utterance. Four of the five ADHD participants made sentence completion utterances, compared to only two of the Non-ADHD participants, and the ADHD participants did so more frequently. All of the ADHD participants made their incomplete statements based on propositions explicitly stated by the Researcher. For example:

Researcher: *They have Lego for babies don't they? They have, ahh>*

A1: *Yup, little stuff that they have the big Lego for babies.*

Researcher: *Big ones, yeah. So they can't get it stuck in their>*

A1: *Mouth.*

Researcher: *In their mouth and swallow it, ooh.*

In this episode, A1's incomplete utterance ("*mouth*") completes the proposition stated by the Researcher ("... *can't get stuck in their*"). The Researcher confirms the appropriateness of A1's prediction in the last utterance and extends the proposition by adding the result about swallowing a Lego piece. A1 also uses the Researcher's proposition in the following example:

Researcher: *So, once you built a Lego model do you use^ do you keep the instructions around at all or do you>*

A1: *Yeah.*

Researcher: *Yeah, do you>*

A1: *And then when I don't need them I just throw them out.*

Researcher: *I see.*

Researcher: *And you can build whatever>*

A1: *Thing you want.*

A1 completes the Researcher's statement by predicting an appropriate proposition. Similarly, A3 predicts an appropriate proposition by using the Researcher's stated proposition:

Researcher: *Yeah, alright. Sometimes I can't recognize them cause they look>*

A3: *Weird.*

Researcher: *Weird, the same or>*

A3: *Yeah, its, um, it's a magic mirror.*

A3's incomplete statement "*weird*" is related to the Researcher's proposition regarding "*look*" so the "*weird*" describes how a Lego piece might look. A5 uses a similar tactic:

Researcher: *Oh, yeah, the poor driver has to, ahh>*

A5: *Just sit on the floor.*

Researcher: *He has to sit on the floor, yeah.*

A5's utterance completes the Researcher's proposition regarding where the driver must sit.

Two of the ADHD participants also made incomplete utterances that were not sentence completions. For example:

Researcher: *So, that's like a microphone I guess, like a microphone, ahh.*

Researcher: *I never noticed that before.*

A1: *I noticed it all the time.*

Researcher: *Well, Lego's kinda>*

A1: *Crunchy type.*

In this episode it is not clear what A1's utterance "*crunchy type*" is referring to or what it means. A5, on the other hand, imitates the Researcher's utterance and his meaning is clear in the following:

> ***Researcher:*** *You see pictures in your h^ in your mind? Or are you just tryin' different things?*
>
> ***A5:*** *Tryin' different things.*
>
> ***Researcher:*** *Different things.*

A5 appropriates part of the Researcher's utterance and grammatical structure, "*tryin' different things*", and uses it as his response to the Researcher's question.

One Non-ADHD participant, N1, also used the Researcher's explicit proposition to complete the Researcher's utterance. For example:

> ***Researcher:*** *You got a lot of friends that play Lego or like to?*
>
> ***N1:*** *Yes.*
>
> ***Researcher:*** *Play Lego, yeah.*
>
> ***N1:*** *Lots, tons, tons.*
>
> ***Researcher:*** *They come over to your house?*
>
> ***N1:*** *Tons.*
>
> ***Researcher:*** *You go over to their house and> [the Researcher asks whether N1 has friends that like to play Lego]*
>
> ***N1:*** *Play Lego.*
>
> ***Researcher:*** *Play Lego.*
>
> ***N1:*** *Not always.*

In this episode, N1 completes the Researcher's question with an appropriate ending that makes an anaphoric reference to a previous utterance made by the Researcher about playing Lego with friends. In this episode, N1's incomplete sentence "*play Lego*" that completed the Researcher's utterance used a proposition already expressed by the Researcher.

N5 makes a qualitatively different response to a statement by the Researcher:

> ***Researcher:*** *Sometimes I have trouble when I look at the picture on the instructions and look for a piece.*
>
> ***N5:*** *Umhum.*
>
> ***Researcher:*** *Sometimes it doesn't>*
>
> ***N5:*** *Really show you.*
>
> ***Researcher:*** *Yeah.*

In this episode, the proposition underlying the appropriate sentence completion by N5 was implied in the Researcher's previous utterance but not stated explicitly as it was in N1's episode. In this case, N5 had to infer from the Researcher's proposition that the instructions don't always show the piece and one must, therefore, infer the correct Lego piece and placement from the information given in the instructions.

In summary, participants in both groups used shifting references that did not recognize the need for anaphoric reference and used incomplete sentences but the ADHD participants used them more than did the Non-ADHD participants. The ADHD group failed to make anaphoric or shared references for nouns, pronouns and personal pronouns while the Non-ADHD group failed to make references to nouns and pronouns. Both groups tended to use incomplete utterances to complete the Researcher's utterances. The

ADHD group (and N1, from the Non-ADHD group) used the Researcher's stated propositional and grammatical structure to make their predictions about the completion of the utterance. One Non-ADHD participant inferred his predicted completion from the Researcher's utterance rather than using an explicitly stated proposition or structure.

Perspective-taking.

The analysis examined the ways in which participants modified their utterances to take into account the listener's perspective. Three aspects of perspective-taking were examined: person, place and time deixis. Overall, the analysis of perspective-taking showed that both groups were alike regarding person deixis. There were differences, however, regarding place and time deixis.

Person deixis.

Table 16 shows that both groups used the first person personal pronouns, such as "*I*", "*my*", "*we*" and "*our*" the most frequently, followed by third person personal pronouns, such as "*it*", "*he*", "*they*" and "*them*" and finally, second person personal pronouns, namely, "*you*", "*your*", and "*yourself*".

Table 16

Percentage of Participants' Use of Person Deixis by Type

	ADHD		Non-ADHD	
	%	N	%	N
1st Person	51.1	144	51.9	191
2nd Person	11.0	31	15.5	57
3rd Person	37.9	107	32.6	120
Total	100	282	100	368

There were, however, differences in how person deixis was used. The ADHD participants showed a slight tendency to make more inappropriate use of person deixis. A1, for example, shifted his reference from the second person "*you*" to a plural first person "*we*":

> ***Researcher:*** *You ever bought Lego and then looked for pieces and haven't found any pieces?*
>
> ***A1:*** *Yup.*
>
> ***Researcher:*** *That ever hap^ that ever ever happened to you too?*
>
> ***A1:*** *But I do have the piece at home.*
>
> ***Researcher:*** *Oh, That's what we do.*
>
> ***A1:*** *To look for the piece or if^ and if you can't find the piece we build the piece.*
>
> ***Researcher:*** *Oh, that's a good idea.*

In A1's last utterance, he shifts his reference from the 2nd person personal pronoun "*you*" to the plural 1st person personal pronoun "*we*". This shifts the pronoun reference from one that includes the addressee but excludes the speaker "*you*" to one that includes the speaker "*we*". The referent for "*we*" is not stated by A1 and the listener must infer whom the other people might be to whom A1 is referring, such as A1's brother. A1 does use the 1st person personal pronoun "*I*" appropriately in his second utterance suggesting that he does know, at least implicitly, the difference between person for personal pronouns.

Similar to A1, A2 also shifts between 1st and 2nd person personal pronouns in his utterances. For example:

> ***A2:*** *Where do you put the wheels on to?*
>
> ***Researcher:*** *Ah, that's a good question you got there.*

A2: *Hum, I think we should make the wheels first.*

Researcher: *Okay.*

In his first utterance, A2 uses the 2nd person personal pronoun "*you*" as a general referent to any person and then shifts in his second utterance to the 1st person plural personal pronoun "*we*", again a general referent to any person but without any clear indication as to whom he is referring by the pronoun "*we*". This shifts the referent from excluding the speaker to including the speaker. A2 is consistent in his use of referential pronouns. For example:

A2: *I wonder where we can put the wheels now?*

A2: *Good thing we're using the instructions.*

Again, in these utterances the reference to "*we*" is left unstated either in A2's utterances or through his actions. One interpretation may be that he is including the Researcher because of the Researcher's proximity even though A2 is the only one doing the building. He did, occasionally, appropriately use the 1st person personal pronoun. For example:

A2: *I think this is all a little bit too small.*

A2: *I can't find any of the parts to this.*

A2 tends not to shift his referents within the same utterance, as A1 does, but consistently uses either one personal pronoun or another in his utterances. The utterances of both A1 and A2 are understandable by the listener even as they shift their referents. Another ADHD participant, A3, made one person reference error:

A3: *Let me guess, this would hook up to these. [A3 looks at the Lego pieces]*

A3: *If I'm right.*

Researcher: *Are you guessing or do you really know? How do you know that?*

A3: *Hum, you're smart.*

In this episode, A3's last utterance continues the Researcher's structure for personal pronouns but does not shift the reference to make it his own. Hence, the appropriate transformed personal pronoun would be "I'm" rather than "*you're*" so the sentence would read, "I'm smart".

Place deixis.

Place deixis looked at the participants' use of six deictic terms indicating location, namely "here/there", "come/go" and "this/that". Figure 14 shows that both groups were similar in their use of the pair "come/go" and differed somewhat in the use of the other two pairs (see Appendix K, Table K1 for frequencies). The numbers above each bar are the frequencies. The Non-ADHD group used the deictic term "this" relatively more than the ADHD group while the ADHD group used the term "here" more than the Non-ADHD group.

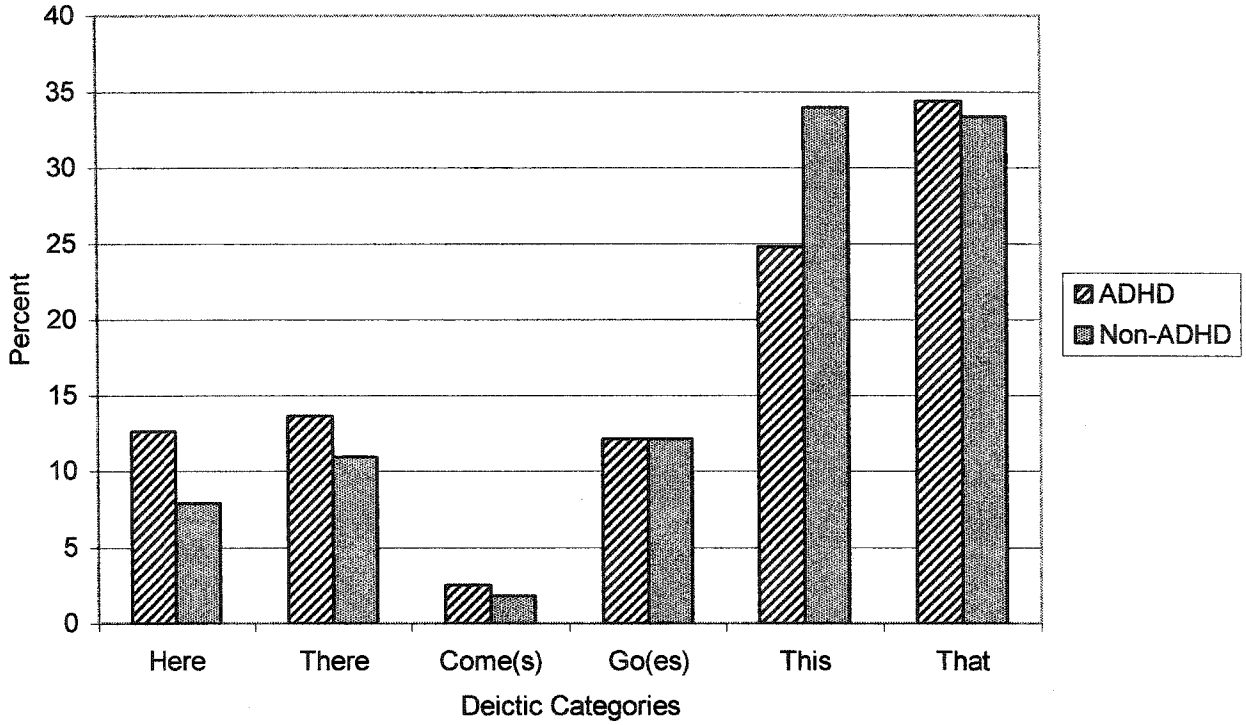

Figure 14. Participants' use of place deixis.

Two patterns emerged: one pattern involved linking the deictic term with a physical action and the other pattern involved the participants not talking to the Researcher but only to themselves.

In both groups, the deictic terms "*this*" and "*here*" tended to be associated with physical actions through pointing to the object, holding the object up for the Researcher to see, or demonstrating either with the object or though body motions, such as using hands. The ADHD group linked their physical actions to the deictic terms more often (n = 43) than did the Non-ADHD group (n = 25). For example:

> ***Researcher:*** *So, what happens when you have a problem with Lego? What do you do?*
>
> ***A2:*** *Oh, I don't know. [A2 shrugs]*

A2: *You just go like this. [A2 demonstrates with the Lego model]*

Researcher: *Okay. [Watches the demonstration]*

A2 demonstrates with the model, which serves as the connection between the deictic term "this" and the referent object (the model). Similarly, N2 uses a physical action to link the object to the deictic term:

Researcher: *How'd you know which pieces to go where?*

N2: *Ah, well, I^ see these pieces go at there. [N2 points to the instructions]*

Researcher: *Oh, yeah.*

N2: *Yeah, and then the part on this here fits into there. [N2 holds up the Lego part for the Researcher]*

Researcher: *Oh, I see, okay, yeah.*

By pointing his finger at the instructions and holding up the object for the Researcher to view, N2 links his deictic terms to the objects. Physical action, then, substitutes for a lexical referent.

In addition to linking physical actions with deictic terms, the participants also used deictic terms without any references for the listener. In these instances, the participants were talking to themselves. For example:

A4: *I know^ I know what'd be better than this.*

A4: *I put that here, put that here.*

Researcher: *Umhum.*

A4 makes no attempt to clarify the referent for "*this*" or "*that*" or "*here*". He is talking to himself and therefore already knows what the object is to which he is referring. Similarly, N4 asks a question and responds to it:

***N4:** What is this? Oh, that. [N4 looks at the instructions]*

Here, the referents for "*this*" and "*that*" are not stated explicitly because N4 is not talking to the Researcher but to himself. This pattern of self-talk holds for the other participants. Self-talk is examined in more detail in the Results section under Discourse Competency.

Overall, the participants' use of place deixis shows a relationship between the deictic terms and physical actions by the participants to link the deictic terms with the referent object. The ADHD participants linked their physical actions with the deictic terms more often than did the Non-ADHD participants. Within the immediate context of the study, the connection between the deictic term and the object was clear and did not interfere with the flow of the topic. But without the situational context, meaning is not clear. During self-talk episodes, the participants did not specify the referents for the deictic terms they used. There was, however, no need or conversational requirement to do so. The participants used place deixis appropriately within the context of the study, but for the ADHD participants situational context was more often required for clear understanding.

Time deixis.

The analysis of time deixis examined time references that depend on the moment they are spoken, such as "next" and "yesterday", and tense markers. The analysis examined the 100-utterance sample for any words that referred to time. The result of this analysis was the creation of five categories of time: "Past", "Present", "Future", "Period"

and "Frequency". Words referring to time were grouped under the headings "Past", "Present" and "Future". The words referring to the "Past" were "*ago*", "*just*", "*used to*", "*already*". The "Present" category included the word "*now*" and the "Future" category included the words "*yet*" and "*until*". Other time words referred to time periods and were grouped under the category "Period". These words included "*summer*", "*time(s)*", "*weeks*", "*year*", "*month(s)*", "*a while*" and "*since*". References to the frequency of time, in the category "Frequency" included "*again*", "*never*", "*sometimes*", "*once*", "*always*", "*usually*", "*often*" and "*ever*".

Figure 15 shows the percentage of the deictic terms that express past, present, and future relationships.

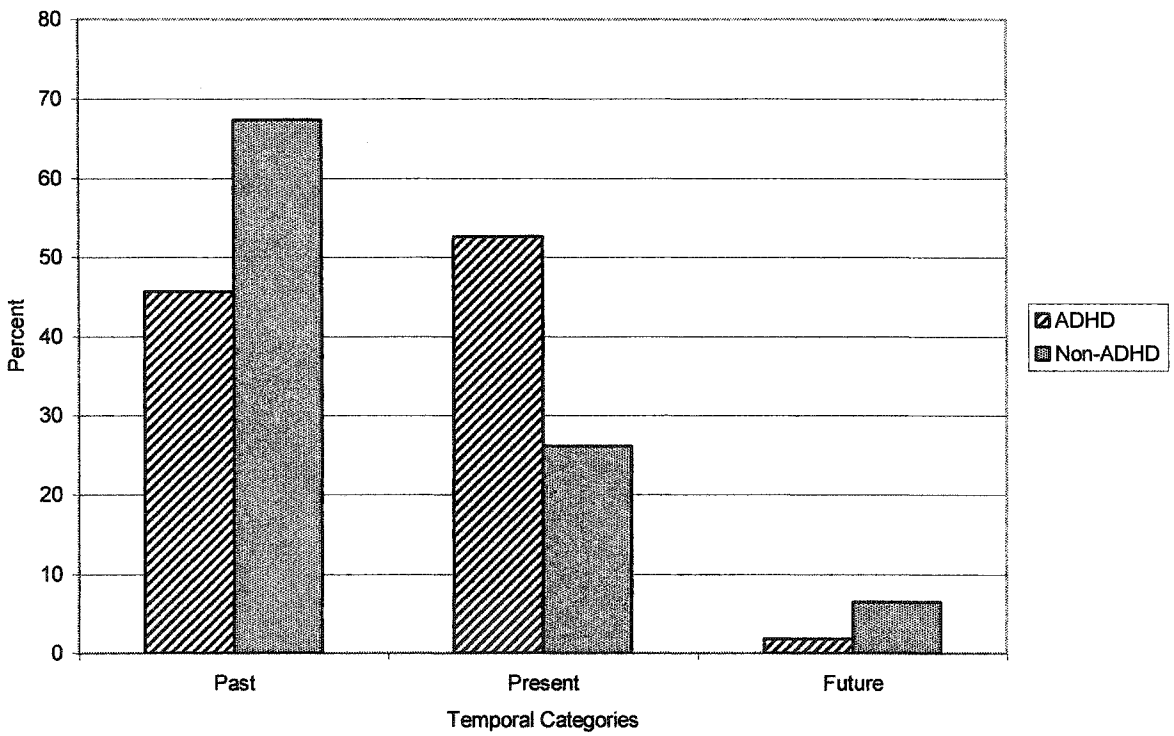

Figure 15. Categories for Past, Present and Future expressed by participants.

The ADHD group made more than twice as many references to the "Present" time (n = 30) as did the Non-ADHD group (n = 12). The ADHD group made references to the "Present" in 52.6% of their time references, compared to 26.1% for the Non-ADHD group. The Non-ADHD group referred to the "Past" (67.4%, n = 31) and "Future" (6.5%, n = 3) more often than the ADHD group did (45.6%, n = 26 and 1.7%, n = 1 respectively).

Figure 16 shows the participants' use of the time references for "Period" and "Frequency".

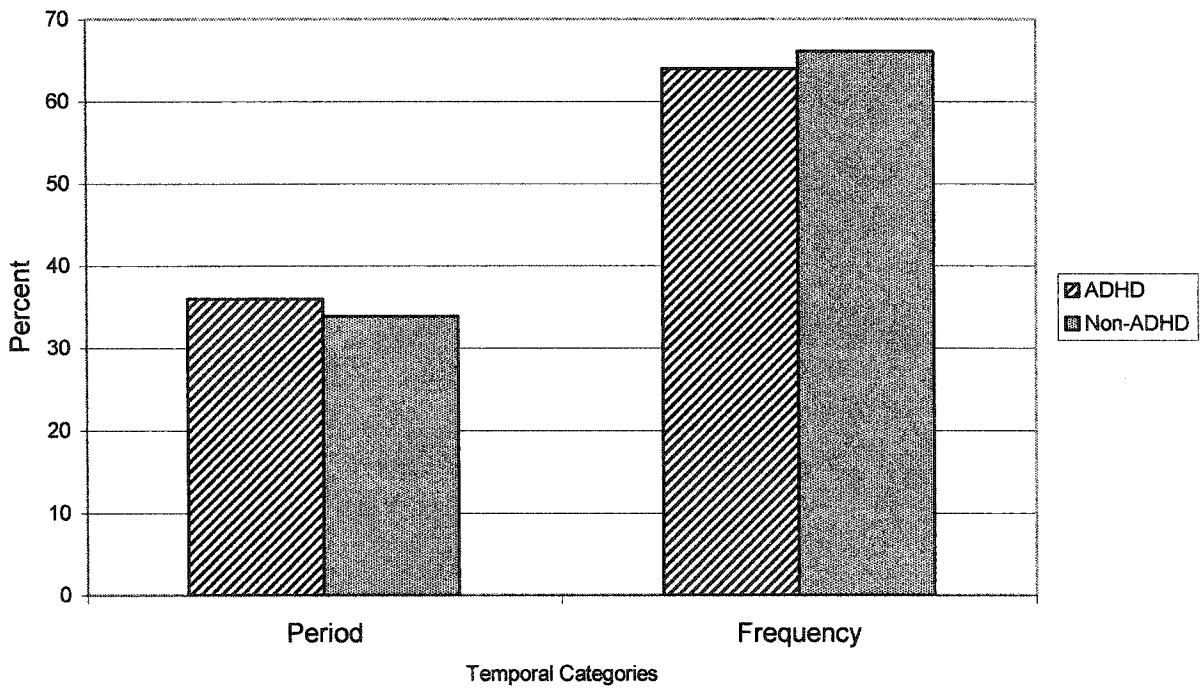

Figure 16. Participants' references to Period and Frequency relationships.

Basically, there were no differences in both group's references regarding time periods (ADHD, n = 18; Non-ADHD, n = 20) and time frequency (ADHD, n = 32; Non-ADHD, n = 39).

The participants appeared to have little difficulty with time deixis regarding tense. Two ADHD participants and one Non-ADHD participant made rare inappropriate tense references. For example:

> ***Researcher:*** *Do you have Lego at school that you get to play with?*
>
> ***A2:*** *Yeah.*
>
> ***Researcher:*** *Yeah? Is that during the>*
>
> ***A2:*** *The other kids are playing too rough with it so [teacher's name] had to take it away.*
>
> ***A3:*** *Those are hard to recognized. [A3 looks for Lego pieces in a pile in front of him]*
>
> ***Researcher:*** *What's the best Lego model you've ever built?*
>
> ***N2:*** *Umm, well, I have a Lego house at my house and^ and I haven't broke it yet^ one time I^ it dropped and it broke but I build it back together again.*

In these episodes, A2 uses a present tense marker, "*are*" when referring to past events. The appropriate tense marker would be "*were*". A3, on the other hand, uses a past tense marker "*-ed*" when no past tense is necessary. His utterance, without the tense marker "*–ed*", would read: "Those are hard to recognize." N3 uses the present tense verbs "*broke*" and "*build*" instead of the appropriate past tense verbs "broken" and "built".

Summary of contextual meaning.

In summary, both groups demonstrated appropriate use of referencing and perspective taking within the context of the study. The ADHD participants tended to show more problems making clear anaphoric or shared references for nouns and

pronouns and distinguishing between the articles "a" and "an". Eighty percent of the ADHD participants, compared to 40% of the Non-ADHD participants, interrupted the Researcher to complete his utterances. The ADHD participants tended to appropriate the Researcher's grammatical structure. Both groups were alike in their use of person deixis, with the ADHD participants showing a slight tendency to make inappropriate person deixis. Again, both groups were similar in their use of place deixis by connecting deictic terms to physical actions. Finally, the ADHD participant tended to use substantially more deictic terms regarding the present time than did the Non-ADHD participants. In the 100-utterance sample, the ADHD participants, while roughly equivalent to their Non-ADHD peers, showed a tendency to have more difficulties linking the context to their lexical meaning.

Conceptual Domains

The analysis of conceptual domains looked at the different ways the participants' words related to one another. The primary emphasis in this analysis was to consider how their words reflected concepts and which concepts were related. The analysis followed Lund and Duchan's (1983) categories for adverbs, adjectives, verbs and nouns (see Appendix H).

Adverbs

Adverbs perform a wide variety of functions within a sentence. Adverbs modify or specify the mode of action of a verb (e.g., "*steadily*" in "*run steadily*"), an adjective (e.g., "*very*" in "*very beautiful dress*"), or another adverb (e.g., "*rather*" in "*go rather quickly*"). The analysis of adverbs in the 100-utterance sample used the 11 conceptual domains derived from Lund and Duchan (1983; see Appendix H). Table 17 shows the

domains and the percentage of adverbs expressed by the groups for each domain in descending order.

Table 17

Conceptual Domains Expressed by the ADHD and Non-ADHD Groups

ADHD			Non-ADHD		
Conceptual Domain	%	N	Conceptual Domains	%	N
Location	31.6	77	State - Quality	22.6	47
Temporal	24.2	59	Temporal	14.4	30
State - Quality	13.9	34	Recurrence	11.5	24
Characteristic of Action	7.8	19	Location	11.1	23
Recurrence	5.7	14	Sequence	10.6	22
General	5.3	13	Quantitiy	9.6	20
Sequence	4.5	11	Characteristic of Action	8.7	18
Causation	3.7	9	General	5.3	11
Motivation	2.0	5	State of Person	2.9	6
Alternatives	0.8	2	Accompaniment	1.9	4
Other	0.4	1	Causation	1.4	3
Total	100	244	Total	100	208

The ADHD group used adverbs expressing "Location" almost 3 times as often (31.6% versus 11.1%) as did the Non-ADHD group. They also used adverbs related to the "Temporal" domain more often, but used adverbs expressing "State-Quality" less frequently.

Adverbs regarding location were the most frequently expressed by the ADHD participants. The most common location adverbs used by the ADHD group were "*here*" and "*there*". In the following examples, the words "here" and "there" modify verbs to indicate a specific place:

A1: *Stick it here.*

A2: *Put it right here.*

A3: *This helmet goes on here.*

A4: *I put that here.*

A5: *I'm trying ta go from here.*

A1: *Now, get in there.*

A2: *Put this steering wheel on right there.*

A3: *And there's the other leg.*

A4: *There it is.*

A5: *Then I made something there.*

The ADHD group also used other location adverbs that indicated more general locations. For example:

A1: *They're around here somewhere.*

A3: *That should [be] behind and back like that.*

The adverb "*somewhere*" indicates an unknown or unspecified place while "*behind*" and "*back*" specify a location at or toward the rear. The general pattern shown by the ADHD participants regarding adverbs is to use them to refer primarily to specific locations within the study context and to refer to an unspecified location, again, within the study context.

The second conceptual domain referred to by ADHD participants involved concepts of time or temporal relations. Here the most frequently occurring adverb was the word "*now*". The adverb "*now*" expressed an action or thought occurring within the immediate context. For example:

A1: *'Cause the stickers aren't on right now.*

A2: *I wonder where we can put the wheels now.*

A3: *There. Now it's better.*

A4: Right now it looks like this.

A5: Now, I can turn the page again.

Another adverb, "*sometimes*", expressed concepts about the frequency of an event or an activity whereas; the word "*now*" expressed concepts regarding the immediacy of the action or event in the present. For example:

A1: Sometimes when we^ my brother buys race tracks with cars.

A4: That's what they would do sometimes in all sets, they do that.

A5: I use tires for heads sometimes.

Other temporal adverbs included "*never*", "*finally*" and "*ago*":

A3: I never even looked at that.

A5: Now, finally the last pages.

A1: [I] can't remember 'cause it was such a long time ago.

The domain category "State-Quality" refers to more abstract relations than the domains of "Location" and "Temporal". The category "State-Quality" refers to relations that express a state that is qualitatively distinct from other states, such as those regarding a person, expressed by the adverb "cheerfully" or "sadly". The "State–Quality" category contains adverbs that perform a wide range of functions within the sentence. The category includes adverbs such as "*barely*", "*just*", "*maybe*", "*really*", "*actually*", "*very*", and "*almost*". Some, such as "*very*" and "*almost*", indicate the degree (or intensifiers), in which a verb is modified according to a high degree (e.g., "*very*"), or a state that is similar to a verb but not exactly (e.g., "*almost*"). Others, such as "*really*", "*actually*" and "*just*" indicate a relation to a fact or an act. "State-Quality" adverbs, then, intensify or add a qualitative aspect to the meaning of a verb or verb phrase.

In the 100-utterance sample, the ADHD participants used 7 different types of "state-quality" adverbs. For example:

> ***A1:*** *Barely anything that's why nobody in my class uses it 'cause there's barely anything.*
>
> ***A2:*** *Maybe it fell on the ground.*
>
> ***A3:*** *It really doesn't matter.*
>
> ***A4:*** *Sometimes I even use my teeth.*
>
> ***A5:*** *Yup, most of the time actually.*

These examples illustrate the range of concepts captured by the adverbs such as: in a meagre manner ("*barely*"), possibility but not certainty ("*maybe*"), an act or fact ("*really*"), an intensifier to emphasize action ("*even*") and reality ("*actually*").

The Non-ADHD participants used adverbs to express concepts regarding "State-Quality" the most. The adverbs used most often to express "State-Quality" were the words "*just*", "*actually*" and "*really*". The function of these words in their sentences was similar to that of the ADHD participants. The Non-ADHD participants used the words "*just*", "*really*" and "*actually*" more than did their ADHD peers. The Non-ADHD participants also used more types of adverbs (n=12) related to "State-Quality" than did the ADHD participants (n = 7).

For the ADHD group, the second most frequently expressed conceptual domain was the category "Temporal". The Non-ADHD participants used similar adverbs as did the ADHD participants (e.g., "*now*", "*sometimes*") and both groups were similar in the types of adverbs used (ADHD = 6; Non-ADHD = 7).

The third most frequent domain expressed by the Non-ADHD participants was the category "Recurrence". This category involves adverbs about activities or events that happen time after time as indicated by words such as "*again*" or "*often*". The category "Location" was the fourth most frequent domain expressed by the Non-ADHD group. They used words similar to those of the ADHD group (e.g., "*here*" and "*there*").

In summary, there were substantial differences between the two groups in the use of conceptual domains involving adverbs. The ADHD group primarily expressed adverbial relations of location and time. The Non-ADHD group expressed relations about State-Quality and then time. Both group used similar or the same adverbs to express relations.

Adjectives

Adjectives express some feature or quality of a noun or pronoun. Conceptual domains regarding adjectives were examined within four sub-categories: Sensory, Logical, Affective Qualities and Relations. Table 18 shows the conceptual domains for adjectives.

Table 18

Percentage of Adjective Categories by Conceptual Domains

	ADHD		Non-ADHD	
	%	N	%	N
SENSORY QUALITIES				
Vision	10.2	13	1.0	1
LOGICAL QUALITIES				
Size	16.5	21	14.9	15
Number	25.2	32	7.9	8
Condition	12.6	16	9.9	10
AFFECTIVE QUALITIES				
Feelings	0	0	1.0	1
Judgments	15.0	19	26.7	27
RELATIONS				
Possession	0	0	3.0	3
Exclusivity	1.6	2	1.0	1
Inclusivity	0	0	6.9	7
Qualification	5.5	7	4.0	4
Relative Position	7.9	10	7.9	8
Comparison	5.5	7	13.9	14
Disappearance	0	0	2.0	2
Total	100	127	100	101

The ADHD group used adjectives to express more conceptual domains about "Sensory" and "Logical" qualities than did the Non-ADHD group. The Non-ADHD group used adjectives related to "Affective Qualities" and "Relations" more than did the ADHD group.

The only sensory category expressed by both groups was "Vision", which related to objects participants saw or described (e.g., "*blue*", "*bright*"). More than 10% of the ADHD group's adjectives were about Vision, compared to only 1% for the Non-ADHD group.

Both groups were similar in their expression of "Size" using adjectives, such as "*big*", "*little*". The ADHD group expressed adjectives describing "Number" (e.g., "*two*", "*three*") more than 3 times as much as did the Non-ADHD group. The groups were, again, similar in their expression of "Condition" indicated by words such as "*new*", and "*broken*".

In the 100-utterance sample, only one Non-ADHD participant expressed an affective quality regarding "Feelings" while no ADHD participant used adjectives related to this domain. The Non-ADHD group expressed adjectives related to "Judgment" twice as much as did the ADHD group. Opinions, beliefs or evaluations expressed by participants were coded within the category "Judgments". The ADHD participants expressed fewer judgments (4 types) than the Non-ADHD participants (13 types). The two most frequently expressed judgments by the ADHD group were the adjectives "*supposed*" and "*good*". The adjective "*supposed*" was used to indicate a belief or opinion regarding a presumed order for building. For example:

A2: *It's supposed to go on two.*

A5: *And one side's supposed to be red.*

A5: *And there's supposed to be two on each side.*

N1: *'Cept that one is supposed to work cause, see.*

N4: *See, there's supposed to be a human right there, so.*

N4: *Supposed to be pink maybe they mean red.*

In these episodes, the participants express their belief or opinion about the order for building or the location of a Lego piece. The adjective "*good*" was used to express opinions of an agreeable or favourable character:

A2: Good thing we're using the instructions.

A2: That's good stuff.

A4: I know a good thing, instead of copying it, it's almost like copying.

N1: Pretty good, two of these. Darn, it's got this.

N4: Yeah, but you have to start getting good at chess.

The Non-ADHD participants used other adjectives to express a range of opinions and beliefs including "*crummy*", "*stupid*", "*neat*", "*crazy*" and "*fun*". The ADHD participants expressed a narrower range of opinions, including "*hard*" and "*correct*", as illustrated in the following:

A1: It's hard to get your fingers in little packages.

A4: Sometimes, it's hard for them to get.

A3: If I'm correct I'll need this to put into the middle one like this, like that way.

Under the domain "Relations" both groups were similar with respect to "Exclusivity", "Qualification", and "Relative Position". None of the ADHD participants expressed any adjectives regarding "Inclusivity" (e.g., "*any*", "*most*" and "*entire*") whereas 7.1% of the Non-ADHD group's adjectives expressed this domain. The Non-ADHD group expressed twice as many "Comparison" category adjectives of these types as did the ADHD group.

Overall, the ADHD participants expressed a higher percentage of their adjectives in terms of Sensory Qualities and Logical Qualities, while the Non-ADHD participants expressed a higher percentage of their adjectives in terms of Affective Qualities and

Relations. The ADHD participants tended to express those domains in which objects could be seen and counted, rather than the domains requiring more abstract connections.

Main Verb

Main verbs have a clearly stateable meaning (e.g., "run", go" and "want") and function as the head of the verb group. Table 19 shows the percentage of main, lexical verbs used by conceptual domain category.

Table 19

Percentage of Verbs by Conceptual Domains

	ADHD		Non-ADHD	
	%	N	%	N
Pro-Verbs	29.5	96	28.1	105
Change of State	5.8	19	2.4	9
Action with Body	4.6	15	7.5	28
Action with Object	32.9	107	25.4	95
Sensory Stative	16.0	52	26.5	99
Sensory Process	10.8	35	9.6	36
Locomotion	0	0	0.3	1
Function	0	0	0.3	1
Other	0.3	1	0	0
Total	100	325	100	374

Overall, the pattern of verb used by conceptual domains was similar for the two groups, although there were some differences. Both groups were similar in their expression of "Pro-Verbs" (e.g., "*do*", "*go*" and "*had*") that state a general action that may be applied in several situations. The groups also showed similarities under the categories of "Action with Body" (e.g., "*feel*", "*play*", "*find*" and "*give*"), "and "Sensory Process" (e.g., "*looking*", "*want*", "*knew*", "*guess*", "*think*", "*talking*", "*noticed*" and "*like*").

The Non-ADHD group expressed lexical verbs within the "Sensory Stative" category more than did the ADHD group. These verbs relate to passive sensory

experiences such as "*hear*", "*see*", "*know*" and "*feel*". The ADHD group expressed verbs within the category "Action With Object" more than did the Non-ADHD group. "Action with Object" verbs are related to some action involving an object as opposed to an action with their body. These verbs include "*throw*", "*found*", "*find*", "*put*", "*made*", "*build*", "*take*" and "*built*".

In summary, both groups were similar in their conceptual domain use regarding main verbs. However, the ADHD participants showed a tendency to express more verbs related to action with objects while the Non-ADHD participants tended to talk more about their sensory experiences. This suggests the ADHD participants may be more focused on their manifest activity (i.e., building the Lego model), while the Non-ADHD participants tended to focus more on internal processes.

Nouns

Nouns, traditionally, name persons, places or things. In this study, nouns were categorized into 6 types: animate, inanimate, concrete, abstract, count, and noncount. Animate nouns refer to living things; inanimate nouns refer to nonliving things. Concrete nouns have a material referent while abstract nouns describe a quality, state, action or other intangible, unobservable notions. Count nouns refer to things that can be counted and noncount nouns have referents that are not countable (e.g., "happiness" and "water"). Table 20 shows that both groups were almost identical in their use of nouns to express conceptual domains.

Table 20

Percentage of Nouns by Conceptual Domains

	ADHD		Non-ADHD	
	%	N	%	N
Animate	3.6	28	4.4	45
Inanimate	29.7	232	28.7	296
Concrete	31.8	249	31.8	328
Abstract	1.4	11	1.6	16
Count	30.7	240	30.1	310
Noncount	2.8	22	3.4	35
Total	100	782	100	1030

Summary of Conceptual Domains

The ADHD group tended to express conceptual domains related more directly to their immediate activities than did the Non-ADHD group. The ADHD participants' use of "Location" and "Temporal" adverbs, "Sensory" and "Logical Qualities" adjectives and "Action with Object" verbs are all connected to their Lego building activities during the study session. The Non-ADHD participants tended to express domains related to more abstract and conceptually distant (i.e., from the immediate circumstances) notions such as "State-Quality" for adverbs, "Judgments" for adjectives and "Sensory Stative" for verbs.

The one conceptual domain in which both groups showed remarkable similarity is that of "Nouns". Nouns name a person, place or thing. However, the Non-ADHD participants also expressed more abstract and conceptually more complex relations than did the ADHD participants.

Summary of Grammatical Competency

At the most fundamental level of language, both groups were similar in a number of respects. Within the conditions created in the study and within the 100-utterance sample, both groups produced an equivalent amount of talk, or language production

(except for N4 who consistently produced more talk throughout the session), at a similar level of grammatical complexity as measured by the Syntactic Complexity scores. Both groups demonstrated their phonological competency by producing the appropriate language sounds and combining these sounds into understandable words. The groups were also similar in their pattern of deviations regarding their phonological utterances.

The general morphological analysis showed both groups were similar in their ability to combine the language sounds into words and order those words appropriately. The groups were most similar in their use of pronouns. Thus, at the most basic levels of language, the ADHD and Non-ADHD participants were alike. There were, however, certain tendencies at the morphological level pertaining to personal pronouns, verb, adjective and adverb forms that indicated differences between the groups in their grammatical competency.

As the complexity of the language changed from the phonological and morphological levels to syntactic and semantic levels, more differences between the groups emerged. The Non-ADHD participants showed a slightly wider range in the types and tokens for common and proper nouns, verbs, adjectives and adverbs. This suggests more lexical diversity in their language. Consequently, the Non-ADHD participants appear to have more types of morphological forms available to them and they use these forms more often to express their thoughts.

The tendency of the Non-ADHD participants toward lexical diversity was further elaborated by another tendency emerging from the analysis of syntax. There was a tendency for the Non-ADHD participants to use more complex clause and phrase structures and to show slightly higher mean phrasal complexity. The lexical diversity of

the Non-ADHD group was manifested through more complex clause and phrase structures.

The analysis of semantics also showed subtle differences between the groups. The differences between the groups lay in the quantitative shifts that signal the emergence of a qualitatively different level of communicative competency. The differences between the groups are marked by differences in quantity (i.e., more or less of a semantic aspect). For example, while both groups were similar regarding lexical meaning, the ADHD participants tended to substitute pronouns for nouns more often than did the Non-ADHD group. The ADHD group tended to have more problems using anaphoric or shared references, made more inappropriate choices for person deixis and used more deictic terms related to the present time than did the Non-ADHD group. The quantitative changes in the participants' use of phonology, morphology and syntax are transformed into qualitative changes manifested in their expression of conceptual domains. Using the very same or similar terms, different patterns of conceptual domains emerge for each group.

The ADHD participants tended to focus on their immediate activities in the "here-and-now", while the Non-ADHD participants introduced more abstract conceptions related to judgments and making comparisons. In their conceptual domains, a qualitative change begins to appear. All participants are focused on the task of building the Lego model. Their language reflects this activity. While all participants are engaged fully in the task at hand, the grammatical competency of the ADHD participants appears to be more focused and constricted by their activity than that of the Non-ADHD participants. The ADHD participants do not appear inclined to go beyond their immediate context and

activity, whereas the Non-ADHD participants, while also fully engaged in the "here-and-now", do convey more abstract and complex concepts. Consequently, the grammatical competency demonstrated by the Non-ADHD participants is qualitatively different than the ADHD participants, even though both groups are alike in several aspects.

Sociolinguistic Competency

Sociolinguistic competency examines the ways utterances are understood. The primary focus is the extent to which communicative functions are appropriate within a given sociocultural context. The analysis examined (a) the influence of situational context and (b) the conversational interaction.

Influence of the Situational Context

The study context provided the background for the interaction between the Researcher and the participants. The analysis of the situational context yielded an indicator of the degree to which a participant's language and communication were bound to the physical environment, in this case, the study room.

The analysis looked at two types of participants' assertives: (a) those that were identifications of objects and/or events that were directly observable in the immediate physical context (ASCO), such as talking about the Lego model or referring to the one-way mirror, and (b) those assertives that were reports of mental events, evaluations, statements of rules and explanations about objects and/or events that were not directly observable in the immediate physical context (ASST), such as topics about the participants' previous Lego experiences, playing chess or comments on participants' likes and dislikes.

Figure 17 shows that the ADHD group made more than twice as many statements about events and/or objects that were directly observable in the immediate physical context (mean = 184.5 statements) than did the Non-ADHD group (mean = 89.8 statements). Appendix K, Table K2 reports the frequencies for ASCO and ASST statements by participant.

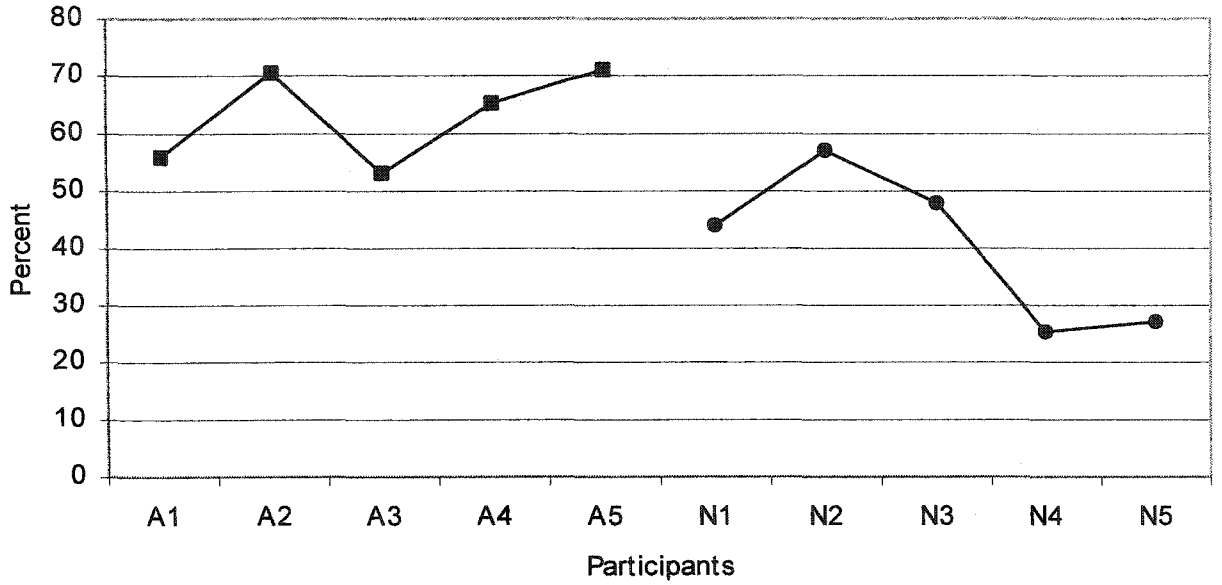

Figure 17. Participant's statements of directly observable events/objects as a percentage of statements about observable and non-observable events/objects.

For the ADHD group, almost two-thirds of all their statements and comments (which excludes questions and responses) were about events and/or objects directly observable in the study room. On the other hand, for the Non-ADHD group, only 40% of all their statements and comments referred directly to observable events/objects. The Non-ADHD participants had a somewhat greater range of scores than did the ADHD participants.

Following are examples of the types of statements participants made that were linked to the situational context:

> ***A5:*** *I think I'll put a helmet on him instead. [Statement of Directly Observable Event/Object – Initiate Topic – while building the Lego figure, A5 looks at the instructions]*

A5: *I could add extra things on to it because there's a whole bunch of pieces left over. [Statement of Directly Observable Event/Object – Extend Topic]*

A3: *Yeah, it's a magic mirror. [Statement of Directly Observable Event/Object – Initiate Topic – A3 points to one-way mirror]*

Researcher: *That's a magic mirror, yeah. It's called a one-way mirror. [Statement of Directly Observable Event/Object – Extend Topic]*

Researcher: *Oh, boy, lots of stuff. [Statement of Event/Object Not Directly Observable – Extend Topic – A1 opens the Lego advertisement paper and looks at it]*

A1: *This probably isn't the one that you make. [Statement of Directly Observable Event/Object – Extend Topic – A1 points to a picture on the Lego advertisement paper]*

N3: *I think I want to build the car. [Statement of Directly Observable Event/Objects – Initiate Topic – N3 looks at the instructions]*

N1: *I can see a outlines of everything. [Statement of Directly Observable Event/Object – Initiate Topic – N1 looks at the one-way mirror]*

Researcher: *Yeah, there's the outlines there. [Statement of Directly Observable Event/Object – Maintain Topic]*

In these examples, the topic of the utterances focused on aspects of the Lego model itself, such as building parts of the model or playing with objects that came with the Lego model (e.g., the advertisement pages, stickers or the instructions). The participants also referred to objects in the room, such as the one-way mirror or the microphones on the ceiling.

The collary to the observation that the ADHD group made more statements about directly observable events/objects is that the Non-ADHD group made more statements about events/objects there were not directly observable in the immediate situational context. Figure 18 shows that the Non-ADHD group made more statements about non-observable events/objects (mean = 139.4 statements) than did the ADHD group (mean = 114.7 statements). Overall, the ADHD group had an average of 36.8% of their statements related to events and/or objects that were not directly observable and the Non-ADHD group averaged 59.7% (see Appendix K, Table K2 for frequencies).

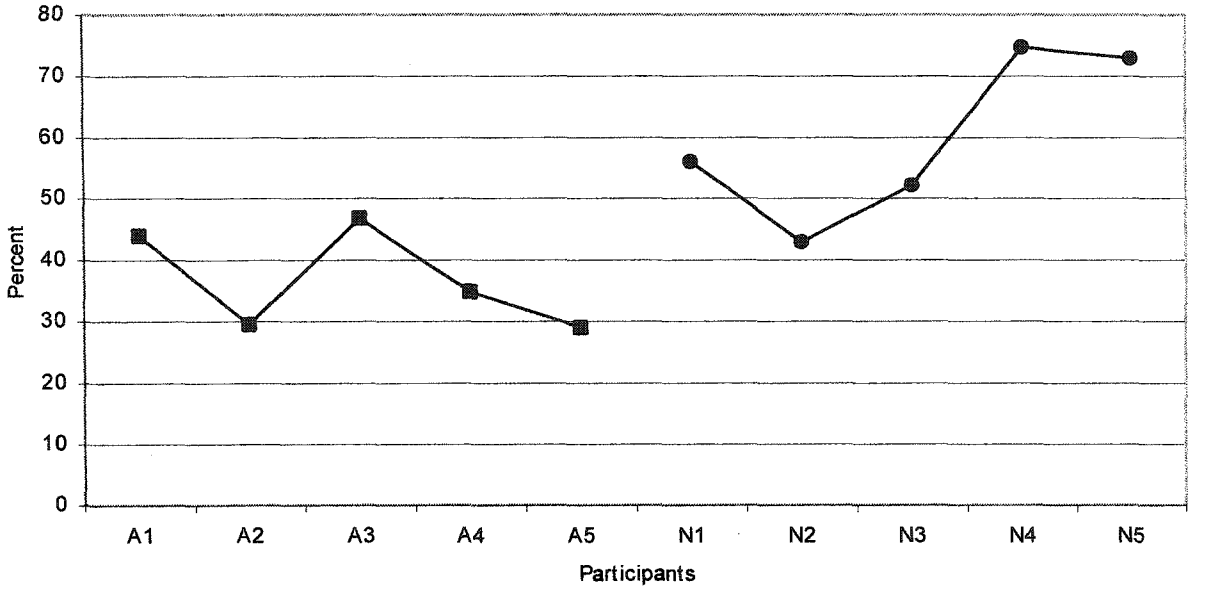

Figure 18. Participants' statements of events/objects not directly observable as a percentage of statements about observable and non-observable events/objects.

On average, the ADHD participants referred to events/objects not directly observable in the study context in about 37% of their statements. This compares to almost 60% for the Non-ADHD participants.

Following are examples of participants' statements about non-observable events/objects:

A4: *Because I don't wanna put on something and it won't get and it might get stuck. [Statement of Non-Observable Event/Object – Extend Topic – A4 wants to keep the instructions for later reference]*

Researcher: *That's a good idea. [Statement of Non-Observable Event/Object – Extend Topic]*

Researcher: *A wolf has got 42 teeth in its mouth. [Response to Request for Clarification – Extend Topic – wolves]*

A3: *Most wolves have about 32. [Statement of Non-Observable Event/Object – Extent Topic]*

Researcher: *32? [Imitation – Maintain Topic]*

A3: *The-you know the sager tooth wolf? The sager tooth. [Statement of Non-Observable Event/Object – Extend Topic]*

N2: *I have this friend who's really good at Lego and she always plays with him [another friend], um like, we make models likes houses and stuff. [Statement of Non-Observable Event/Object – Extend Topic – N2s sister and friends also play with Lego]*

Researcher: *Yeah? [Response to Statement – Maintain topic]*

N2: *And then they live together with husband. [Statement of Non-Observable Event/Object – Extend Topic]*

N4: *It's where the Queen is like^ your King's in front of their Queen. [Statement of Non-Observable Event/Object – Extend Topic – chess moves]*

Researcher: *Umhum [Response to Assertive – Maintain Topic]*

N4: *You like – you put your Rook down, check the King so the King has to move away. [Statement of Non-Observable Event/Object – Extend Topic]*

Statements about events/objects that were not directly observable in the situational context showed a wider range of topics, as indicated by these examples, than did statements about directly observable events/objects. Some topics were specified as part of the study procedures, such as topics about the Lego model in the study, building

the study Lego model, giving instructions, snack, playing with the study Lego model and packing up at the end of the session. Other topics were initiated by the participants. These topics included playing with Lego at school and at home with family members and friends, past experiences with Lego models (both positive and negative), Lego models desired by the participants, Pokemon, Star Wars movie (Phantom Menace), chess, BMX bicycle racing, snowball fights, birthday parties, wolves, bees, hornets, what happens when insects get sucked into a vacuum cleaner, space, raining cats and dogs, computers and family pets.

All participants talked about their experiences with family members and friends across a range of topics. For example, A1 talked about Lego models he desired, A2 talked about the problems he was having building the Lego model in the study (it kept falling apart), A3 talked about his brother's Lego models, A4 described the Lego models he had modified, A5 recounted a story about falling into deep snow, N1 told about building Lego with his Dad, N2 recalled playing with Lego with his friends, N3 and N4 talked about their brothers and N5 recalled an incident when his Lego model was accidentally broken by his sister. All of these topics are based on personal experiences, which indicate a distance that is psychologically close to the participants. That is, the topics were related to things the speaker did (or wanted) or did with family members and friends.

The Non-ADHD group, however, also talked about a range of topics outside of the study room that were more distant, psychologically, from the speaker. For example, N4 talked about different chess moves, the relative merits of a Macintosh computer versus a PC and computer chess games. N3 talked about using blueprints to design cars and Lego models, trucks in Australia with several trailers (like trains), space, volcanoes,

music and he made several joking comments about raining cats and dogs, while N1 re-told the events from the Star Wars movie Phantom Menace, complete with sound effects. These topics, some of which were based on the speaker's personal experiences, such as chess for N4 and the Star Wars movie for N1, went beyond the personal experience into more generalized statements relating several themes, aspects or features. These topics required the speakers to organize information based on personal experience and synthesize that information with new, more abstract information in order to extend the topic. For example:

> ***N3:*** *I'm not like^ I don't usually play with Lego. [The Researcher had commented that N3 appeared to have had previous Lego experience]*
>
> ***Researcher:*** *So, we couldn't describe you as a Lego Maniac.*
>
> ***N3:*** *No.*
>
> ***Researcher:*** *Okay.*
>
> ***N3:*** *So, if I got lost and they found like all this Lego like lying around? That wouldn't be a clue.*
>
> ***Researcher:*** *Wouldn't be a clue. [Laughs]*

This episode illustrates the more abstract nature of the Non-ADHD participants' statements of events/objects not directly observable. N3 chose to respond to the Researcher's comment about his past Lego experience by adding the new information that he doesn't play with Lego often. He then takes that statement, based on personal experience, and extends the proposition to a more abstract level that moves beyond his personal experience with Lego and synthesizes additional information about being lost, found, and clues regarding the identity of the so-called lost person's identity. The result is

a complex of abstract propositions based on personal experience. The psychological distance moves from a concrete base, such as personal experience, toward a statement of more abstract ideas, concepts and propositions.

N1 describes some scenes in the movie Phantom Menace:

N1: *You remember when he [Jar Jar Binks] was like 'Loosagagaga', and then Qui Con Jim is like 'there's always a bigger fish". [N1 and the Researcher chuckle]*

N1: *Because all the time those fishes get eaten up by a bigger one and that gets eaten up and then that one gets eaten up.*

In this re-telling, N1 takes a quote from one of the Star Wars characters and elaborates on it. He moves from the more concrete (i.e., the quote) to explaining the quote's meaning (a move toward the more abstract).

The ADHD group tended to talk about more concrete topics based on their past experiences such as racing BMX bicycles, playing with friends and family and modifications they had made to previous Lego models, without producing statements reflecting more abstract ideas or propositions. This is not to say that the ADHD participants did not make statements about more abstract events or ideas. A5, for example, expressed the following:

Researcher: *You know in California there's a Legoland? They've just built.*

A5: *Oh, yeah, I seen that in some magazine.*

Researcher: *Yeah.*

Researcher: *One of the things I know that they do is when they build their models>*

A5: *They glue them together?*

Researcher: *Exactly, they glue them together.*

Researcher: *Exactly.*

A5: *They have to or else the wind would-might-blow them down.*

In this episode, A5 first predicts the sentence ending for the Researcher (i.e., gluing the Lego together) and then explains the reason for gluing which entails knowing the properties of Lego, such as that the pieces come apart, and then linking this knowledge to the current sentence topic to give reasons for gluing Lego together (i.e., so the wind doesn't destroy the models). While A5 does move toward more abstract concepts and ideas in his statements, the other four ADHD participants had more difficulty communicating abstract ideas when they attempted to move from the concrete to the more abstract. For example:

A1: *I can't see the other side of that, so I do not know if it goes like this or not.*

[A1 is looking at the picture of the vehicle on the Lego box]

Researcher: *Right.*

A1: *Cause I can't see the other side.*

Researcher: *Yeah. Why would they only give you one side on that picture?*

A1: *Because it's a picture like of a like a car like cartoons have.*

Researcher: *What do you mean by cartoons?*

A1: *I don't know.*

Researcher: *I don't quite follow, but anyway.*

A1 noticed that the picture on the Lego box was drawn in one dimension, showing only one side of the vehicle. He appeared to have difficulty extending this observation to

consider that the vehicle was symmetrical, as shown in the instructions, that one side was the mirror image of the other side. Consequently, it was necessary only to show one side of the vehicle. A1's difficulty with the abstract concept of dimensionality is further compounded by his difficulty in expressing to the Researcher the reasons for the one-dimension picture. He made a comparison between the picture on the Lego box and cartoons but had difficulty carrying the analogy to its logical conclusion and he stated, "*I don't know*" thus ending the topic and the explanation of a concept A1 found difficult to express. Four of the five ADHD participants appeared to have more difficulty than the Non-ADHD participants expressing concepts, ideas and relations that were not located in the immediate study context.

Summary of the Influence of the Situational Context

Examination of the situational context showed that the ADHD participants appeared to rely more on the study context in their interactions with the Researcher than did the Non-ADHD group. They made more statements about events/objects directly observable in the study context than did the Non-ADHD group. The topics the ADHD participants chose to talk about tended to focus more on their personal experiences and observations than did the topics of the Non-ADHD participants. The Non-ADHD participants appeared to have less difficulty expressing abstract concepts as reflected in their choice of topics. Their choice of topics represented a tendency to express ideas, events, and propositions that were more psychologically distant from the speaker. The ADHD group, for the most part, remained focused on their immediate context and appeared content to talk about topics that were psychologically closer to them.

Conversational Interaction

Conversation was the main form of interaction between the Researcher and the participants. A conversation is created through the contributions of both conversational partners. Conversations that are dominated by one partner over the other become something other than a conversation, such as a monologue, a lesson or a storytelling session. Thus, a conversation requires the active participation and contributions of both partners to be viable. Within the conversational interaction in this study, four aspects were analyzed: responding to the conversational partner, semantic contingency, turn-taking and the listener context. The results for each of these four aspects are described below.

Responding to the Conversational Partner

Measures of participants' conversational assertiveness (which is qualitatively different than behavioural assertiveness) constitute a general indicator of responsiveness in a conversation. In order to maintain a conversation, both parties must contribute. The level of assertiveness of the participants indicates their relative contribution to the conversation. Symmetry (i.e., the point of equal contribution of both conversational partners) in a conversation is 50%. Figure 19 shows the assertiveness of the participants across the all of the sessions (see Appendix K, Table K3 for the frequencies of the participants' and the Researcher's assertive statements).

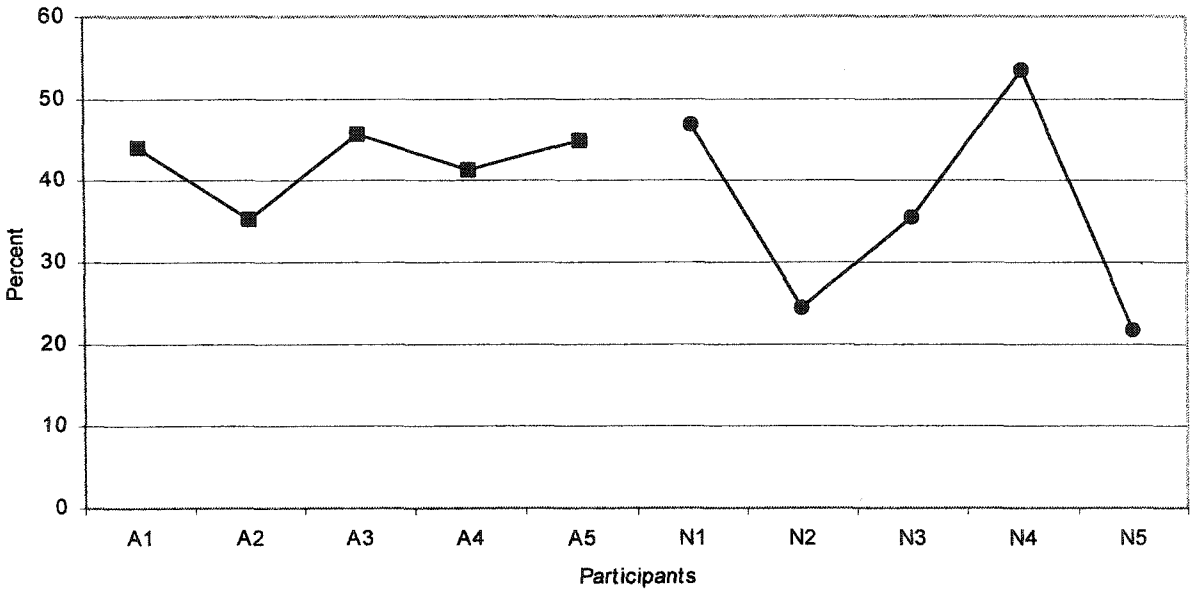

Figure 19. Participants' assertiveness in the study.

The ADHD participants were as, or more, assertive than the Non-ADHD participants. All of the ADHD participants were below the 50% mark and there was relatively little variation in their scores. The average assertiveness level of the Non-ADHD group was somewhat lower with extensive variation in their scores.

Those participants whose assertiveness levels were around the 50% level contributed to the conversation more or less equally with the Researcher. In conversations in which the participants contributed less than 50%, the Researcher tended to dominate and in the single conversation in which the participant contributed more than 50% (i.e., N4), the participant tended to dominate. There were, however, no participants (including the Researcher) who dominated to the extent that the conversation transformed into something else, such as a lesson or monologue. Similarly, for those participants who contributed less to the conversation, the Researcher provided extra support in the form of questions and/or comments to maintain and extend the conversation. Overall, the ADHD

group showed much more consistency in the levels of their contributions to the conversation than did the Non-ADHD participants.

The participants' levels of assertiveness varied across the different phases of the session. Figure 20 shows the participants' assertiveness for the first three phases (see Appendix K, Table K3 for frequencies).

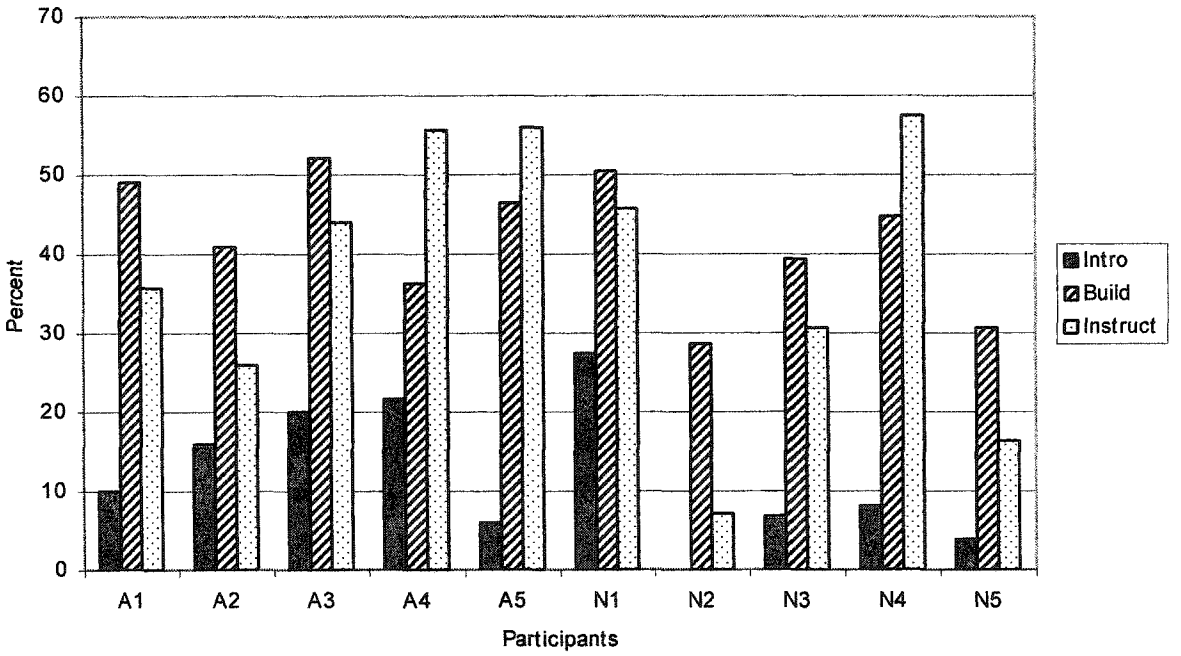

Figure 20. Participants' assertiveness levels for Introductory, Building and Instruction Phases.

Participant assertiveness levels varied with the study task. In the Introductory Phase, all of the participants were well below the 50% symmetry level, as the Researcher dominated the conversation. A certain level of Researcher dominance was, however, appropriate for this phase because the Researcher was showing the participants the study and observation room, connecting the tie microphone, explaining the procedure and asking for the participants' verbal consent to participate in the study.

The ADHD participants generally showed higher levels of assertiveness than did their Non-ADHD peers. Only one Non-ADHD participant (N1) had a higher level of assertiveness than did his ADHD counterpart (A1). There was one participant (N2) who showed no linguistic assertiveness at all in the Introductory Phase.

In the Building Phase, participant assertiveness increased substantially toward symmetry. In this phase the participants contributed more to the conversation with the Researcher. Two participants (A3 and N1) reached the 50% mark indicating a symmetrical interaction with the Researcher. The one who showed the most assertiveness throughout the Building Phase of all the participants was an ADHD participant (A3). These levels of assertiveness were, again, appropriate to the context and indicated that even though the participants were engaged in the building activity they were able to contribute to the conversation.

During the Instruction Phase, assertiveness levels dropped for seven of the participants. In this phase, the participants were asked to provide the Researcher with instructions about how to build the Lego model they had just completed. The instructions provided by two ADHD participants (A4 and A5), consistent with their increased assertiveness levels, were more detailed than the instructions provided by other participants. The single Non-ADHD participant (N4), who demonstrated increased assertiveness provided more detail than the other Non-ADHD participants and spent more time explaining why he would not give instructions. Hence the higher levels of assertiveness for N4.

Figure 21 shows the assertiveness levels of the participants during the play and ending phases of the study (see Appendix K, Table K3 for frequencies).

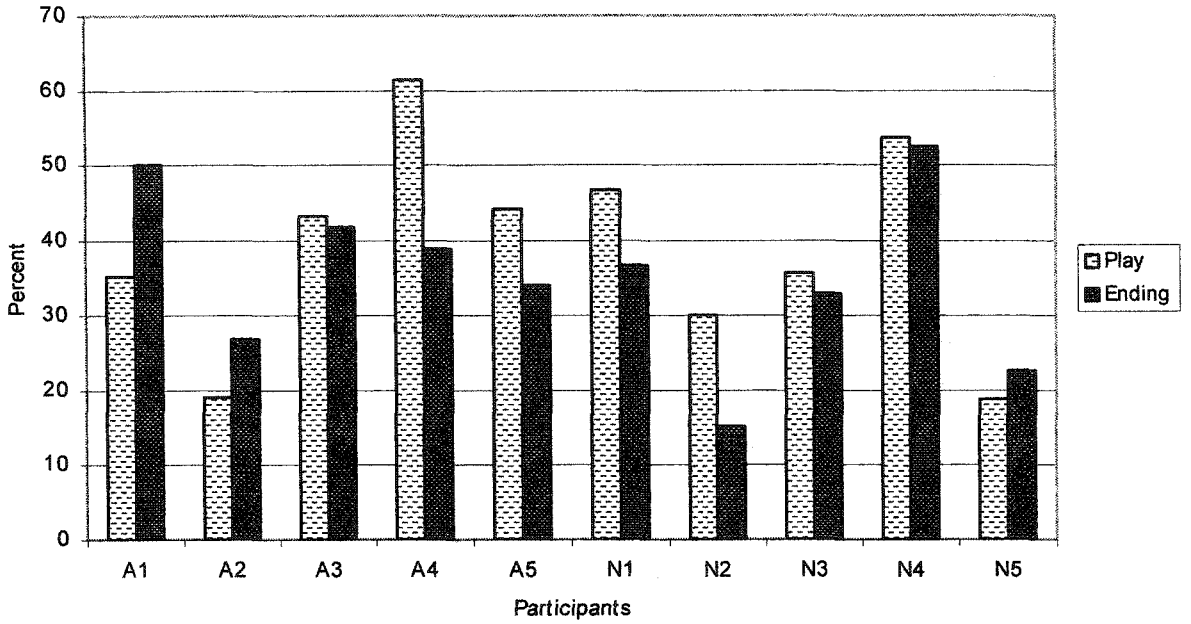

Figure 21. Participants' assertiveness levels for the Play and Ending Phases.

The varied levels of the participants' assertiveness during the Play and Ending phases appear to represent a lower level of involvement in the Play phase. The Non-ADHD participants tended to show more interest and enthusiasm in the Play Phase than did the ADHD participants. The participants' levels of assertiveness for the Play Phase was, overall, appropriate to the study conditions and task.

The Ending Phase marked the conclusion of the session and the Lego model was packed for the participant to take away. The ADHD participants overall showed higher levels of assertiveness than did their Non-ADHD peers. The level of assertiveness during this phase was appropriate for both groups.

Overall, the participants' levels of assertiveness, an indication of their relative contribution to the conversation, varied across the study tasks, indicating that all of the participants adjusted their behaviour according to the sociocultural context. The

assertiveness levels demonstrated by all participants across the entire study session were appropriate. However, within each phase, the majority of the ADHD participants showed higher levels of assertiveness than did their Non-ADHD counterparts.

Another indicator of participant responsiveness was the extent to which they responded to the Researcher's questions. Over the course of the entire study, the Researcher asked the ADHD group a total of 504 questions and the Non-ADHD group 435 questions. Figure 22 shows the participants responses to the Researcher's questions (see Appendix K, Table K4 for frequencies).

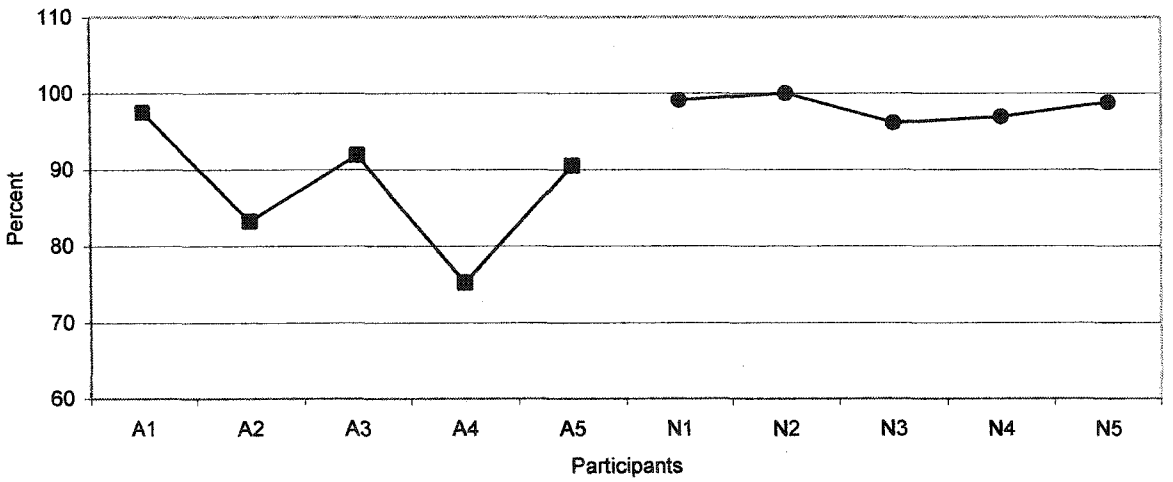

Figure 22. Participants' responsiveness to Researcher's questions.

Overall, the participants responded to the Researcher's questions a high percentage of the time, indicating that all of the participants were monitoring the conversation during the different study tasks. However, the ADHD group consistently showed substantially less responsiveness than did the Non-ADHD group. In addition, while there was considerable variability within the ADHD group, the responsiveness of the Non-ADHD group was strikingly consistent.

The ADHD group had a higher frequency of null responses to the Researcher's questions (n = 67) than did the Non-ADHD group (n = 7; see Figure 23.).

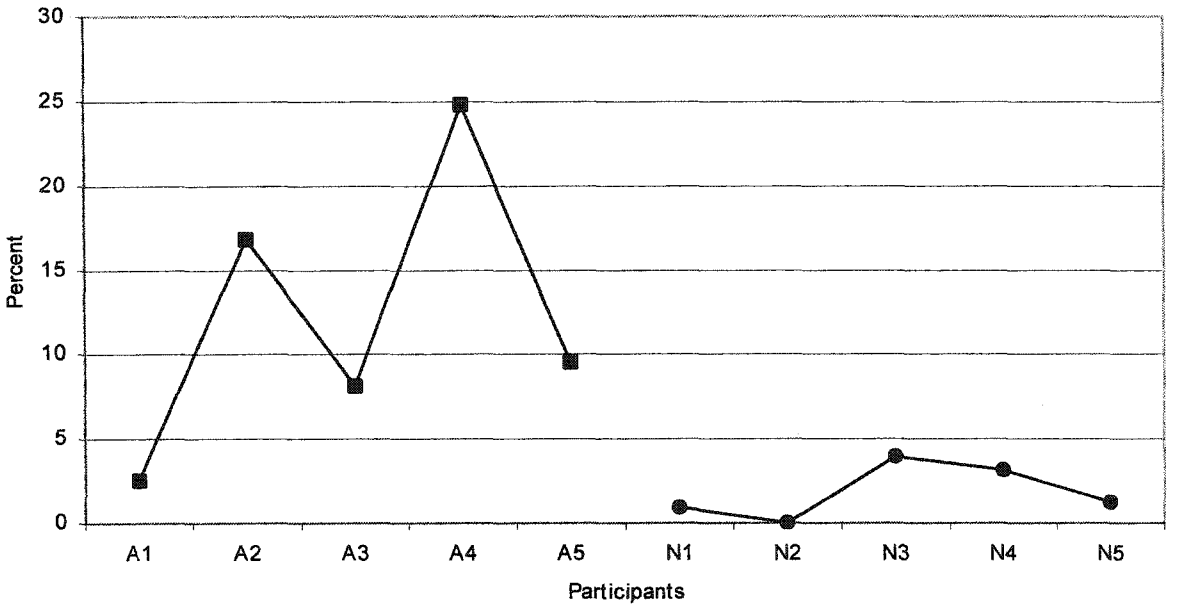

Figure 23. Percentage of participants' null responses to Researcher's questions.

As a group, the ADHD participants did not respond to 13.3% of the Researcher's questions, while the Non-ADHD did not respond to 1.6% of the Researcher questions. For the ADHD group, the null responses were distributed across all of the study phases. There was no single phase during which null responses were more likely. A similar pattern holds for the Non-ADHD group. This suggests that engaging in an activity such as building a Lego model is no more distracting, thus not resulting in increased null responses, than providing instructions or playing with Lego models.

In addition to answering the Researcher's questions, participants could choose whether or not to respond to the Researcher's non-question utterances. Responding to non-question utterances indicates that the participants were monitoring what the Researcher was saying and thus responding to the sociocultural context. Figure 24 shows the participants' responses to the Researcher's non-question utterances (see Appendix K, Table K6 for frequencies).

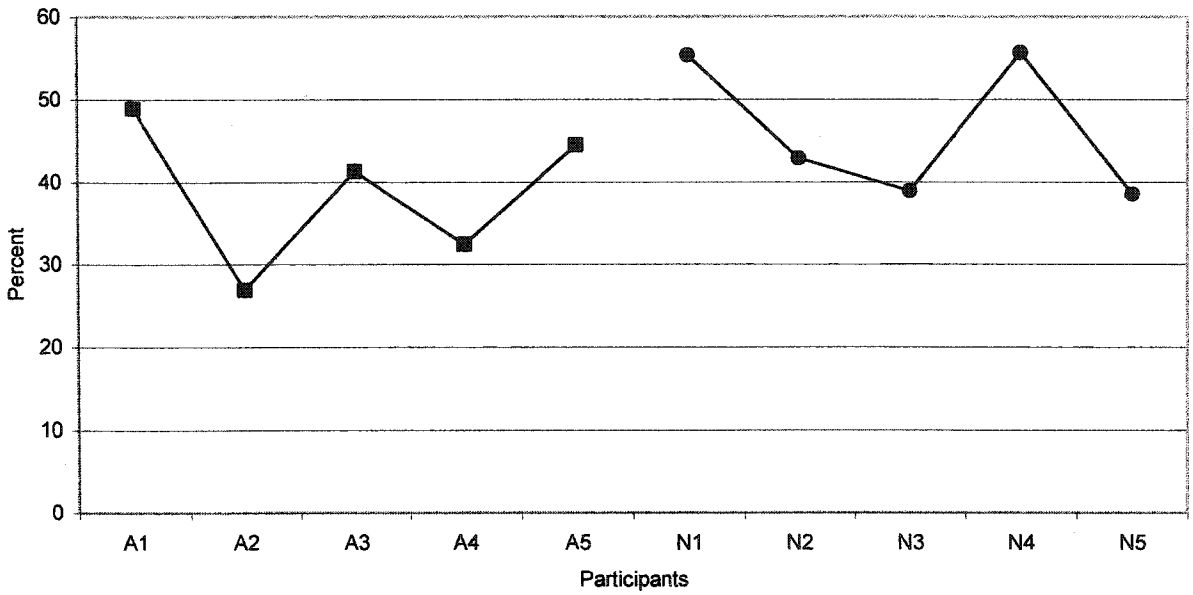

Figure 24. Percentage of participants' responses to Researcher's non-question utterances.

Overall, both groups were similar in choosing to respond to the Researcher's non-question utterances, with some variation within the groups. Both groups showed similar willingness to respond to the Researcher's utterances when there was no obligation, such as answering a question, to do so. The Non-ADHD group showed less variation (38.5% to 55.6%) than did the ADHD group (26.9% to 48.9%).

Participants chose to respond to a range of topics involved in the Researcher's non-question utterances. For example:

Researcher: *You just hang in there. That's right, never say never. Never say quit. [Statement of Non-Observable Objects/Events – Extend Topic – resigning in a chess game]*

N4: *I just said never. You just said never. [Statement of Non-Observable Objects/Events – Extend Topic]*

In this episode the Researcher made a comment about the topic of resigning in a chess game to which N4 chose to respond with his statement about the Researcher's utterance. In another episode, the Researcher commented about the Lego figure A5 was working on and A5 chose to respond:

Researcher: *Well, it's a good thing he's got that [Statement of Observable Event/Object – Extend Topic - Researcher points to the Lego figure's helmet]*

A5: *At least I got his helmet off [Statement of Observable Event/Object – Extend Topic]*

Researcher: *Yeah, you got the top down [Statement of Observable Event/Object – Extend Topic]*

There was no discernible pattern regarding the type of Researcher's comments (e.g., statements of observable or non-observable events/objects or responses to prior utterances) to which participants chose to respond.

Summary of responding to the conversational partner.

All of the participants were appropriately assertive during each of the study phases. The levels of conversational assertiveness varied with the tasks in each of the

phases. The highest levels of participant assertiveness were during the building phase. Within each phase, the majority of ADHD participants showed higher levels of assertiveness than did their Non-ADHD peers, but the levels were appropriate for each of the phases. The ADHD group responded less frequently to the Researcher's questions and had a higher level of null responses than did the Non-ADHD group. Both groups were similar regarding their willingness to respond to the Researcher's non-question utterances.

Semantic Contingency

The ability to relate one's utterances to prior utterances is an important skill. Semantically contingent conversations are easier to understand and contingency between conversational partners indicates there is a joint focus between them that contributes to sustaining the social interaction through the conversation.

An indicator of semantic contingency is the ability of the conversational partners to maintain and extend topics, thus contributing to the progression of the conversation.

Figure 25 shows the percentage of topics maintained and extended (see Appendix K, Table K5 for frequencies).

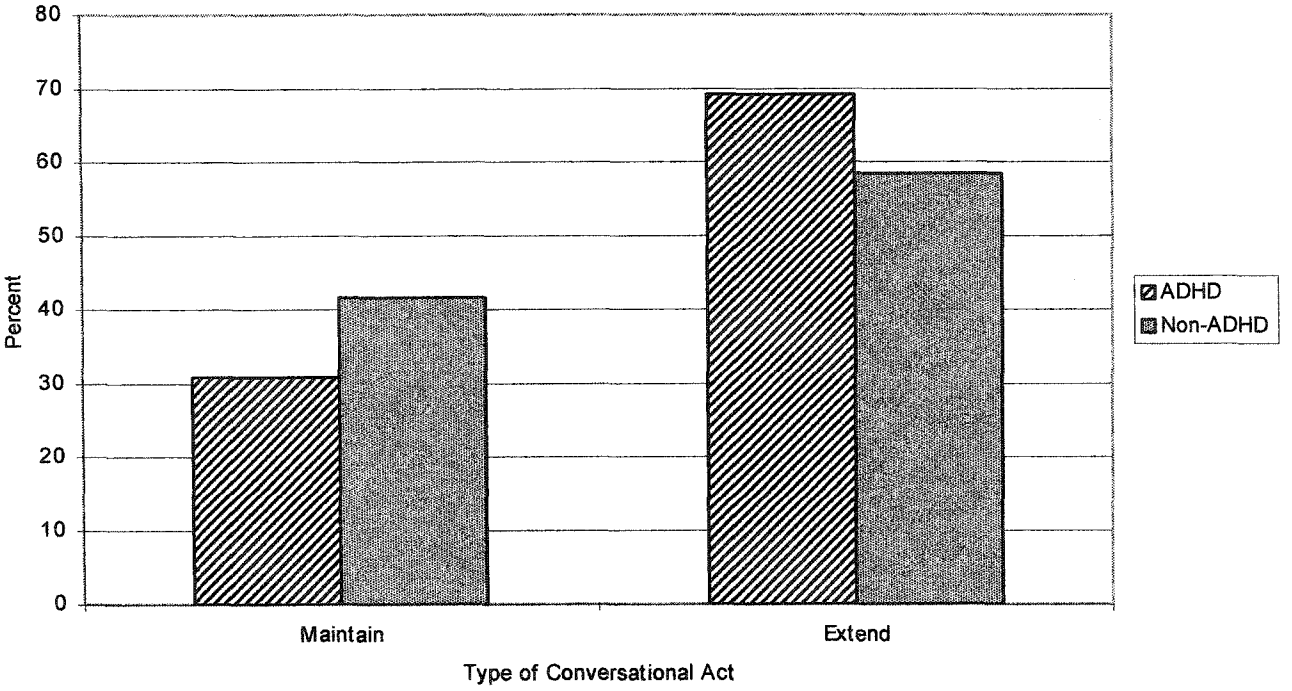

Figure 25. Percent of topics maintained and extended by participants

All participants were able to express semantically contingent utterances to share meaning during the conversation. However, there were some differences between the groups. The Non-ADHD group maintained topics with 41.6% of their utterances compared to 30.8% for the ADHD group. The ADHD group extended topics with 69.2% of their utterances as compared to 58.4% for the Non-ADHD group.

There were two general patterns of interaction in which semantic contingency was maintained. Following is an example illustrating a type of semantic contingency in which the Researcher initiates a topic:

Researcher: *Do you ever miss any steps when you're doing Lego? [Request for Information – Initiate Topic]*

A1: *No, cause my brother usually helps. [Response for Information- Maintain Topic and Statement of Non-Observable Object/Event- Extends Topic].*

Researcher: *Oh, yeah, it's good to have help sometimes. [Statement of Non-Observable Object/Event – Extends Topic]*

In this episode, the Researcher initiates a topic through questioning; the participant responds to the question, thus maintaining the interaction and provides new information that extends the topic. The Researcher responds by adding new information to that provided by the participant, again extending the conversation. Each partner takes his turn-at-speaking to create the conversation.

The following episode illustrates another pattern of semantic contingency in which the participant initiates a topic:

N3: *I think I want to build the car. [Statement of Observable Object/Event – Initiate Topic].*

Researcher: *You do just whatever you like to do. [Statement of Non-Observable Object/Event – Extend topic]*

N3: *Hum [Response to Assertive – Maintain Topic]*

N3: *And that's what I think I'll do [Statement of Non-Observable Object/Event – Extend topic]*

Researcher: *Okay. [Response to Assertive – Maintain Topic]*

N3: *Mmmm [Response to Assertive – Maintain Topic]*

Researcher: *You the action man? [Request for Information – Initiate Topic].*

N3: *Null [No Response]*

N3: *Hum, wrong one [Statement of Observable Object/Event – Initiate Topic]*

In this episode, the conversational partners alternate turns for the first two utterances followed by N3 speaking twice in a row followed by the Researcher's response and N3's

response. After the Researcher asks a question that receives no response, N3 initiates a new topic. The null response served as a marker that the topic in this episode was finished and a new one was introduced. This new topic is then maintained and/or extended by the partners alternating turns or one participant speaking two or more utterances. This pattern is common for each of the new topics.

The section of the Results on Discourse Competency presents more detail regarding the types of statements participants made that were semantically contingent to maintain and extend topics. Another important component of a conversation, speaking-in-turn, is examined next.

Turn-Taking

Taking turns-at-speaking is an important aspect of any conversation. An equitable distribution of turns ensures that each conversational partner is contributing to the conversation. Figure 26 shows the average number of sentences per turn for the participants and the Researcher.

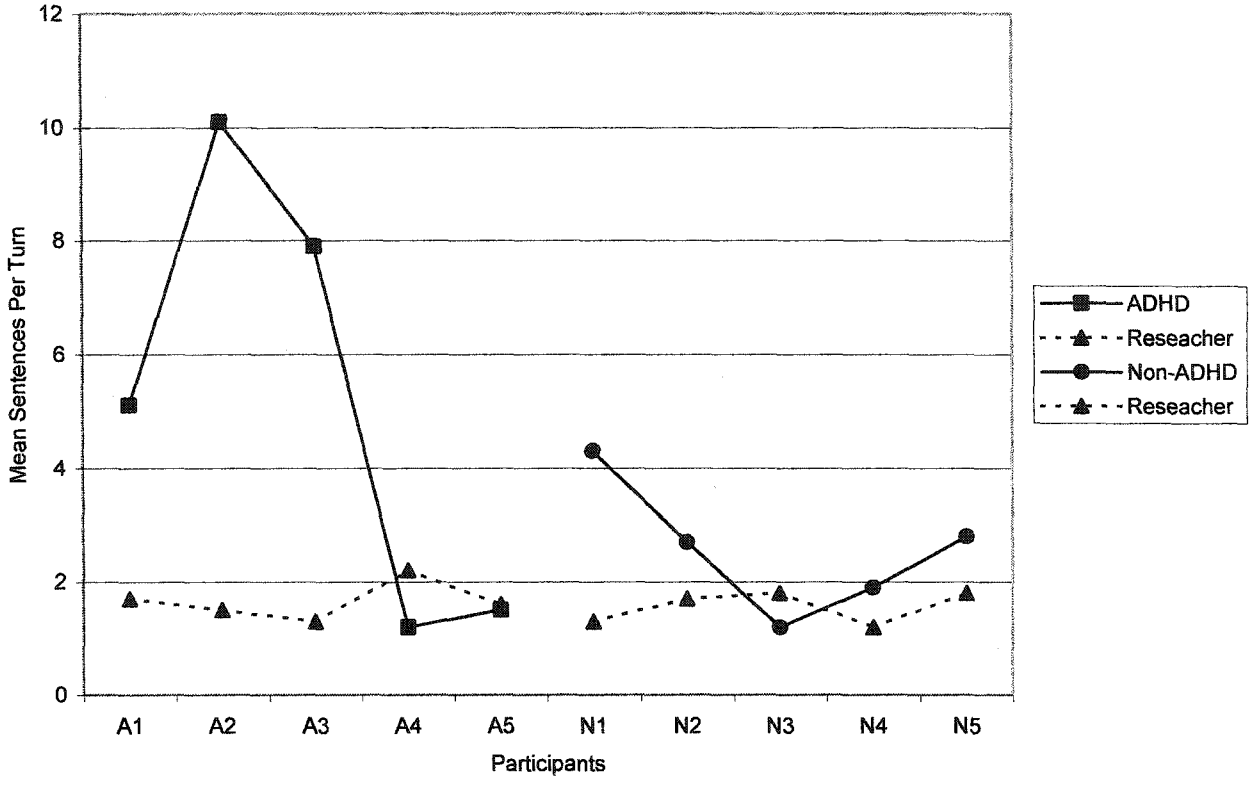

Figure 26. Average number of sentences per turn for participants and the Researcher.

The Researcher maintained a constant average number of sentences per turn for all of the participants. The Non-ADHD group showed more variation in the average number of sentences per turn but within a relatively restricted range (1.2 to 4.3 sentences per turn). However, the ADHD group showed substantial variability ranging from 1.2 to 10.1 sentences per turn. Three of the ADHD participants (A1, A2 and A3) maintained their turn in the conversation longer by uttering a relatively higher number of sentences compared to the other participants.

Turns-at-speaking followed two general patterns. One pattern was the alternating turns in which each speaker took a turn after the other's turn. For example:

Researcher: *Do you think you get extra pieces? [Request for Information – Extend Topic – extra parts in a Lego model]*

N1: *Oh, I think I know why, because if you lose a piece you still have that piece [Response to a Request for Information – Extend Topic]*

Researcher: *Oh [Response to Assertive – Maintain topic]*

N1: *It's a different one. [Statement of Observable Object/Event – Extend Topic]*

Researcher: *Oh, that's a good thing [Statement of Non-Observable Object/Event – Extend Topic]*

Another pattern was a series of utterances produced by one speaker followed by the other speaker's turn. For example:

Researcher: *You can make up stories to go with Lego, I noticed. [Statement of Non-Observable Object/Event – Initiate Topic]*

N1: *Yup. [Response of Assertive – Maintain Topic]*

N1: *Yup, I can. [Statement of Non-Observable Object/Event – Maintain Topic]*

N1: *I'm gonna make it the other thing. [Statement of Observable Object/Event – Initiate Topic – builds a Lego model]*

N1: *I really like Lego. [Statement of Non-Observable Object/Event –Initiate Topic]*

N1: *Really Like Lego. [Imitation – Maintain Topic]*

Researcher: *I really like Lego too. [Statement of Non-Observable Object/Event – Extend Topic]*

In this episode, there are alternating turns for the first two utterances followed by N1 taking four more turns at speaking before the Researcher chose to respond to N1's non-

question utterance. In this episode N1's series of utterances demonstrates a pattern common to self-talk (see Results section on self-talk for more description). Turns-at-speaking, either alternating or one speaker uttering more than one sentence, are given and taken by the speakers. Another form of securing a turn-at-speaking is interrupting.

Interruptions.

Interrupting in a conversation is one way to secure a turn-at-speaking. Of all the Researcher's utterances, the ADHD group interrupted 8.9% of them and the Non-ADHD interrupted 5.8%. Thus, the participants' interruptions were relatively few over the course of the study. However, of all the interruptions made by the participants, the ADHD group interrupted the Researcher 62.5% (n = 183) of the time and the Non-ADHD group interrupted only 37.5% (n = 110).

The analysis also looked at the types of discourse level conversational acts participants used when they did interrupt. Figure 27 shows the percentage of participant interrupts by discourse level conversational acts.

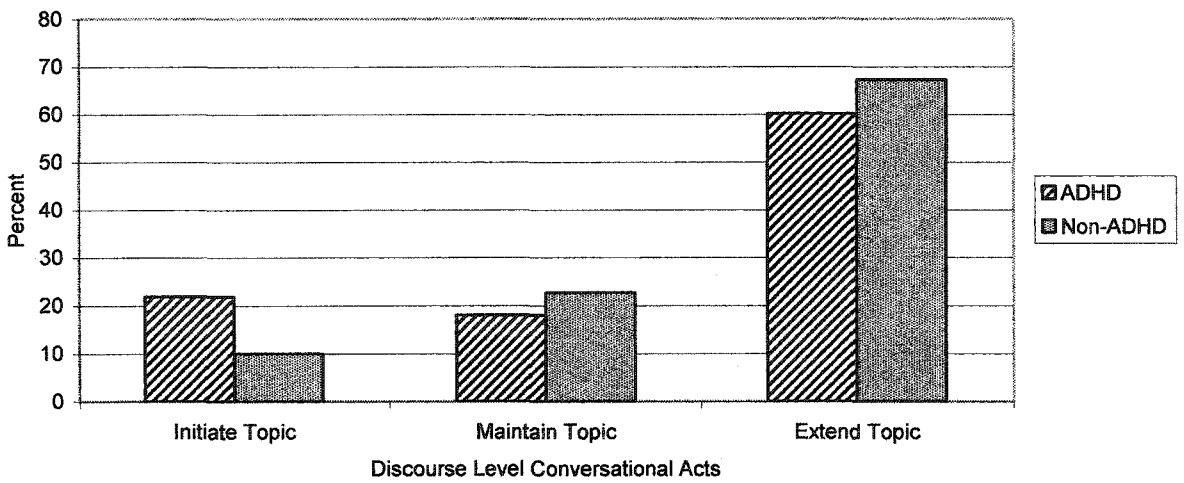

Figure 27. Participant interruptions by discourse level conversational acts.

When the ADHD group interrupted, they did so to initiate a topic twice as much (21.6%, n = 40) as did the Non-ADHD group (10%, n = 11). The Non-ADHD group extended (67.3%, n = 74) and maintained topics (22.7%, n = 25) somewhat more often than did the ADHD group (60.1%, n = 110 and 18%, n = 33 respectively).

When the participants interrupted to initiate, maintain or extend a topic they used different types of conversational acts (see Appendix I for the coding scheme for the conversational acts). Table 21 shows the percentage of conversational acts by group for the three discourse levels. It should be noted that the frequencies in some of the categories are small, which limits percentage comparisons. The percentages given in the table below should be viewed as trends or tendencies within each group and not as measures of absolute differences.

Table 21

Percentage of Interruptions by Discourse Level by Conversational Acts

	ADHD			Non-ADHD	
Initiating Topics	%	N		%	N
ASCO	50	20	ASST	63.6	7
RQIN	22.5	9	ASCO	27.3	3
ASST	22.5	9	RQIN	9.1	1
RQAT	5	2			
Maintaining Topics					
RSAS	42.4	14	RSAS	56.0	14
RSIN	27.3	9	RQCL	16.0	4
ASST	12.1	4	ASST	16.0	4
ASCO	6.1	2	RQAT	4.0	1
RQAT	6.1	2	RQIN	4.0	1
RSCL	3.0	1	ASCO	4.0	1
IMI	3.0	1			
Extending Topics					
ASST	53.6	59	ASST	63.5	47
ASCO	32.7	36	RSIN	16.2	12
RSIN	7.3	8	ASCO	12.2	9
RQIN	5.5	6	RQIN	4.1	3
RQCL	0.9	1	RQCL	2.7	2
			ASDA	1.3	1

When the ADHD group interrupted to initiate topics they tended to make more statements about events/objects that are directly observable than other types of conversational acts and more ASCO statements than did the Non-ADHD group. The Non-ADHD group tended to make more statements about events/objects that are not directly observable and more ASST statements than did the ADHD group.

Within the category of maintaining topics both groups made responses to assertives (RSAS) the most. The ADHD group often interrupted to answer the Research's questions (RSIN) whereas the Non-ADHD interrupted to ask for clarification (RQCL). Both groups made a similar percentage of statements about events/objects not directly observable (ASST) to maintain the topic.

Both groups extended topics the most by making statements about events/objects not directly observable (ASST). The ADHD group made more statements about events/objects that are directly observable (ASCO) than did the Non-ADHD group and the Non-ADHD group interrupted to answer the Researcher's questions (RSIN) more than did the ADHD group.

The following examples illustrate the types of responses and assertives made by the participants. For example, A1 interrupts by making a response to a request for information that maintains a topic (RSIN/MT):

> ***Researcher:*** *So, once you built a Lego model do you use^ do you keep the instructions around at all or do you> [Request for Information – Initiate Topic]*
>
> ***A1:*** *Yeah [Response to Request for Information – Maintain Topic]*

In the following episode, A2 responds to the Researcher's non-question assertive:

Researcher: *But I hadn't seen a Lego that big before it's (ahh) >[Statement of Events/Objects Not Directly Observable – Extend Topic]*

A2: Umhum [Response to Assertive - Maintain Topic]

Researcher: *Like life size [Statement of Events/Objects Not Directly Observable – Extend Topic]*

The next episode illustrates a statement of events/objects not directly observable that extends a topic made by N1:

Researcher: *That's a cool looking model> [Statement of Directly Observable Events/Objects – Extend Topic]*

N1: *Except I'm not done yet [Statement of Events/Objects Not Directly Observable – Extend Topic]*

In the following, A1 interrupts to make a statement of a directly observable event/object that initiates a topic:

Researcher: *I've been in some classrooms they have some teachers have Lego and> [Statement of Events/Objects Not Directly Observable – Extend Topic]*

A4: *Let's see something [Statement of Directly Observable Events/Objects – Initiate Topic]*

In the final example, N4 makes a statement of directly observable events/objects that extends a topic:

Researcher: *Hum, that's weird> [Statement of Events/Objects Not Directly Observable – Maintain Topic]*

N4: *Oh, maybe I'm supposed to do that. [Statement of Events/Objects Directly Observable – Extend Topic]*

Both groups did interrupt to extend the conversational topic, indicating that they were monitoring the conversation and interested in contributing to it. The ADHD group was more than twice as likely to initiate topics through interruptions than the Non-ADHD group, which suggests that, in these cases, they were monitoring something other than the Researcher's utterances and the conversation. These interruptions occurred when the participant was doing something with the Lego model, the instructions, or the advertisements that came with the model, or something in the study room, such as the one-way mirror.

Eye contact.

Eye contact among conversational partners is an important mechanism for exchanging information about the conversation, such as when to take a turn-at-speaking.

Over the entire study session, the ADHD participants made substantially less eye contact with the Researcher than did the Non-ADHD group (see Figure 28).

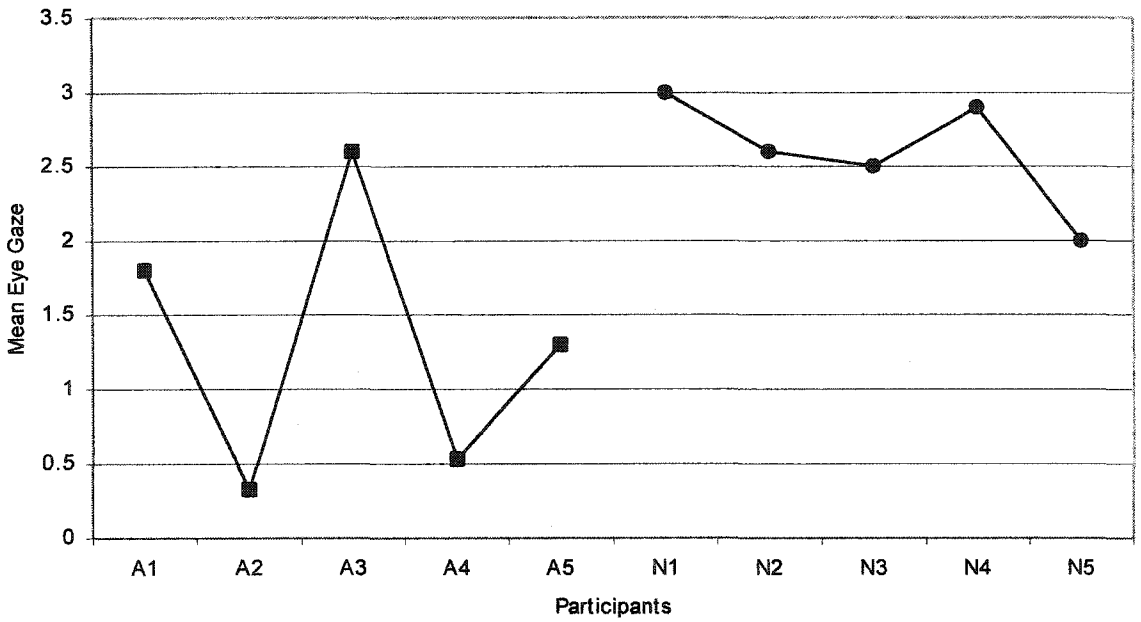

Figure 28. Participants' average eye gaze per minute.

The Non-ADHD participants made nearly twice as many eye-gazes per minute (n = 730) as did the ADHD participants (n = 386). The ADHD group's eye contacts per minute ranged from .33 to 2.6 while the Non-ADHD group ranged from 2.0 to 3.0 eye contacts per minute.

The Non-ADHD group not only made more eye contacts per minute than the ADHD group, they also held their eye contact for longer periods. The ADHD group made intermittent contacts lasting the length of one utterance, whereas the Non-ADHD participants' eye contact would be 3 or 4 utterances in duration. The Non-ADHD participants would also either pause or stop their activity to look at the Researcher, whereas the ADHD group continued their activity while looking or glancing at the Researcher.

The eye gaze of the ADHD participants fell on a variety of objects, such as the model they were building, the Lego instructions, the table, the Researcher's hand's when he was writing, or the one-way mirror.

Listener Context

An important component in communicating effectively is keeping the needs of the listener in mind. This means the speaker must understand the perspective of the listener. They must be able to assume the point of view of their conversational partner. This study considered the extent to which the participants were aware of the need to take the listener's perspective into account regarding the listener's background knowledge.

Listener's background knowledge.

A speaker must provide the listener with background information about the topic so the listener can understand the speaker's utterances. Failure to provide background

information may create confusion and the message may not be transmitted to the listener effectively. Among the indicators of a speaker's ability to take the listener's perspective are the existence of relative clauses, the presence of identifying adjectives, and the use of orienting and transition indicators. Using these indicators to guide the analysis, three patterns in the participant's recognition of the listener context emerged.

The Non-ADHD group tended to use orienting terms and transition indicators to keep the listener informed about the topic or change of topic. For example:

N2: *One time, well, you know I told ya about the birthday I went to.*

Researcher: *Yes.*

In this episode, N2 uses a transition phrase ("*I told ya about the birthday*") to refer the Researcher back to a previous conversation about a birthday party attended by N2 where he received a small Lego model in his treat bag. The transition phrase links the previous utterance to this current one. Another Non-ADHD participant used orienting terms:

N4: *The biggest model is-you know those Insectoids?*

Researcher: *Yes.*

In this episode, N4 uses the term "*you know*" to orient the listener to the next proposition "*Insectoids*" (similar to the terms used by N2 in the episode above). Terms and phrases such as "you know" or "remember when" or "I told ya" inform the listener about the topic. Four of the five Non-ADHD participants used orienting terms and transition indicators to keep the Researcher informed about the topic or a previous topic. Only one ADHD participant used these devices. Following are examples of conversations where ADHD participants did not use orienting terms or transition indicators.

Researcher: *Your brother was doing a job when I was at your house [a previous comment that children don't have jobs reminded the Researcher about A1's brother]*

A1: *Yeah, my Mom hired him.*

A1: *Where...Which colour? [Self-talk]*

A1: *Colour. Red. Blue. [Self-talk]*

A1: *My brother isn't home right now. He's at somebody's house.*

Researcher: *Oh, he is, is he? Wow.*

Researcher: *Going over for a play?*

A1: *No, he went over last night.*

Researcher: *Oh.*

A1: *After school biked over there and, um, spent the night.*

Researcher: *A sleep-over, well that's>*

A1: *They do that all the time even in the tree fort.*

Researcher: *You have a tree fort?*

A1: *Nods his head up and down indicating yes.*

A1 introduces the topic that his brother isn't home without any warning to the listener that a new topic is being introduced. The Researcher responds with a non-committal response ("*oh, he is, is he*") and requests more information. A1 provides the requested information but again without any additional background information for the listener. The listener is left to infer that as his brother went over last night (the listener infers it's a sleep-over) then, perhaps, he biked over yesterday after school although A1 doesn't

explicitly provide this information. The topic of a tree fort surprizes the listener who responded with a statement/question "*You have a tree fort?*" to which A1 nods in affirmation. In this episode, the lack of orienting terms and transition indicators by A1 means the Researcher, as the listener, must do much of the work to fill in the background information in order to understand what A1 is talking about.

Another episode with A3 reveals a similar pattern:

A3: *I thought it's supposed to have two [A3 is looking at Lego box]*

Researcher: *Two what? [Researcher is asking for background information]*

A3: *This is weird, oh, now look on the back [A3 turns Lego box over]*

Researcher: *What does that tell us? [Requesting information]*

A3: *That's half of it. [A3 looks at Lego box]*

Researcher: *Oh.*

In this episode A3 makes statements without providing the Researcher enough background information so the Researcher is able to understand the topic. The Researcher responds by asking questions to clarify A3's topic. It was not clear exactly what A3 was talking about in this episode and the next utterance introduced a new topic. In this episode, the listener was unable to gather or infer enough background information to make A3's comments understandable.

Another pattern emerges in the use of relative clauses to orient the listener to a particular referent. Again, the Non-ADHD group tended to use relative clauses generally to inform the listener while the ADHD group tended to introduce topics without the use of relative clauses. For example:

Researcher: *Do you get frustrated sometimes? [Topic – N5's previous Lego building experiences where Lego pieces fall off]*

N5: *Umhum, there's this really big one that I just finished and [Person's Name] accidently tripped on it.*

Researcher: *That musta been difficult for you and for [Person's Name]*

In this episode, N5 uses the relative clause "*that I just finished*" to provide the listener with background information about the Lego model and its relationship to N5 and the person who stepped on it. In the following episode A2 does not provide such background information:

A2: *The other kids are playing too rough with it so [Person's Name] had to take it away.*

A2 does not provide a relative clause informing the listener who [Person's name] is. The listener must infer from previous utterances that [Peron's name] is A2's teacher. Similarly, A3 brings introduces a person's name without any background information.

A3: *and then there's a tr^ then there's a triangle thing that's it would hook on to things from one one from two of these fr^ [A3 is describing his Lego model]*

A3: *[Person's name] has that piece.*

Again, A3 does not provide the listener with any information about who [Person's name] is. Later in the session, the listener was able to infer from A3's comments that [Person's name] was actually A3's brother.

Another pattern regarding the listener's background knowledge was the use of deictic terms, such as "*here*", "*there*", "*this*", "*that*", and "*it*". Both groups use deictic terms. The ADHD group tends to use deictic terms in conjunction with hand motions and

demonstrations, while the Non-ADHD group also uses semantic referents such as nouns. For example:

> ***Researcher:*** *Anything else? [A2 is packing up his Lego model at the end of the session]*
>
> ***A2:*** *I don't need anything.*
>
> ***A2:*** *And I don't want this. [A2 points to the Lego advertisement papers]*
>
> ***A2:*** *I only want this one [A2 points to the Lego instructions]*
>
> ***Researcher:*** *Okay.*

A2 uses the deictic term "*this*" in conjunction with pointing to the objects, thus substituting the noun for a hand gesture. The next example illustrates an extreme case of using deictic terms without an accompanying semantic referent:

> ***A4:*** *They just kinda go like that then like that then kinda like that [A4 is describing how he put together his Lego model while drawing the Lego parts in the air with his finger.]*
>
> ***Researcher:*** *So, I'll just draw a picture that goes like that and that.*

A4's description of the Lego parts makes use of deictic term "*that*" but without an accompanying noun referent. While A4's description makes sense in the immediate context, when time passes and the context changes, his description is more difficult to understand. This pattern of linking the object being referred to with a deictic term in conjunction with pointing to objects and demonstrating with the actual object is common for the ADHD group. The Non-ADHD group, while also employing this pattern, tends to use nouns more often as a referent. For example:

N1: *We have a special tool for getting Lego pieces off. [N1 responds to the Researcher's comment regarding Lego pieces that stick together and are hard to separate]*

Researcher: *Oh, yes, there's a good idea.*

N1: *But I can't find it anymore.*

N1 uses the deictic term "*it*" to refer to the Lego tool in his previous utterance. In this case, the noun "*special tool*" is the semantic referent for the later deictic reference. Similarly, N3 states:

N3: *I know a band called Bad Hair Day. [The Researcher just commented that N3's Lego figure, whose hair just fell off, was having a bad hair day]*

Researcher: *Oh, yeah?*

N3: *Yeah, well it's not a real band.*

Researcher: *Oh, yeah?*

N3: *A kid's band with a music teacher and they play together in it.*

The word "*it*" in N3's last utterance is linked to the noun "*band*" in that utterance and N3's previous utterances. It is easy for the listener to follow the referential thread linking the word *band* to the deictic term *it*.

The Non-ADHD group tended to use more linguistic forms to take into account the listener's perspective than did the ADHD group. Through the use of orienting terms and transition indicators and relative clauses, the Non-ADHD group provided information necessary for the listener to understand the topic and monitor the conversation. While some of the ADHD group did use these forms occasionally, there was a tendency for this group to introduce topics or people without accompanying

background information. The listener had to seek further information and clarification from the participant to infer the relationships and understand the interaction. The ADHD group tended to substitute pointing gestures and demonstrations with objects for nouns in order to link their deictic terms to the object. The Non-ADHD group, while employing this technique, also used nouns to make the connection between the object and the deictic term. This provided the listener with a semantic links that helped him monitor the interaction. Overall, the Non-ADHD group was more effective in providing the listener with necessary background information.

Summary of Conversational Interaction

All participants demonstrated appropriate levels of conversational assertiveness across all phases of the study. All participants responded to most of the Researcher's questions but the ADHD group had a higher rate of null responses. Both groups appeared willing to respond to the Researcher's non-question utterances. Both groups expressed semantically contingent utterances in which Researcher initiated topics were maintained and/or extended by subsequent participant responses and/or participant initiated topics were maintained and/or extended by the Researcher. The ADHD group showed more variability in the mean number of sentences per turn than did the Non-ADHD group. Taking-turns-at-speaking tended to alternate between the participant and the Researcher or one conversational partner took two or more turns before the other spoke. While all participants interrupted the Researcher, the ADHD group did so more often and did so to initiate topics and to make statements about event/objects that either initiated a topic or extended a topic. The ADHD group tended to use orienting terms and transition indicators to take the listener context into account less than the Non-ADHD group. They

also used relative clauses less than the Non-ADHD group to orient the listener to a particular referent. The ADHD group used deictic terms in conjunction with hand motions and demonstrations with the referent object while the Non-ADHD also used nouns to link the deictic terms to the referent.

Summary of Sociolinguistic Competency

Sociolinguistic competency examines the ways in which communicative functions are appropriate within a given sociocultural context. Two aspects were examined: the influence of the situational context and the conversational interaction. Overall, the ADHD group's interactions with the Researcher appeared to be more context-bound than those of the Non-ADHD group; semantic links to the context (e.g., nouns) were replaced by physical behaviours such as pointing. While the sociolinguistic competency of the ADHD group appeared to be appropriate for this study context, the Non-ADHD group demonstrated less difficulty moving beyond the physical constraints of the study context to make more abstract statements and connections that extended the conversation.

The ADHD group appeared to depend on the physical, situational context to structure their utterances more than did the Non-ADHD group. The ADHD group made more statements regarding events/objects that were directly observable in the study context than did the Non-ADHD group. The topics the ADHD group chose to talk about tended to be based more on their past experiences than did those of the Non-ADHD group. Those topics appeared to be psychologically closer, and more concrete, to the participants, while the Non-ADHD group talked about topics that were psychologically distant and more abstract.

Within the conversational interaction, both groups showed levels of conversational assertiveness appropriate to the different situations in the study. While both groups responded to the Researcher's questions, the Non-ADHD group showed slightly higher and more consistent levels of responding, while the ADHD group showed higher levels of null responses. The ADHD group also showed more variability in their responses to the Researcher's non-question utterances. Both groups made semantically contingent responses by maintaining and extending topics. The ADHD group showed more variability in the number of sentences per turn and uttered more sentences than did the Non-ADHD group, indicating that some ADHD participants took longer turns-at-speaking. The ADHD group interrupted the Researcher more than the Non-ADHD group and when they interrupted they made more statements regarding events/objects directly observable in the study context that initiated and extended topics. The Non-ADHD group showed higher levels of eye gaze than the ADHD group, indicating they had more opportunity to exchange non-verbal information with the Researcher and observe cues for turn-taking. The Non-ADHD group took the listener's point of view into account in their conversations with the Researcher more frequently than did the ADHD group. The Non-ADHD group used orienting terms, transition indicators and relative clauses to keep the listener oriented and informed about the topic. The ADHD group depended on deictic terms in conjunction with hand motions and demonstrations with the referent object to maintain the connection between their utterances and the referent but they often did not use nouns. The Non-ADHD group, who also used hand motions consistently, used nouns as a lexical referent.

Discourse Competency

Discourse competency is the ability to connect grammatical forms and meanings into a meaningful, unified text. This study looked at participants' topic management as a necessary prerequisite for the construction of a coherent conversation. Following Mentis (1994), two aspects of topic management were examined: topic introduction and topic maintenance. Under the rubric of topic introduction, the following parameters were analyzed: (a) identification of topic management components including the number of topics/subtopics introduced, the manner of topic/subtopic introduction including topic changes, shifts and inappropriate tangential shifts, and the type of topic/subtopic introduced including new topics, and the content and (b) the contribution of linguistic factors such as adverbial conjuncts, discourse particles, questions, relative clauses and conjunctions.

Topic maintenance is examined following a similar framework: (a) identification of the components of topic management including the length of topic/subtopic sequence, type of topic maintenance, such as adding new information (or extending topic/subtopic) and no new information (or maintaining the topic/subtopic) and (b) the contribution of linguistic factors such as pronouns, comparative adjectives, determiners, ellipsis, conjunctions and verb tensing.

The analysis also examines the contribution of cognitive factors, such as general world knowledge and underlying organizational knowledge structures, such as scripts and schemas, to the introduction and maintenance of topics/subtopics.

The analysis first presents descriptive profiles for topic introduction and topic maintenance, followed by a detailed examination of the relative contributions of

linguistic and cognitive factors in a sample of participants from both groups that illustrated topic introduction and maintenance.

Participant Topic Management: Topic Introduction

The introduction of a topic needs to be done so that the topic is clear to the listener and maintains the coherence of the discourse. The ADHD group introduced more topics (n = 395) than did the Non-ADHD group (n = 261). Figure 29 shows the manner of topic introduction by the type of conversational acts used (see Appendix K, Table K7 for frequencies).

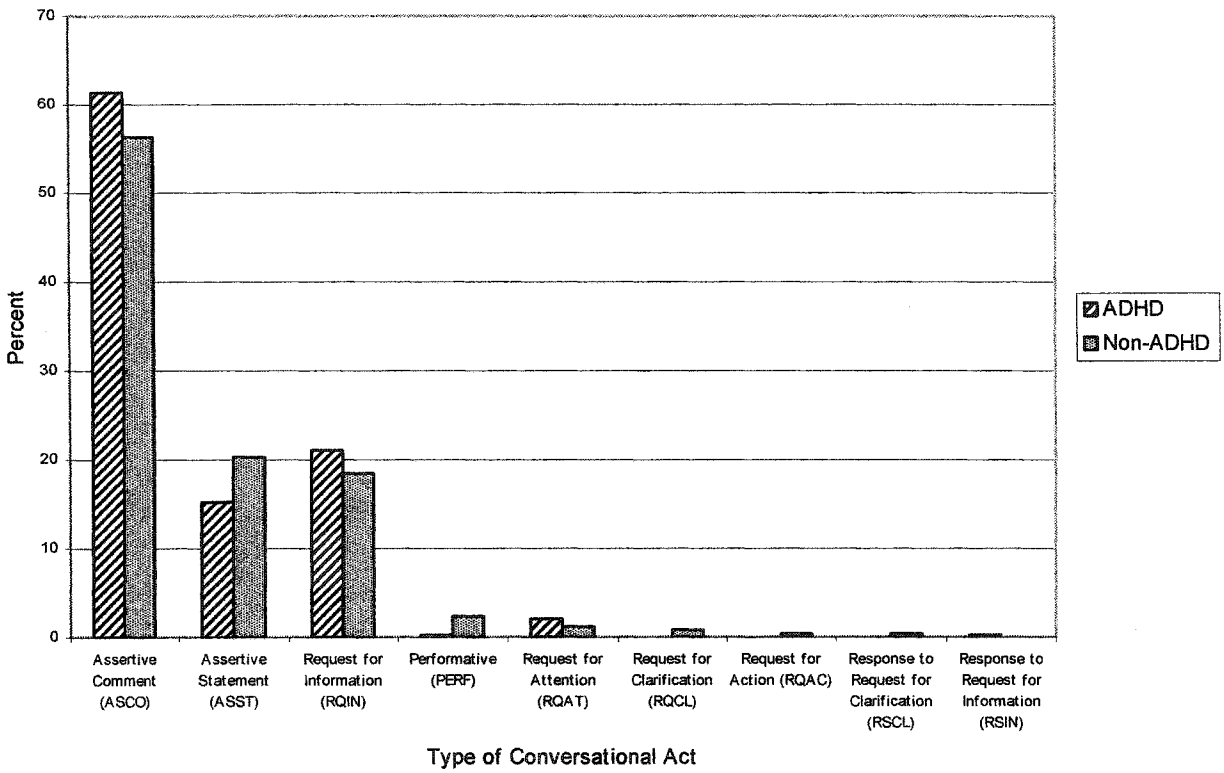

Figure 29. Percent of introduction of topic by type of Conversational Act.

Overall, there were some differences in the types and frequencies of conversational acts used. The ADHD group used 6 types of conversational acts to introduce topics whereas

the Non-ADHD group used 8 types. The ADHD group introduced topics most frequently by making statements of directly observable events/objects (ASCO), followed by requests for information (RQIN), statements of events/objects not directly observable (ASST), requests for attention (RQAT), performatives (PERF) such as warnings and a response to a request for information (RSIN). The Non-ADHD group, similar to the ADHD group, most often made statements of directly observable events/objects (ASCO), followed by statements of events/objects not directly observable (ASST), requests for information (RQIN), performatives (PERF) such as warnings ("*look out!*"), requests for attention (RQAT), requests for clarification (RQCL), requests for action (RQAC), and a response to a request for clarification (RSCL).

The ADHD group made more statements of directly observable events/objects (ASCO) than did the Non-ADHD group while the Non-ADHD group made more statements of events/objects not directly observable (ASST) than did the ADHD group. The ADHD group also made more requests for information (RQIN) did than the Non-ADHD group while the Non-ADHD group made more performatives (PERF).

Participant Topic Management: Topic Maintenance

Topic maintenance involves the production of utterances that are related to the topic under discussion and their contribution to the propositional development of the current topic. Successful topic maintenance requires participants to produce contingent responses and to structure and organize new and old topic-related information across an extended sequence of discourse. Topic maintenance is related to the concepts of local and global coherence. Local coherence refers to the logical connections that exist between two consecutive propositional utterances. The utterances are related if they share

common arguments. This suggests that each utterance should be related to the content of the previous utterance. Mentis (1994) defines global coherence as the "overall semantic connectedness of the discourse and the relevance of each utterance to the topic under discussion" (p. 34). Effective topic maintenance requires that the discourse be both locally and globally coherent.

An important parameter in topic maintenance is the type of information each utterance contributes to the conversation. Each of the participant's utterances were coded for three types of conversational acts: (a) utterances that were related to a prior utterance and that fulfilled the speaker's obligation to respond but did not add new, unsolicited information (i.e., maintain topic), (b) utterances that are related to a prior utterance and that extend the established topic by adding new semantic details or link appropriately to some related topic and (c) utterances that were related tangentially to some aspect of a prior utterance but did not seem to extend the topic adequately enough to continue the topic.

Under topic maintenance both groups most frequently extended topics (ET) followed by maintaining topics (MT). Figure 30 shows the percent of participants' utterances that contributed to topic maintenance by extending the topic reported by the type of conversational act (see Appendix K, Table K8 for frequencies).

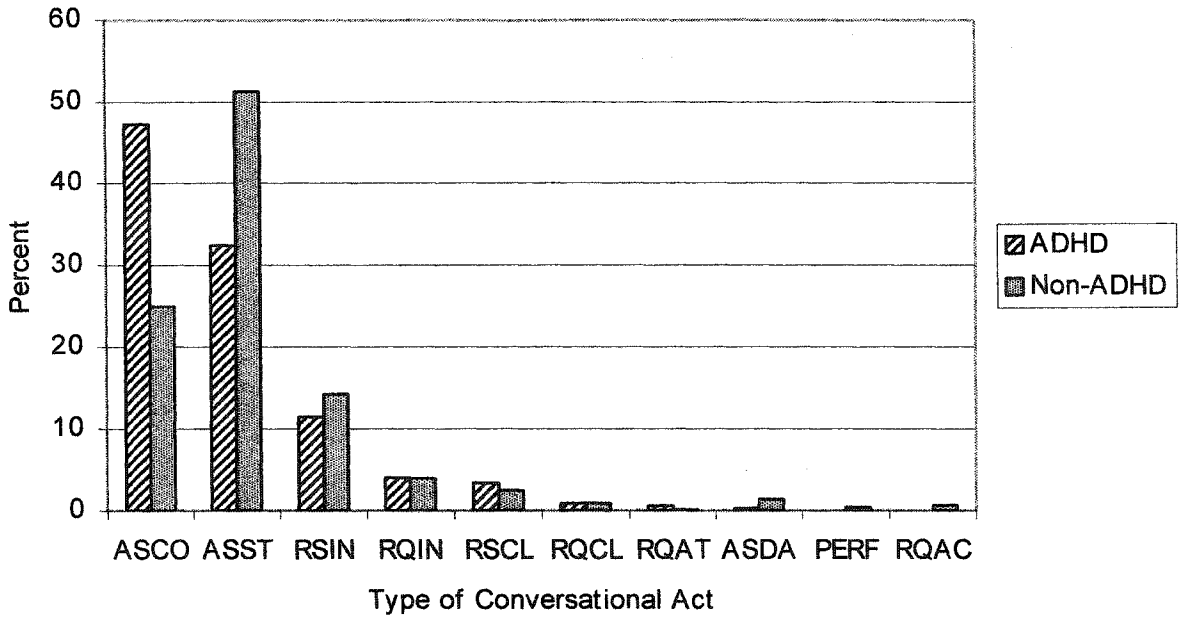

Figure 30. Percent of extending topic by type of conversational acts.

Substantial differences between the two groups were observed. The ADHD group extended topics by using statements of directly observable events/objects (ASCO), followed by statements of events/objects not directly observable (ASST), responses to requests for information (RSIN), requests for information (RQIN), responses to requests for clarification (RSCL), requests for attention (RQAT) and assertives of disagreement (ASDA). The ADHD group used twice as many ASCO statements as did the Non-ADHD group. The Non-ADHD group used ASST statements almost one-third more frequently than did the ADHD group. For the remaining conversational acts, both groups were approximately equivalent.

Both groups also maintained the topic by responding to previous utterances but did not add new information. Figure 31 shows the percent of maintaining the topic by type of conversational acts (see Appendix K, Table K9 for frequencies).

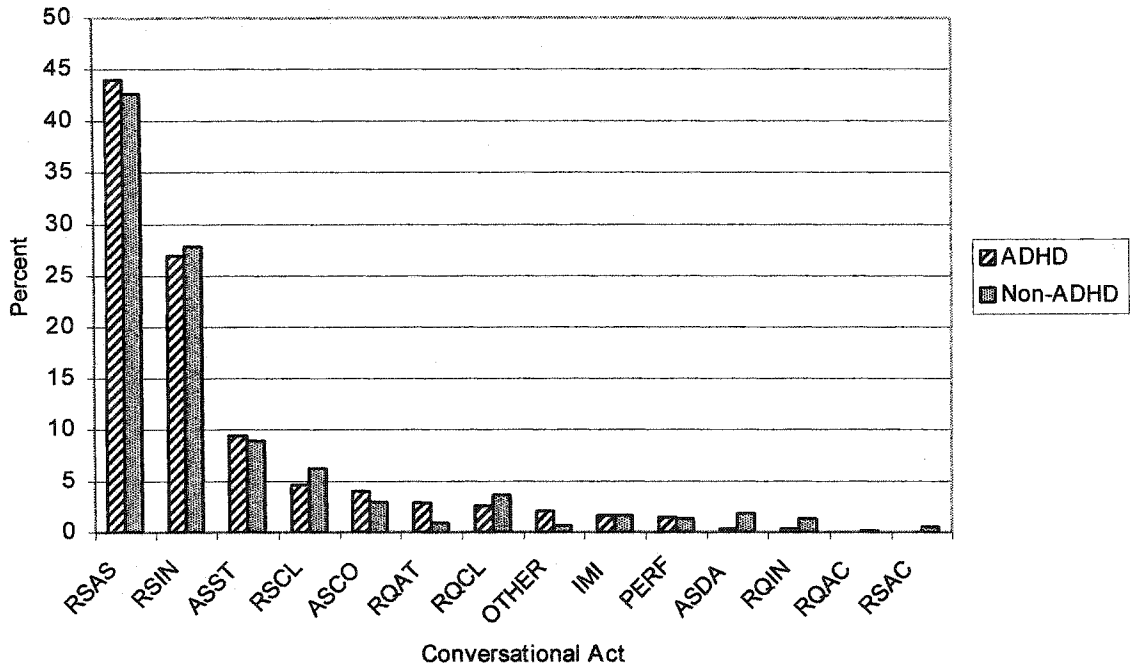

Figure 31. Percent of maintaining topic by conversational acts.

All participants responded similarly when maintaining a topic. They met their conversational obligations by maintaining topics through responses to assertives (RSAS), responses to requests for information (RSIN), statements of event/objects not directly observable (ASST), responses to requests for clarification (RSCL), statements of events/objects that were directly observable (ASCO), requests for attention (RQAT) and requests for clarification (RQCL). The ADHD participants had a slightly higher percentage of "Other" maintaining responses in the form of sounds such as "*dobie-dobie-dobie*" and "*oink-oink-oink*" that added no new information but provided some continuity to the topic. Overall, the participants were very similar in their use of these conversational acts.

Overall, the participants demonstrated their abilities for topic introduction and maintenance. There were, however, differences in the ways in which participants

managed the topics. The following samples illustrate typical techniques that two participants used for topic introduction and maintenance.

The Building Phase was selected as the sample phase because this was the longest phase for all participants (approximately 30 minutes) and, consequently, the one with the most topics. The number of topics indicates the extent to which one conversational partner is managing the conversation. The length of the topic sequence provides an indication of the flow of a conversation. Conversations with longer topic sequences tend to flow more smoothly than conversations with many topics of short duration. Mentis (1994) points out that the longest topic sequence maintained is a better measure of topic length than mean topic length. The reason is that a conversation requires the interaction between at least two people who bring to a topic their interests, goals and motives. It is expected, therefore, that only certain topics will be maintained over extended sequences. The longest topic sequence provides an indication of the nature of each speaker's contribution to the topic. Figure 32 shows the longest topic sequence for all participants during the Building Phase.

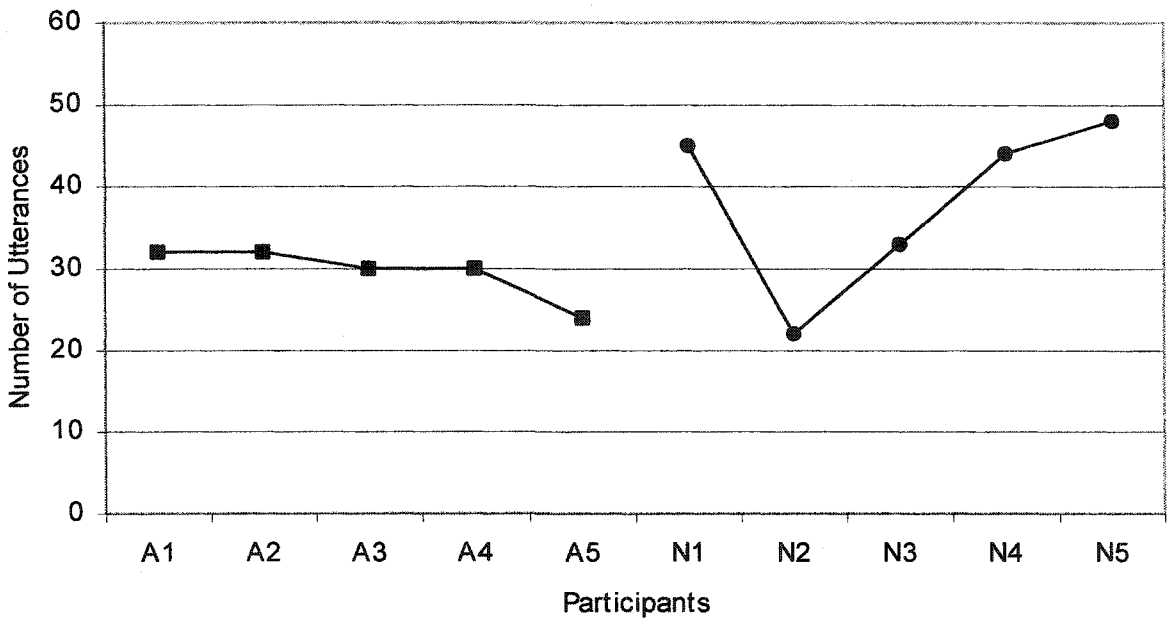

Figure 32. The number of utterances in the longest topic sequence during the Building Phase.

The ADHD group maintained shorter topic sequences than did the Non-ADHD group. The ADHD group produced an average of 29.6 utterances to maintain their topics, while the Non-ADHD group produced an average of 38.4 utterances.

The longest topic sequences for participants A3 and N3 are examined in detail to illustrate the relative contributions of the Researcher and A3 and the Researcher and N3 to maintain the topic. A3 and N3 were selected because they are similar in age (A3 is 8 years old and N3 is 8 years 1 month old) and had topic sequences of similar length (A3 maintained a 30 utterance topic sequence and N3 maintained a 33 utterance topic sequence). The detailed analysis also shows the manner in which A3 and N3 used different techniques, typical of other members in their group, for topic introduction and maintenance.

In the following topic sequence, the Researcher placed the Lego model on the table and A3 had just begun to open the Lego box.

A3: I [↑] know some Pokemon names. [Statement of Events/Objects Not Directly Observable – Initiate Topic – A3 turns his body toward the Researcher and looks at the Researcher; he stops opening the Lego box]

Researcher: *Oh? Like what? Which Pokemon? [Request for Information – Extend Topic]*

In this episode, A3 introduces a new topic by turning his body toward the Researcher and looking at him while emphasizing the word "I" at the beginning of his first utterance. He does not, however, provide to the listener any syntactic forms indicating a transition to a new topic such as "Oh, by the way", or "You know what?" The topic of Pokemon is unexpected by the Researcher as indicated by his initial response "*Oh?*" and he seeks more information by questioning A3 ("*Like what? Which Pokemon?*"), thereby extending the topic. The Researcher's initial surprize and subsequent questions occur very quickly, in just over one second. The speed of the Researcher's shift to the new topic reveals the local and global coherence between A3's utterance and the Researcher's response. The two consecutive utterances are locally coherent because they share common propositions. The common proposition is each partner's background knowledge of the topic. A3's utterance reveals his knowledge of Pokemon and something about his past experiences with Pokemon. The Researcher's response also reveals his knowledge of Pokemon. He is familiar with the term "Pokemon" so he does not need to ask A3 to define "Pokemon". Pokemon is a children's cartoon created in Japan depicting the adventures of a group of young people who acquire and train their mythical figures called "Pokemon". Each

Pokemon character has a unique name and special set of abilities (e.g., propel fire or water at an opposing Pokemon). In each cartoon episode, the main characters' Pokemon do battle with an opposing gang of evil characters' Pokemon. It is a classic tale of good versus evil. A3's utterance assumes a shared knowledge of Pokemon without first determining a basis for shared Pokemon knowledge. Prior to this topic sequence, Pokemon had not been a basis for conversation between A3 and the Researcher. The Researcher's younger son was, at the time of this study, a Pokemon enthusiast so the Researcher did have general background knowledge about Pokemon. The local coherence between A3's and the Researcher's utterances depended upon the relevance of their utterances to their global knowledge of the topic. Thus, the two utterances are semantically contingent because a common background knowledge exists that creates a globally coherent discourse for the first two utterances. The topic sequence continues as A3 responds to the Researcher's question.

A3: *Ahh-dish, Pick-A-Chew, and Pick-An-Rye-Chew ... [Response to Request for Information – Extend Topic – A3 glances toward the ceiling]*

Researcher: *And ... [Statement of Events/Objects Not Directly Observable – Maintain Topic]*

A3: *And. [Imitation – Maintain Topic]*

Researcher: *Are you a Pokemon collector? [Request for Information – Extend Topic]*

A3: *I-I'm learnin' the names. [Response to Request for Information – Extend Topic Tangential]*

Researcher: *Oh, good. [Statement of Events/Objects Not Directly Observable – Maintain Topic]*

As A3 recalls the Pokemon names, he glances up at the ceiling as an apparent aid to help him recall long-term memory. The pause after "*Pick-An-Rye-Chew*" allows an opportunity for the Researcher to interject a conjunction ("*and*") to facilitate A3's recall and also maintain the topic. In this episode, the names of the Pokemon characters A3 recalled were not commented upon by the Researcher. He accepted A3's knowledge of Pokemon. That is, given the Researcher's general background knowledge of Pokemon, there was no reason to challenge or comment on the names given by A3. However, subsequent research into the Pokemon characters revealed that A3 pronounced the names phonetically and confused some of the sounds. Where A3 said "*Ahh-dish*", "*Pick-A-Chew*" and "*Pick-An-Rye-Chew*" the actual spelling of the names are "Oddish", "Pikachu" and "Raichu". While it may be that the names have a Japanese origin and thus contain phonetic blends unfamiliar to A3, or A3's pronunciation of the names reveal a dialect unique to A3, other Pokemon names he provides later in this topic sequence, such as "*Ticklet*", are not only phonetically inaccurate, but the entire name is inaccurate. Thus, A3 demonstrates his global knowledge of Pokemon that, upon further research, is shown to be inconsistent with the manufacturer's description of the same character. Similarly, other explanations provided by A3 are inconsistent with the scientific evidence. It may be that the information A3 learns undergoes a transformation between the source of the information and A3's recall and retelling of that information, or perhaps he learned the information incorrectly from the outset.

In the topic sequence, described above, the Researcher's pause after his first utterance allows A3 the opportunity to imitate the Researcher's utterance, thereby claiming his turn and maintaining the topic. However, he is unable to recall another Pokemon name and the Researcher, in his second utterance, extends the topic by asking A3 another question. The Researcher's question is related to A3's first utterance by the underlying proposition that A3 has had experiences with Pokemon, otherwise he would not know any Pokemon names, and the Researcher's own background knowledge that Pokemon is not just a cartoon but comes with a large variety of commercial products such as Pokemon cards and figures. The Researcher's question creates local and global coherence by linking the implicit proposition in A3's first utterance with the names specified in A3's second utterances and the Researcher's background knowledge about the Pokemon phenomenon. A3's response to the Researcher's question ("*Are you a Pokemon collector?*") while extending the topic does not extend the topic adequately enough to maintain the topic but tangentially. A3's response makes explicit what had previously been implicit. That is, to know Pokemon names, one must learn them and learning Pokemon names is not the same as collecting Pokemon figures or cards. A3 does not directly answer the Researcher's question but provides a re-statement of an implicit proposition. A "yes/no" response would suffice to answer the question. The Researcher responds to A3 with a positive affirmation that supports A3's efforts to learn the names. A3 extends the topic by recalling more Pokemon names.

A3: *There's Tangler. [Statement of Events/Objects Not Directly Observable – Extend Topic – A3 chuckles when he says 'Tangler' and looks at Researcher]*

Researcher: *Yeah. [Response to Assertive – Maintain Topic]*

A3: *It's a octa-pus squid-is all^ of-all of his squid things. [Statement of Events/Objects Not Directly Observable – Extend Topic – A3 motions with his hands to demonstrate the 'squid things']*

Researcher: *Yeah [Response to Assertive – Maintain Topic]*

A3: *His -its been tangled up that's why they call it Tangler. [Statement of Events/Objects Not Directly Observable – Extend Topic – looks at Researcher]*

A3 re-directs the topic back to the Pokemon names by continuing to name Pokemon. He identifies "*Tangler*" as one Pokemon character when the actual name is "Tangela". In A3's next utterance he attempts to describe "*Tangler/Tangela*". His explanation is ambiguous and confusing. He uses an inappropriate article "*a*" before "*octa-pus*" which makes the vowel blend of /a/ and /o/ sound awkward. Using "octopus" and "squid" consecutively seems to suggest some confusion as to whether "*Tangler/Tangela*" is an octopus (a cephalopod with eight arms) or a squid (a cephalopod with 10 arms). The picture of "Tangela" shows it to be a small, round figure with purple octopus-like arms. A3's apparent confusion about the description of "Tangela" may accurately reflect the ambiguous nature of the Pokemon figure. A3 abandons his initial description and re-starts with "*of all his squid things*". In this section of the utterance, A3 has apparently decided that "*Tangler*" is more squid-like than octopus-like. He does not specify what "*squid things*" are and leaves it to the listener to infer a definition. A3 accompanies his description with hand motions to help identify the nature of the "*squid things*". The Researcher acknowledges A3's description with a simple "*yeah*" that maintains the topic

and shows A3 that the Researcher is listening to him. A3 continues his description and immediately re-starts his utterance by changing "*his*" to "*its*" which more appropriately reflects the ambiguous gender of the Pokemon character. A3 provides some insight into the process underlying inconsistencies in his Pokemon knowledge. The name "*Tangler*" reflects an action on the part of the Pokemon character, namely being "*tangled up*". This suggests that the names A3 remembers may be based on some specific function or action of the character. So, "*Tangler*" gets its name from A3 based on the twisted mass of octopus-like arms covering its body and those arms intertwine into an amorphous mass. The name "Tangela" however, does not imply a tangled mass and it is more difficult to remember this name than one based on a special feature unique to that Pokemon figure.

Researcher: *Oh, I didn't thin^ I didn't know that. [Statement of Events/Objects Not Directly Observable – Extend Topic]*

Researcher: *I just thought they picked these names just outta of someone's imagination or something. [Statement of Events/Objects Not Directly Observable – Extend Topic]*

A3: *Nope. [Statement of Events/Objects Not Directly Observable – Extend Topic]*

Researcher: *No? [Request for Clarification – Maintain Topic]*

A3: *There's Ticklet. [Statement of Events/Objects Not Directly Observable – Extend Topic]*

Researcher: *Umhum. [Response to Assertive – Maintain Topic – the Researcher says 'umhum' with rising and falling intonation expressing an affirmative response]*

A3: *Ahh, there's. [Statement of Events/Objects Not Directly Observable – Maintain Topic – A3 looks down to the Lego box he is holding on his lap and continues to open the box]*

A3: *There is. [Statement of Events/Objects Not Directly Observable – Maintain Topic]*

A3: *Ah – Ahh-dish. [Statement of Events/Objects Not Directly Observable – Maintain Topic]*

Researcher: *Ahh-dish. [Imitation – Maintain Topic]*

A3: *Ahh, there is. Umm... [Statement of Events/Objects Not Directly Observable – Maintain Topic]*

The Researcher responds to A3's description of "*Tangler*" with confirmation that A3 is the source of Pokemon knowledge and reveals the limitations of his own Pokemon knowledge (i.e., "*I didn't know that*"). The Researcher abandons his utterance and re-states his main proposition. The Researcher expresses A3's implicit proposition that Pokemon names are related to some action they perform. He extends the topic beyond specific Pokemon names to include another topic indicated by the pronoun "they". The Researcher does not specify a noun for "*they*" and leaves A3 to infer possible nouns such as "the Pokemon people" or "the Pokemon manufacturer". The proposition regarding the selection of Pokemon names remains unexplored as A3 responds to the Researcher's assertive with a negative to which the Researcher seeks clarification ("*no?*") and A3 re-directs the interaction back to the topic of Pokemon names ("*there's Tickle*t"). This name is another one that appears inconsistent with the manufacturer's description of the Pokemon characters. There is no "*Tickle*t" in the Pokemon collection. There is a

character named "Diglet". It may be that A3 is confusing the /t/ and /d/ sounds as both are prevocalic plosive alveolar consonants. This is another example in which A3 consistently demonstrates discrepancies between his expressed knowledge and the source information. The Researcher's responds to A3 with a general acknowledgement that serves to maintain the topic. A3's next three utterances maintain the topic while serving as markers to secure his turn-at-speaking. He repeats the name "*Ahh-dish*" that functions, again, as a discourse marker indicating that he is still thinking about names and keeps his turn-at-speaking. The Researcher imitates the name "*Ahh-dish*" indicating he is listening and maintains the topic. A3's last utterance in this episode maintains the topic and repeats his use of discourse markers such as "*ahh*" and "*umm*".

Researcher: *I know one- Bulbasaur. [Statement of Events/Objects Not Directly Observable – Extend Topic – A3 looks at Researcher]*

A3: *Umm, yeah, and Charlmander. [Statement of Events/Objects Not Directly Observable – Extend Topic – A3 looks at Researcher]*

Researcher: *Charmander, I heard-heard that^- I've heard that one before. [Statement of Events/Objects Not Directly Observable – Extend Topic]*

A3: *And Squirtle [Statement of Events/Objects Not Directly Observable – Extend Topic – looks at the Researcher while continuing to open the Lego box]*

Researcher: *Yeah. [Response to Assertive – Maintain Topic]*

A3: *That's splashes Pokemon that he usually uses [Statement of Events/Objects Not Directly Observable – Extend Topic – Researcher laughs]*

The Researcher ends A3's discourse markers with his own ("*I know one*") which informs A3 that the Researcher's next utterance will be a name and secures A3's attention (A3

looks at the Researcher when he says "*I know one*"). The topic has been extended to include another Pokemon character to which A3 responds with another character ("*Charlmander*"). The Researcher transforms A3's pronunciation by removing the /l/ and repeating the name "*Charmander*" which is consistent with the manufacturer's description. The Researcher's transformation of "*Charlmander*" to "*Charmander*" is based on his previous knowledge of Pokemon ("*I've heard that one before*"). The Researcher makes two false starts before he completes his utterance. A3 further extends the topic by naming "*Squirtle*". For this Pokemon, A3 appropriately pronounces the same name used by the manufacturer. Similar to his description of "*Tangler*", A3 provides a confusing and ambiguous description of "*Squirtle*". He does not provide any referents (lexical or physical) for "*that*" and "*that's*". It is not clear from A3's utterance what he is talking about. The listener must infer that "*Squirtle*" has something to do with splashing and therefore water is involved. The listener must also deduce that Pokemon characters have special abilities and water may be the feature that defines the actions "*Squirtle*" typically employs when facing an opponent. The conclusion might be inferred that "*Squirtle*" would regularly use water against other Pokemon opponents ("*that splashes Pokemon that he usually uses*"). This conclusion is not at all clear from A3's utterance.

In the topic sequence described above, A3 introduces a new topic without transitional markers. The topic reflects his personal interest and experiences. Even though the topic sequence concerns events/objects that are not directly observable in the study room, the topic is psychologically close to A3. The local coherence of the utterances are semantically contingent because they reflect the global knowledge of the topic by A3 and the Researcher. A3's global knowledge of Pokemon names, however, appears

inconsistent with information about Pokemon characters from the manufacturer. A3's descriptions of Pokemon characters tend to be ambiguous and confused. He appears to equate functional characteristics of the Pokemon figures with their names. A3 and the Researcher tended to alternate their turns-at-speaking except for two consecutive turns the Researcher took and three consecutive turns A3 took. The Researcher offers two opportunities to extend the topic beyond Pokemon names but A3 re-directed the topic back to the names. A3 keeps the topic of Pokemon names in the here-and-now even though the actual objects are not directly observable. This topic sequence remained on topic until the Researcher introduced a new topic by asking A3 a question.

The next topic sequence, N3 and the Researcher, occurs near the end of the Building Phase. N3 had completed building the model and was playing with the model. The topic sequence begins as N3 looks under the table and looks at the one-way mirror.

N3: *Is there anybody there? [Request for Information – Initiate Topic – N3 looks toward the one-way mirror]*

N3: *Right now? [Request for Information – Extend Topic]*

Researcher: *Yeah. [Response to Request for Information – Maintain Topic]*

N3: *I can't see anybody. [Statement of Directly Observable Events/Objects – Extend Topic]*

Researcher: *That's good, yeah, that's why it's a one-way mirror. [Statement of Directly Observable Events/Objects – Extend Topic]*

Researcher: *If you look to the right you'll see the red light. [Statement of Directly Observable Events/Objects – Extend Topic – Researcher points toward the one-way mirror]*

N3: *No, I can only see one person. [Statement of Directly Observable Events/Objects – Extend Topic – A3 looks at the one-way mirror]*

Researcher: *Yeah. [Response to Assertive – Maintain Topic]*

N3: *One person who has brown hair and I think looks really good. [Statement of Directly Observable Events/Objects – Extend Topic – N3 looks at the Researcher smiling]*

Researcher: *Oh. [Response to Assertive – Maintain Topic – Researcher laughs]*

N3 introduces the topic with a question and extends it immediately with another question about an object that is directly observable. At the beginning of the study session, N3 was shown the observation room where the camera operator and his mother would observe the session. He asks his question 35 minutes into the study suggesting perhaps that he has forgotten that his mother and the camera operator are observing. The Researcher assures him with an affirmative response to the question. N3 extends the topic by adding information about what he can see, or more precisely what he cannot see. The Researcher confirms that seeing nobody is actually a positive occurrence (because the primary function of the one-way mirror was to conceal the observers so as not to distract the participants from their study tasks). The Researcher's response re-affirms this proposition. He also provides a superficial and circular explanation why N3 can't see anybody (i.e., because it is a one-way mirror). The Researcher offers N3 further information, thereby extending the topic, by pointing to the small red light barely visible through the one-way mirror (the red light is on the front of the camera). N3, while looking into the one-way mirror, adds an assertive about what he does see in the mirror. This utterance marks the beginning of a sub-topic that moves the topic from the here-and-

now into a more abstract realm. The Researcher's simple acknowledgement of N3's assertive suggests that he does not yet understand the significance of N3's assertive. N3 extends the proposition from his prior utterance by specifying more detail about what or who he is looking at (i.e., hair colour). N3 uses the conjunction "*and*" to connect two independent propositions: a person with brown hair and the person looks good. N3's smile indicates that his propositions are to be understood in a humorous way. The Researcher's use of "*oh*" and his laugh serves as a discourse marker showing that he understood the intent of N3's propositions. N3 was being funny by transforming the image in the mirror (which was his own image) back to himself and talked about himself as if he were a different person. This requires an ability to take the point of view of another person. In this case, that other person was also himself. This was the source of the humour that the Researcher expressed in his laugh. N3's skill in using appropriate syntactic forms in this episode assists the listener in grasping the significance of N3's abstract concepts in his humour. In the following episode, the topic is elaborated.

N3: *Yeah, that person right there. [Statement of Directly Observable Events/Objects – Extend Topic – N3 points at the one-way mirror]*

N3: *See him? [Request for Information – Maintain Topic]*

Researcher: *Yes, [Response to Request for Information – Maintain Topic] that very creative>[Statement of Directly Observable Events/Objects –Extend Topic – N3 interrupts the Researcher]*

N3: *I think he looks good> [Statement of Directly Observable Events/Objects – Extend Topic – N3 points at himself in the one-way mirror as he interrupts]*

Researcher: *I think he looks great> [Statement of Directly Observable Events/Objects – Extend Topic – interrupts N3]*

N3: *Yeah. [Response to Assertive – Maintain Topic]*

Researcher: *The creative genius in this room. [Statement of Directly Observable Events/Objects – Extend Topic]*

N3: *No, [Assertive of Disagreement – Maintain Topic] that room actually. [Statement of Directly Observable Events/Objects – Extend Topic – N3 looks at the Researcher]*

Researcher: *Oh, but this one's coming back in here. Brown haired, brown eyed person [Statement of Directly Observable Events/Objects – Extend Topic – Researcher points to N3]*

N3: *Yeah, like that person. [Statement of Directly Observable Events/Objects – Maintain Topic – N3 looks behind him]*

Researcher: *Yeah. [Response to Assertive – Maintain Topic]*

The sub-topic becomes established in this episode. While the topic is superficially about the image in the mirror, a latent sub-topic emerges about another person who looks like N3. N3 continues to talk about himself as a separate person and refers to himself as a "*that person*" and uses the 3rd person personal pronoun "*he*" to exclude the speaker and listener thereby emphasizing the notion of separateness. The Researcher's second utterance supports N3's proposition by extending the sub-topic to include the notions of creativity, attractiveness and genius. When N3 interrupts the Researcher to comment on "*that person's*" appearance, the Researcher interrupts him to respond affirmatively to N3's assertive and, similarly, N3 interrupts the Researcher to respond affirmatively. In

this four-utterance sequence, the conversational partners rush to interrupt each other's mutually supportative assertives. The Researcher keeps the topic about the other person in the here-and-now when he affirms the presence of "*The creative genius in this room.*" N3 shifts the Researcher's here-and-now proposition into a more abstract form that extends N3's original proposition regarding a separate person, by also separating the location of the other person. Thus, not only is there another person but that person is in another room, which is the "image" room. The here-and-now of the study room becomes the "there-and-then" of the imaginary room reflected in the one-way mirror. The Researcher's next utterance, once again shifts the proposition back to the here-and-now by locating N3 (the "*brown haired, brown eyed person*") back in the study room ("*back in here*"). N3, once again, re-directs the Researcher's here-and-now proposition into a more abstract one. This time N3 looks behind him as he makes an assertion about "that person". The Researcher follows with a general acknowledgement of N3's assertive that maintains the re-directed topic.

N3: *Hey, I can't see him. [Statement of Directly Observable Events/Objects – Extend Topic – N3 looks behind himself – Researcher laughs]*

N3: *Where is he? [Request for Information – Extend Topic]*

Researcher: *There he was. [Response to Request for Information – Extend Topic]*

Researcher: *You must be talkin' about someone we know [Statement of Events/Objects Not Directly Observable – Extend Topic]*

N3: *Maybe-maybe, yeah, maybe it's like a twin or sumthin' [Statement of Events/Objects Not Directly Observable – Extend Topic]*

Researcher: *You'd have a twin, yes. [Statement of Events/Objects Not Directly Observable – Extend Topic]*

N3: A twin that I don't know about. [Statement of Events/Objects Not Directly Observable – Extend Topic]

N3: One that like ran away or sumthin' [Statement of Events/Objects Not Directly Observable – Extend Topic – Researcher chuckles]

This episode begins with N3 using a discourse marker ("*Hey*") to signal the beginning of an utterance to extend the topic. In this episode, the notion of "separateness" is elaborated. N3 turns around, again, and looks behind himself, thus linking his previous utterance to this one. His physical actions are accompanied by his words that, again, link his previous utterance to this one. Semantic contingency is attained through repetition of the physical action of turning around and extending the topic by adding the new information that he cannot see the "other person". This new proposition is further extended by N3's question "*Where is he?*". The Researcher's response turns A3's present tense "*is*" into the past tense "*was*", which extends the notion of separateness from location to time. Thus, the "other person" is not present in the immediate context (from A3's utterance) and the "other person" does not occupy the same time frame as the Researcher and N3 (from the Researcher's utterance). The first utterances of N3 and the Researcher have shifted the sub-topic from the abstract realm of location to an even more abstract realm of location and time. The Researcher's next utterance shifts the sub-topic back to the present and links it to N3. The Researcher drops the consonant ending from the word "*talking*" suggesting an informal exchange. N3 extends the proposition linking the "other person" to him. His first three words ("*maybe-maybe, yeah*") represent a filled

pause that gives him time to think of a response to the Researcher's previous utterance. These words also serve as markers suggesting that N3 is considering the notion of possibilities ("*maybe*") and he may express an imaginary situation. These markers allow the listener to anticipate and predict N3's next utterance and prepare for it. N3 extends the link between the "other person" and himself by elaborating the notion of "separateness" into another person (a twin). N3's informal tone is expressed in his word "*sumthin'*" that synchronizes with the Researcher's informal tone in his previous utterance. The Researcher's utterance supports the notion of a twin and maintains the proposition link between N3 and his twin. N3 takes the abstract notion of a twin one step further, while maintaining the previous notion of separateness, by introducing the idea that N3 is unaware of the existence of his "*twin*". He even provides a reason for being ignorant of his "twin" (i.e., the twin ran away).

In this episode, the elaboration and extension of the topic and sub-topic reaches its zenith. The propositions underlying N3's utterances were at their most psychologically distant point in this topic sequence. The notion of separateness, begun in the previous episode, is transformed, in this episode, into its logical consequence, namely, a separate person (a twin) of whose existence N3 is unaware. N3's use of the word "*ran*" suggests events (such as running away) occurred in the past, hence his use of the past tense. The "absent twin" explanation maintains previous notions of separateness in location and time while also maintaining a connection to N3. The propositional content of the topic moved from the "here-and-now" through assertives of events/objects directly observable (i.e., N3's reflection) to imaginary, abstract propositions expressed through assertives of events/objects not directly observable. What began as a reflection in the mirror has been

transformed, through the mutual co-operation of N3 and the Researcher and N3's fertile imagination, into an abstract and absent twin of N3.

Researcher: *Yeah, I think, ahh, yeah... [Response to Assertive – Maintain Topic]*

Researcher: *It would be like ahhh...[Statement of Events/Objects Not Directly Observable – Maintain Topic]*

N3: *Yeah, a creative twin. [Statement of Events/Objects Not Directly Observable – Extend Topic]*

Researcher: *Yeah, like the movie "Twins" [Statement of Events/Objects Not Directly Observable – Extend Topic]*

N3: *No, [Assertive of Disagreement – Maintain Topic] not like that one. [Statement of Events/Objects Not Directly Observable – Extend Topic]*

Researcher: *Oh? Like what? [Request for Information – Maintain Topic]*

N3: *Maybe like ...[Statement of Events/Objects Not Directly Observable – Maintain Topic]*

This episode is the beginning of the end for this topic and sub-topic. There is an increase in filled and unfilled pauses by the Researcher and N3. In his first two utterances the Researcher struggles to find other propositions that extend the sub-topic. His filled pauses function to maintain his turn-at-speaking while he thinks of something to say. After his second utterance N3 re-introduces the notion of a "*twin*", from the previous episode. N3 uses the word "*creative*" that the Researcher had used two episodes before ("*The creative genius in this room*") with the word "*twin*" from the previous episode thus forming a connection between episodes to create a global coherence for the discourse. The Researcher tries to extend the "*twin*" notion by introducing a movie analogy that is

rejected by N3. Both the Researcher and N3 are unable to think of other propositions to pursue the topic further. N3's last utterance fades out into a pause indicating the end of the topic. This topic sequence ends when the Researcher asks about N3's appetite as a prelude to a snack.

This topic sequence illustrates N3's skilful use of language to create an exchange that is richly imaginative and abstract. He had little difficulty expressing complex and abstract propositions due, in part, to his clear referencing using pronouns and maintaining semantically contingent utterances that facilitated a globally coherent discourse. His syntactic forms also facilitated the expression of his humour, which was the original propositional basis for the topic sequence.

N3's topic sequence and A3's topic sequence provide an interesting juxtaposition in their use of assertives. N3 began the topic sequence using assertives of events/objects that were directly observable to introduce concepts that were abstract and not directly observable in the study room. As the topic became more abstract, he shifted his assertives to events/objects not directly observable to reflect the abstract nature of the topic. The topic developed in the here-and-now from a psychologically close point (i.e., a reflection of his image) to a psychologically distant point in an imaginary past realm (i.e., an absent twin of whom N3 was unaware because his twin ran away). A3 began his topic sequence using assertives of events/objects that were not directly observable in the study room (i.e., Pokemon names). The topic of Pokemon and Pokemon names was psychologically close to A3's interests and experiences. Throughout the topic sequence he maintained this close psychological relationship by keeping the discourse focused on Pokemon names. He did not venture into more abstract topics even when provided the opportunity by the

Researcher's assertives. A3 struggled to describe the actions of the Pokemon characters he had named. His descriptions were ambiguous and did not adequately convey to the listener his propositions. At the end of the topic sequence, A3 was as psychologically close to his topic as when he started. Since he was still talking about events/objects that were not directly observable in the study room there was no necessity or requirement to shift his assertives to any other type of conversational act.

A3 and N3 illustrate syntactic forms and manner of developing a topic sequence that are shared by members of their respective groups. However, there are syntactic forms and manner of topic introduction and maintenance for the ADHD group that were absent from A3's topic sequence, such as use of tenses. Participant A1 illustrates other syntactic forms, topic introduction and maintenance techniques, also typical in the discourse of the ADHD participants.

The following episode with A1 takes place in the first three minutes of the Building Phase in which the Researcher presents the Lego model to the participant. During these three minutes, 12 topics are introduced and maintained: A1 introduces 10 new topics and the Researcher introduces two topics. The longest topic continues for 16 utterances and the shortest topic for one utterance.

> ***Researcher:*** *The moment of^ you've been waiting for. [Statement of Events/Objects Not Directly Observable – Initiate Topic – Researcher reaches into a bag under the table; A1 looks at the Researcher]*
>
> ***Researcher:*** *There it is. [Statement of Directly Observable Events/Objects – Extend Topic – Researcher places Lego model on table in front of A1; A1 chuckles]*

The Researcher's first utterance marks the beginning of the Building Phase. A1 watches the Researcher reach under the table into a plastic bag. The combined utterance and actions of the Researcher mark the introduction of a new topic, namely the Lego model. The Researcher adds new information to the topic by presenting the Lego model to A1 while providing verbal confirmation that the model now in front of A1 is, indeed, the one he has been waiting for. The Researcher's first utterance also contains the proposition, reflecting the Researcher's assumption, that A1 has been waiting, not only since the Introductory Phase of the study, but also waiting for the appointed time to attend the study. The Researcher's utterance, then, marks the beginning of the building session and at the same time recognizes A1's anticipation to begin building the model.

A1: *Where is they starting these things? [Request for Information – Initiate Topic – A1 picks up the Lego box and turns it around in his hand]*

Researcher: *Where do you usually start these things? [Request for Information – Extend Topic]*

A1: *Right here. [Response to Request for Information – Extend Topic – A1 turns box so the end is facing him and starts to open the end of the box]*

Researcher: *Right, there, okay. [Statement of Directly Observable Events/Objects – Maintain Topic]*

A1: *Sometimes I have to use my teeth, it's so hard. [Statement of Events/Objects Not Directly Observable – Extend Topic – Researcher chuckles]*

Researcher: *Yeah [laughs]. [Response to Assertive – Maintain Topic]*

Researcher: *Somebody made the box that doesn't come apart. [Statement of Directly Observable Events/Objects – Extend Topic – A1 is struggling to open the Lego box – A1 chuckles as the Researcher watches]*

Researcher: *You like some help>[Statement of Events/Objects Not Directly Observable – Extend Topic]*

A1: *Can you do it? [Request for Information – Extend Topic – A1 interrupts the Researcher]*

Researcher: *I sure can do it. [Response to Request for Information – Maintain Topic]*

Researcher: *Thank you for asking. Oh, this is, oh. [Statement of Events/Objects Not Directly Observable – Extend Topic – the Researcher starts to open the end of the box]*

Researcher: *Sometimes it is hard, oh boy. [Statement of Directly Observable Events/Objects – Extend Topic – A1 watches as the Researcher struggles to open the box]*

Researcher: *There you go. [Statement of Directly Observable Events/Objects – Extend Topic – Researcher opens the box]*

Researcher: *There you go. [Imitation – Maintains Topic – Researcher hands box to participant]*

A1: *Oh, out. [Statement of Directly Observable Events/Objects – Maintain Topic – A1 makes grunting sounds as he pulls plastic bags containing the Lego pieces out of the box]*

A1: Even more? [Statement of Directly Observable Events/Objects – Extend Topic]

This episode is the longest one within this particular topic. A1 responds to the Lego model by asking a question that also shifts the topic from the Lego model to a new sub-topic – how to open the box. The question "*Where is they starting these things?*" is linguistically ambiguous. A1 does not provide a referent for the pronoun "*they*" or "*these things*". It is not clear from his utterance whether A1 means "*they*" as in previous participants, or other people not present in the study room. A1's ambiguity is continued in the expression "*these things*" which indicate a plural of more than one thing, when there is only one thing – the Lego box. The Researcher clarifies A1's ambiguous referent by using the 2nd person personal pronoun "*you*" and redirects the question back to A1 thereby extending the topic (i.e., opening the Lego box) by adding new information (how would A1 open the box rather than the ambiguous "*they*"). A1 responds by turning the box to its end thus substituting a lexical referent such as "on the end" for a behavioural action (i.e., turning the box around) and using the deictic term "*here*". A1's actions also contribute to extending the topic by adding new information regarding the appropriate location for opening the box.

The Researcher provides confirmation supporting A1's choice of opening location that serves to maintain the topic. A1 extends the topic by adding information about the tools he uses to open Lego boxes (i.e., his teeth). A1's additional information reflects his previous experience with Lego. He uses the word "*sometimes*" as an adverbial conjunct to indicate events in the past that connect his past experience with the current topic. A1 uses the contracted pronoun "*it's*" as a substitute for more precise words such as "to open

the box", so the utterance might become "sometimes, I have to use my teeth to open the box", which would provide the listener with a referent for the pronoun "*it's*". The new information provides a subtle shift in the topic from the direct action of opening the box to prior experiences with Lego and the tools used to solve the problem of opening the box.

The Researcher provides support in the form of a laugh and agreement to A1's statement. He extends the topic by adding information about how difficult opening the box has become for A1. He provides the proposition that "*somebody*" made the box difficult to open thereby deflecting attention away from any potential shortcoming A1 may have, which in turn, shows that the Researcher is sympathetic to A1's plight. He further supports A1 by offering assistance, thereby adding new information that shifts the topic from A1's difficulties to the Researcher. A1 responds by interrupting the Researcher to ask for help. It would appear from this interaction that A1 did not hear the Researcher's offer because his attention was directed toward opening the box and hence A1's request for assistance that the Researcher had already offered.

The Researcher's next five utterances, which provide confirmation that the box is, indeed, difficult to open, support A1's efforts to open the box and the Researcher's utterances maintain and extend the topic. The Researcher responds to A1's request for assistance with an affirmative answer and extends by thanking A1 for asking. In thanking A1 for asking, the Researcher provides encouragement for further interactions because he is demonstrating that questions get a positive response and a social (and verbal) reward for asking questions. The Researcher's next utterance is a form of ellipsis from A1's previous utterance, in which the words "*sometimes*" and "*hard*" are used to extend the

topic. When the Researcher opens the box, he makes a statement marking the successful completion of the task (i.e., "*There you go*") and uses the same utterance to mark the return of the model box back to A1's possession. The same utterance is used to extend the topic and, in the next breath, to maintain the topic. A1 uses "*oh*" as a marker to indicate another shift in topic in which he begins to remove the contents of the box. The words "*out*" and "*even more*" are uttered without any indication of referents for the listener. These words, it would appear from the context, are not directed at the Researcher but are meant for A1 as he faces another Lego problem, which is getting the Lego pieces out of the box. A1's last utterance, "*Even more?*" is not a question directed to the Researcher but is directed to himself. It indicates his own surprize that there were more bags of Lego than he expected. This utterance is the first instance of self-talk or private speech for A1. Self-talk is described in more detail later in the Results section.

In this episode, the main topic underwent a series of transformations through a series of sub-topics from the presentation of the Lego model to opening the box, to past experiences with Lego and tool to use, to offering, seeking and accepting assistance in opening the box, to taking the plastic bags of Lego pieces out of the box. Topic shifts to sub-topics were accomplished by adding new information (extending the topic), such as past experiences, or positively reinforcing A1's activities (using words and laughter). A1's ambiguous referents were transformed by the Researcher into more specific, lexical references. The Researcher also provided positive support for A1's activities that functioned to displace A1's difficulties onto other people so A1 did not feel incompetent. There were 16 utterances for the topic of opening the Lego box. Of the 16 utterances, four (25%) of A1's utterances were in relation to the Researcher's utterances and two

(12.5%) were in relation to his own activities. At the beginning of the episode, the first six utterances were speaking-at-turn in which A1 and the Researcher alternated turns-at-speaking. A change in the alternating pattern occurred in the turns-at-speaking when the Researcher made two consecutive utterances followed by an interruption by A1. The Researcher then spoke for five consecutive utterances, which constituted 31.25% of the entire exchange. Even though A1 initiated the topic, the bulk of the extending and maintaining this topic episode (62.5%) was done by the Researcher in his number of turns-at-speaking. This is a pattern that is consistent throughout the interaction with A1.

Once the Lego box was opened and A1 started taking the plastic bags out of the box, another topic was introduced.

> ***A1:*** *Where'd he go? [Request for Information – Initiate Topic – Lego figure falls out of the box onto the floor]*
>
> ***Researcher:*** *Where'd he go? [Imitation – Maintain Topic – Researcher looks under the table]*
>
> ***Researcher:*** *Right behind your foot, there. [Statement of Directly Observable Events/Objects – Extend Topic]*
>
> ***Researcher:*** *There you go. [Statement of Directly Observable Events/Objects – Extend Topic – A1 bends down and picks up the Lego figure]*

A1 introduces another topic (Lego figure) by using a question, similar to his previous topic introduction. A1's attention has shifted to the Lego figure (because it fell on the floor) and his question directs the Researcher's attention to the same object. The Researcher maintains the topic by imitating A1's prior utterance. Even though the Researcher's utterance is in the form of a question, it is not really a question but rather a

confirmation that the Researcher has listened to A1's question and has directed his attention to the same object as A1, so that both conversational partners are jointly focusing on one object. The Researcher extends the topic by providing directions for A1 to find the missing Lego figure. The Researcher also provides, in his last utterance, verbal confirmation to A1 that A1 has successfully followed the Researcher's directions and has found the Lego figure. Similar to the previous episode, the Researcher provides the bulk (75%) of extending and maintaining this topic.

> ***Researcher:*** *That-that model [Statement of Directly Observable Events/Objects – Initiate Topic – Researcher points to the Lego model on the table]*
>
> ***A1:*** *Umhum [Response to Assertive – Maintain Topic – A1 uses a rising and falling intonation to indicate an affirmative response]*
>
> ***Researcher:*** *Isn't available in any store. [Statement of Events/Objects Not Directly Observable – Extend Topic]*
>
> ***Researcher:*** *It's special from the Lego warehouse. [Statement of Events/Objects Not Directly Observable – Extend Topic - A1 looks at the Researcher and nods his head yes]*

The Researcher introduced a new topic by using "*that*" as a pronoun while pointing to the Lego model on the table. A1 immediately responds with an affirmative ("*umhum*") indicating that he is listening. The Researcher continues with his utterance to extend the information about the Lego model. He points out that the model is "*special*" and by extension the "specialness" of the model reflects the "specialness" of the participant. Again, in this short four-utterance episode the Researcher provides the new information to move the topic along.

A1: *I have that man but not the same Lego thing. [Statement of Directly Observable Events/Objects – Initiate Topic]*

Researcher: *Ah, yes [Response to Assertive – Maintain Topic]*

A1 initiates a new topic (his Lego possessions) independent of the Researcher's prior utterance about the special Lego model. He uses deictic terms "*that*" and "*Lego thing*" without pointing to any specific objects. From his utterance, it is unclear to what A1 is referring. This ambiguity is the basis for the Researcher's non-committal response ("*ah, yes*") suggesting the Researcher is agreeing with A1, and thus maintaining the topic, without a clear understanding of the referent.

A1: *You make a whole bunch of Lego things out of just one thing. [Statement of Events/Objects Not Directly Observable – Initiate Topic – A1 stands up from his chair and looks at the Researcher]*

In this episode, A1 introduces a new topic (different models to make with Lego) using ambiguous references (i.e., "*thing*" and "*things*"). Rather than specifying the term "models", A1 talks about "things". He does not indicate that he is talking about making several different Lego models from one Lego model kit. This ambiguity is supported in his choice of verb. The verb he chooses to use, "*make*", indicates an activity in the "here-and-now" when he appears to be talking about some future or past activity. In this case, the addition of the verb "can" and the nouns "model" and "kit" would clarify the propositions underlying his utterance: "You can make a whole bunch of Lego models out of just one kit." A1's use of the phrase "*a whole bunch*" does not clarify the concept of number for the listener but provides redundant information that tends to cloud his

propositional argument about a number of models. Overall, A1's utterance requires the listener to make inferences regarding his underlying propositions.

A1: *Oh, the instructions. [Statement of Directly Observable Events/Objects – Initiate Topic – A1 takes the instructions out of the Lego box]*

A1: *I don't like using instructions. [Statement of Events/Objects Not Directly Observable – Extend Topic – A1 looks at the Researcher]*

Researcher: *You don't like using instructions? [Request for Information – Maintain Topic – A1 shakes his head no – Response to Request for Information – Maintain Topic]*

Researcher: *How come? [Request for Clarification – Maintain Topic]*

A1: *Cause I don't know how to read yet. [Response to Request for Clarification – Extend Topic – A1 glances at the one-way mirror and looks at the Researcher]*

Researcher: *You don't know how to read, oh, well. [Statement of Events/Objects Not Directly Observable – Extend Topic], there's pictures there you could look at. [Statement of Directly Observable Events/Objects – Extend Topic]*

In this episode, A1 introduces a new topic when he takes the instructions out of the box. He uses "*oh*" as a discourse marker to signal a change, in this case a change in topic. He re-states verbally ("*the instructions*") his actions of removing the instructions. He then offers new, unsolicited information, that he doesn't like using instructions, which extends his previous utterance. The omission of the article "the" makes his utterance applicable to a general context beyond the study room, that is, it suggests that he does not usually like to use the instructions that come with Lego models. The Researcher responds with a

question, similar to an imitation, that transforms the 1st personal pronoun "*I*" to the appropriate 2nd person personal pronoun "*you*" that reflects the Researcher's relationship to A1. A1 provides a non-verbal response (shakes his head no) thereby maintaining the topic. The Researcher requests clarification that, again, maintains the topic. A1 provides an answer using the conjunction "*(be)cause*" to indicate that the following utterance reflects causality, or a cause and effect relationship between the Researcher's question and A1's response. A1 reveals that, at age 6 years 10 months, he cannot read (or perhaps he means that he is not comfortable or confident in his reading). This revelation requires some risk-taking on the part of A1. The fact that he made such a statement suggests that he is comfortable in the study situation and trusts the Researcher. A1 tags the word "*yet*" on to the end of his utterance suggesting that he intends or plans to learn how to read at a future date but for now he cannot read. The Researcher's next utterance provides positive support for A1's disclosure while at the same time indicating, by using "*oh well*", that this deficit is not an issue in the study context. This is immediately reinforced by the Researcher pointing out other options available to non-readers, such as looking at the pictures. In both utterances, the Researcher adds new information that extends the topic.

A1: *Look at these. [Statement of Directly Observable Events/Objects – Initiate Topic – A1 takes out a folded advertisement showing different Lego model sets – A1 glances at the one-way mirror]*

Researcher: *If you want, if you don't that's fine. [Statement of Events/Objects Not Directly Observable – Extend Topic – watches A1]*

A1: Ooooo, there's even an another. [Statement of Directly Observable Events/Objects – Extend Topic – A1 discovers another page of advertisement showing different Lego models]

***Researcher:** Oh boy, lots of stuff. [Statement of Events/Objects Not Directly Observable – Extend Topic]*

A1 jumps to a new topic when he takes the advertisement out of the Lego box. He marks the new topic with a directive to the Researcher to "*look*". Although the Researcher is looking at A1 he continues with an utterance to extend the previous topic about options other than reading the instructions. The Researcher's utterance ("*if you want, if you don't that's fine*") indicates that A1 has options for using the instructions or not, although the Researcher's utterance, by itself, is ambiguous. It does not state an object for the verb "*want*" as in "want to – what". A clearer reference would be to add the phrase "use the instructions". However, this is a moot point since A1 had already moved to a new topic (the advertisement). A1 extends his previous utterance by pointing out another advertisement. He includes the article "*an*" when it is not required, so his utterance sounds awkward. From the Researcher's last utterance in the previous topic to the first three utterances in this topic, there is a parallel conversation being conducted. Both parties are talking about different topics at the same time. For these four utterances, either conversational partner could be elsewhere. The Researcher's reference to the previous topic is lost as the new topic becomes the conversational focus. The Researcher's last utterance shifts back to the new topic as he provides information that confirms A1's finding while extending the topic about different Lego models available.

A1: *This probably isn't the one that you make in the^ [Statement of Directly Observable Events/Objects – Initiate Topic – A1 opens one advertisement page]*

A1: *Wow, there's a bike. [Statement of Directly Observable Events/Objects – Extend Topic]*

Researcher: *What do you got there? [Request for Information – Extend Topic – looks at the advertisement page]*

A1: *My- I asked my Mom if I can buy that, she said no. [Response to Request for Information – Extends Topic]*

Researcher: *Oh, that's the ahhh. [Statement of Events/Objects Not Directly Observable – Maintain Topic]*

A1: *Then I asked her to buy that but not that it's too big. [Statement of Directly Observable Events/Objects – Extend Topic – A1 points to pictures on the advertisement page]*

Researcher: *Yeah. [Response to Assertive – Maintain Topic]*

A1 introduces, again, a new topic as the result of his activity with objects. In this episode he finds advertisements showing a range of Lego model sets that are available. His first utterance contains ambiguous references to "*this*" and "*one*" referring to unspecified pictures in the advertisement. He then abandons the utterance and extends the topic by switching his attention to another picture that he does specify with a noun (i.e., "*a bike*") and points to the picture. The Researcher is unclear about A1's references and asks for information. A1 answers with a false start ("*my*") and continues with his main proposition regarding Lego models he wanted. A1 speaks while looking at the advertisement page but

does not provide references, such as pointing, for the pronoun "*that*". He uses the past tense for the verb "*asked*" but the uses the present tense for the verb "*can*" which supports the ambiguity of his references with ambiguous verb tense. He does not use lexical conjunctions to connect the two propositions in his utterance. Instead he uses a pause. A less ambiguous utterance could read, "I asked my Mom if I could buy that (or add the word "car") but she said no". The Researcher's following utterance suggests some hesitation on his part to try and sort out A1's propositions. His hesitation is indicated by the marker "*oh*" and "*ahh*" which gives the Researcher some time to think, thereby maintaining the topic. A1, however, continues to extend the topic with his next utterance. His use of the adverb "*then*" indicates a time sequence not specified in his previous utterance. It would appear that he asked his Mom, first, to buy "*that*" and at a later time asked her to buy "*that*". While his use of the 3rd person personal pronoun "*she*" follows from his previous reference to "*my Mom*" and is, in this case entirely appropriate, his continued use of ambiguous pronoun "*that*" tends to present a confused picture for the listener. He continues to connect two propositions in his utterance with a slight pause rather than a lexical conjunction. The conjunction "*but*" is used appropriately to indicate a contrast between two propositions (i.e., to buy one model but not the other model) but he fails to provide an appropriate conjunction indicating causality or a reason for his request. The conjunction "because" could be included to give the listener an indication that the following utterance contains a reason for making a request. A modified utterance might read: "Then I asked her to buy that (or give a noun) but not that (or give a noun) because it's too big". While A1 extends the topic, he does so ambiguously, to which the Researcher responds with a general acknowledgement of A1's utterances (i.e., "*yeah*")

that only serves to maintain the topic. This suggests that the listener has little to talk about regarding the current topic, but when the topic shifts again, the listener has more to say.

A1: *My teacher, my old teacher, she has a whole bunch of boxes of these at her school. [Statement of Directly Observable Events/Objects – Initiate Topic – A1 points to the pictures on the advertisement page]*

Researcher: *You got to play with Lego at school? [Request for Information – Extend Topic]*

A1: *Umhum [Response to Request for Information – Maintain Topic – A1 says 'umhum' with a rising a falling intonation to indicate an affirmative response]*

Researcher: *In class? Oh, that's great. [Statement of Events/Objects Not Directly Observable – Extend Topic]*

A1: *Only. [Statement of Events/Objects Not Directly Observable – Extend Topic]*

A1: *I didn't buy this big thing like I have [Statement of Directly Observable Events/Objects – Extend Topic]*

Researcher: *Yeah. [Response to Assertive – Maintain Topic]*

In this episode, A1 introduces a new topic while he looks at the advertisement page. His activity in the immediate context provides the impetus for expressing a new proposition. His first utterance includes a relative clause ("*my old teacher*") that provides the listener with necessary background information about A1's referent. His use of the 3rd person personal pronoun "*she*" is appropriate since A1 uses the noun "*teacher*" before he used the personal pronoun. Implicit in this first utterance is the proposition that he is talking

about an event that occurred in the past, hence his description of his "*old teacher*". The listener is left to infer that A1 is referring to a school he attended previously or to his teacher last year. However, his use of the verb "*has*" indicates a present tense of an event occurring now. A1 combines a proposition indicating a past event with a verb indicating a present event. The result is an ambiguous proposition. He uses the phrase "*a whole bunch*" again to denote a large number of items which, as in the previous case, gives the listener redundant information. He points to the pictures as a behavioural reference for the word "*these*" without an accompanying lexical referent to clarify his referents. His use of the 3rd person personal pronoun "*her*" is consistent with his prior references to "*teacher*" and "*she*". The phrase "*at her school*" suggests a separation in time between A1, the speaker, and his old teacher at his old school. The old teacher remains located in the old school and thus the school is "her school" as he does not attend any longer. There is the implication that A1 no longer considers himself a part of his old school, and his past, because he does not attend the school. The inference is that A1 considers the "here-and-now" as his place and the past is her (his old teacher's) place.

The Researcher's response to A1's utterance singles out one aspect of the underlying propositions. One proposition that A1 expressed is to recall his past experiences with specific Lego models in his old school. The Researcher picks out the implicit general proposition that A1 played with Lego at school. His question to A1 serves two functions. One is a confirmation that the Researcher understood the underlying proposition in A1's utterance and the other is to extend the topic and transform it into a sub-topic, namely Lego at school.

The Researcher gives a positive response to Lego at school and in the classroom, again extending the sub-topic. The Researcher's re-direction of the topic into a sub-topic is stopped by A1's next utterance. The word "*only*" suggests that A1 is focused on something other than the Researcher's utterance. It does serve as an intended discourse marker to indicate a change. That change is to re-direct the sub-topic back to the topic of Lego models depicted on the advertisement page. A1's next utterance is confusing. The underlying proposition appears to be that he did not buy a Lego model because he already owns it (or one of a similar type). His use of "*this big thing*" does not provide specific references to clarify what he is talking about. This confusion is further compounded by the word "*like*". The word "like" may be used as a verb, a noun, an adjective, an adverb, a preposition or a conjunction. It would appear the A1's usage of the word "*like*" in the phrase "*like I have*" is that of a particle because it does not appear to be used as a noun, verb, adjective, adverb, preposition or conjunction. The word "*like*" is defined, in A1's usage in terms of its relation to A1. The utterance seems to imply that he has a Lego model like (or similar to) "*this big thing*" shown on the advertisement and consequently expresses this relation as "*this big thing like I have*". The Researcher responds with a simple acknowledgement ("*yeah*") without further comment.

A1: *I want the whole entire everything here. [Statement of Directly Observable Events/Objects – Initiate Topic – A1 makes a sweeping motion with his hands over the Lego advertisement page]*

Researcher: *That would be neat. [Statement of Events/Objects Not Directly Observable – Extend Topic – Researcher chuckles]*

The topic introduced by A1 is consistent with his other topic introductions. It emerges from his immediate activity, which is looking at the Lego advertisement. He expresses his desire for all of the Lego models depicted in the advertisement with an abundance of adjectives (i.e., "*whole entire everything*"). While his use (or over use) of adjectives describing number does support his strong expressed desire for all of the Lego models, it gives the listener redundant information. In this case, however, the over-expression of adjectives matches the magnitude of his expressed desire for the Lego models. The Researcher confirms the connection between language and desire when he responds with an affirmative utterance (that extends the topic) accompanied by a chuckle, reflecting the humour underlying the connection between all of the models and the over-statement of number expressed in A1's language.

A1: *Here it is. [Statement of Directly Observable Events/Objects – Initiate Topic – A1 picks up the instructions]*

Researcher: *Oh, there it is. [Statement of Directly Observable Events/Objects – Maintain Topic]*

Researcher: *Yeah. [Response to Assertive – Maintain Topic]*

A1: *Now, open it up to do the Number One. [Statement of Directly Observable Events/Objects – Extend Topic – A1 chuckles as he opens the instructions]*

Researcher: *You can read. [Statement of Events/Objects Not Directly Observable – Extend Topic – A1 looks at the Researcher]*

Researcher: *You're reading that number. [Statement of Events/Objects Not Directly Observable – Extend Topic]*

Researcher: *That's pretty good. [Statement of Events/Objects Not Directly Observable – Extend Topic]*

Researcher: *Ah, you can> [Beginning of Statement of Events/Objects Not Directly Observable – Extend Topic]*

A1: *Can only know my numbers. [Statement of Events/Objects Not Directly Observable – Extend Topic]*

Researcher: *Well, that's a start. [Statement of Events/Objects Not Directly Observable – Extend Topic]*

A1: *Umhum. [Response to Assertive – Maintain Topic – A1 says 'umhum' with rising and falling intonation indicating an affirmative response]*

Researcher: *Yeah. [Response to Assertive – Maintain Topic]*

Researcher: *Yeah, I know some people – don't even know their numbers. [Statement of Events/Objects Not Directly Observable – Extend Topic]*

Researcher: *Some little ones. [Statement of Events/Objects Not Directly Observable – Extend Topic]*

Researcher: *Little-little people. [Statement of Events/Objects Not Directly Observable – Extend Topic]*

Once again the topic A1 introduces reflects his immediate activity; he re-discovers the Lego instructions. A1's first utterance is one of discovery and one that re-introduces a previous topic, namely the Lego instructions. The Researcher's following utterance transforms the deictic term "*here*", indicating a location relative to A1, to the deictic term "*there*", indicating a location relative to the Researcher. This type of transformation takes the listener's context into consideration. The Researcher's next two utterances maintain

the new but re-introduced topic. A1 uses the word "*now*" appropriately to indicate the time in the immediate context and supports this by physically opening the instructions. A1's utterance appears directed more to himself than to the Researcher. He is expressing in words what he is doing physically. There is a parallel between his words describing his actions and his actions. Once the topic of the Lego instructions is re-introduced, the Researcher moves to a sub-topic and re-introduces the previous sub-topic, that A1 cannot read. The Researcher points to the fact that A1 is reading the numbers and is able to read in a general sense. The Researcher provides positive support for this accomplishment (e.g., "*that's pretty good*"). A1 interrupts the Researcher's next utterance to extend the topic by clarifying that he reads only numbers not letters or words. A1 omits the 1st person personal pronoun "I" at the beginning of his utterance ("*can only know*"). He does, however, appropriate the verb the Researcher had just uttered before he was interrupted. That is, the Researcher said "*You can*" and A1 interrupted to continue, "*can only know my numbers*". An appropriate transformation of the Researcher's utterance would be to include the 1st person personal pronoun "I" to make the utterance "I can only know my numbers". A1 does use the appropriate 1st person personal pronoun "*my*" when he refers to himself. The Researcher provides positive support for A1's admission that he only knows his numbers. This support is further expressed in the Researcher's following utterances that extend the topic beyond A1 to include other people. The extension of the topic to other, little people, implies that other children even younger than A1 do not know their numbers. The implication here is that A1 has acquired an important skill that not all children possess. His knowledge is valuable and represents an accomplishment not to be denigrated.

The first three minutes of the Building Phase show the pattern of topic introduction and maintenance typical of the interaction with A1 and the other ADHD participants. Topics tended to be introduced based on the immediate activities of A1 with directly observable events/objects in the study context. The number of topics A1 introduced reflected his attention shifts. Of the 10 topics A1 introduced, the longest was 16 utterances and the shortest was one utterance. Half of the topic sequences were only two utterances long. The result was a conversation that did not flow smoothly but started and re-started continuously. The conversation appeared erratic.

A1 tended to make ambiguous references often accompanied by physical moves such as pointing to create a connection between his lexical reference and the object. He also created ambiguity by using past and present tenses, sometimes in the same utterance. He did make appropriate use of pronouns, at times, and did use one relative clause to provide background information for the listener. There was, however, a tendency to conduct the conversation in parallel with the listener rather than in conjunction with the listener. The listener was often left to infer background information and seek further information through questioning.

In total, there were 70 utterances in the first three minutes. A1 introduced 14.3% of the topics while the Researcher introduced 2.8%. A1 maintained 10% of the topics and extended 18.6% of them. The Researcher maintained 22.9% of the topics and extended 31.4% of them. This indicates that the Researcher did the bulk of the work of topic maintenance while A1 did most of the topic introduction.

A3 and N3 show similarities with respect to their maintaining and extending topics. A3's longest topic sequence, lasting 30 utterances, took 2 minutes to complete

with 5 topic shifts. N3's longest topic sequence was 33 utterances that took 1.5 minutes to complete with 6 topic shifts. A3 introduced 2.8% of the topics, maintained 11.8% and extended 35.3% of the topics. He also extended 2.9% of the topics tangentially. N3 introduced 2.8% of the topics, maintained 13.9% and extended 33.3% of them. N3 did not extend tangentially any topics. With A3, the Researcher did not introduce any topics, maintained 26.5% of the topics and extended 20.6% of them. With N3, the Researcher introduced 2.8% of the topics, maintained 19.4% and extended 27.8% of them.

Summary of Topic Introduction and Maintenance

Overall, all participants demonstrated their skills in introducing, extending and maintaining topics. There were differences between the two groups. The ADHD group tended to introduce more topics without the aid of transitional markers to alert the listener to a topic change. The topics they chose to talk about tended to reflect a psychological distance that was closer to their past experiences and knowledge than the topics the Non-ADHD members talked about. The ADHD group also tended to maintain the topic with which they had familiarity and even re-direct the topic back to the familiar when the Researcher shifted the topic. This kept the topic focused, typically, on the "here-and-now" with little venturing into more abstract topics. The ADHD group made more ambiguous references and did not provide enough background information for the listener to understand easily, leaving the listener to often infer meaning.

Participant's Self-Talk (Private Speech)

Conversation was the primary discourse genre in the study session. Conversation requires the active participation of at least two people. During the Building Phase, there were episodes in which participants conducted a conversation without the Researcher's

active participation. In these episodes, the participants engaged in self-talk or private speech.

All of the participants in this study engaged in self-talk. All of the participants self-talked during the Building Phase. Two ADHD participants also engaged in self-talk during other phases. One ADHD participant self-talked during the Play and Ending phases (self-talk over the three phases for this participant comprised 25.8% of his utterances), while the other ADHD participant self-talked during the Play Phase (overall self-talk for the 2 phases were 14.2% of his utterances). In all episodes of self-talk, the participants were engaged in a manipulative activity. Self-talk emerged as participants encountered problems in their activity, such as building the Lego model in the Building Phase, repairing their model during the Play Phase, or putting the Lego model back in the box without breaking it during the Ending Phase.

The ADHD group engaged in substantially more self-talk than did the Non-ADHD group. During the Building phase, self-talk comprised 20% of the ADHD participants' utterances while self-talk comprised 5.1% of all utterances throughout the study for the Non-ADHD participants. Figure 33 shows the percentage of participants' self-talk during the Building Phase (see Appendix K, Table K10 for frequencies).

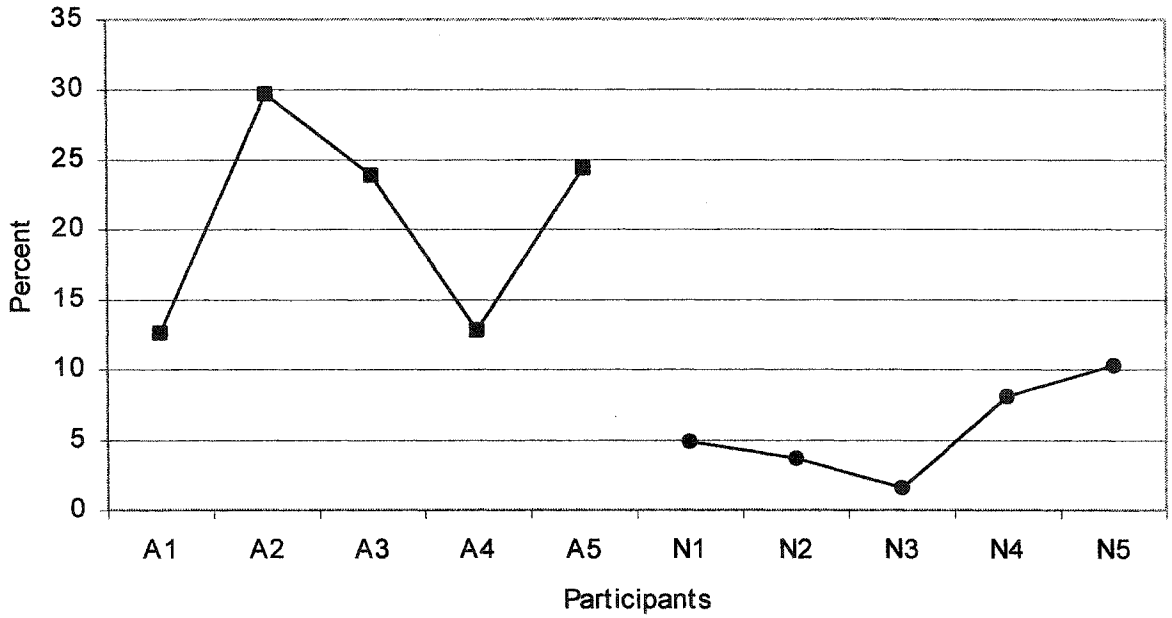

Figure 33. Percentage of participant's self-talk during Building Phase.

Participants' self-talk, in this study, was characterized by four features.

First, self-talk emerged in response to problems participants encountered. There were individual differences regarding the threshold at which self-talk emerged. Some participants began to self-talk early in their model building activity while for others self-talk emerged while their model building was well underway. For example, N3 is building the Lego figure:

N3: *Hum [N3 is putting the hair on the Lego figure in his lap]*

N3: *Bald.*

N3: *She's bald.*

N3: *Umhum.*

N3 had encountered problems fixing the Lego figure's hair onto its head. Self-talk emerged as he tried to solve this problem.

Second, self-talk was spoken in a low voice. The volume of speech helped distinguish self-talk from other types of monologues. For example, N3 engaged the Lego figure in a one-sided conversation:

N3: *Oh, come on. Fine, I'll just leave you. [N3 talks to the Lego figure in a low voice]*

N3: *Like that new hat I gave you for Christmas?*

N3: *Maybe it can have cable. [N3 is referring a television he built into his vehicle]*

N3: *Hey, you took my hat. [N3 brings the other Lego figure into the play activity]*

Here, N3 is engaged in a series of consecutive utterances that is not self-talk. He is engaged with the Lego figures in a play activity. He is addressing the Lego figures but not himself. The volume of his utterances is at a normal level and he is not engaged in a problem-solving activity.

Third, self-talk may take a variety of forms ranging from complete sentences, to partial sentences, to single words, to sounds. In the episode described above, N3 used sounds ("*hum*" and "*umhum*"), a single word ("*bald*") and a complete sentence ("*she's bald*") in his self-talk.

Fourth, self-talk may not contain a grammatical subject. For example, participant A2 is engaged in building the vehicle:

A2: *Forgot about the seat.*

A2: *Oh, man, the seat.*

A2: *Hard time.*

In this episode, A2's first utterance contains a verb ("*forgot*") and an object ("*the seat*") but the subject is omitted. In some analyses, this omission may be viewed as a deficit or grammatical error. However, the grammatical subject has not been omitted but replaced with a psychological subject. Because A2 is engaged in self-talk, that is, speech for oneself, there is no functional need to include the subject because the subject is implied in the self-talk. The subject is A2 and he does not express the subject ("I") because he does not need to. He knows who the subject is. Similarly, his last utterance contains no subject or verb just an adjective ("*hard*") and a noun ("*time*"). Again the grammatical subject and verb have been replaced by psychological ones that do not need to be expressed because the speaker knows to whom he is addressing and what action he needs to take.

Participants' self-talk represented another form of discourse that facilitated communication, communication with themselves. Self-talk functioned to bring their activities into conscious awareness and under the direction of their speech to solve a problem.

Expository Discourse

During the Instruction Phase of this study, participants were asked to provide the Researcher with instructions for other participants. This recounting of the instructions imitated the expository discourse often called upon in the classroom, either through the teacher relaying information to the students or students relaying information to the teacher or each other.

Instructions

There was a range of instructions proffered by the participants that varied in length and amount of detail. In the ADHD group, the range of utterances used to describe the instructions, as a measure of the amount of detail, was from 10 to 78 utterances. In the Non-ADHD group the range was from 9 to 30 utterances.

Participants A1, A2 and A3 offered very general directions, while A5 provided slightly more detailed instructions and A4 provided very detailed, piece-by-piece instructions that included a drawing (using 78 utterances). Participants N1, N3 and N5 provided general piece-by-piece instructions while N2 and N4 offered general advice in lieu of instructions.

The three ADHD participants who offered general advice said to use the instructions (or look in the book) while one Non-ADHD member had the same advice. For example, A2 stated, "*All they have to do is follow the instructions*". A1 said, "*I'd show them the instructions and the instructions would tell them what to do*". N4 advised, "*The first step is look at the book*". He also added, "*Then probably never give up and that's all*". N2 offered general advice "*Well, don't keep the little pieces around babies*", "*Um, do it on a table*" and "*If you get stuck then keep trying*".

When participants offered more detailed instructions, they all looked at their model (either in their hand or on the table) as they recounted their instructions. These instructions were, essentially, a description of the steps participants took to build their respective models. For example, A4, holding his model, said, "*First get the main part*", "*Then you get the two long yellow pieces*". A5, looking at his model, stated, "*Well, the*

first thing I did was to make that glass part", "*And then I put this black part on, then the steering wheel, then that gray piece*".

The two Non-ADHD participants offered less detailed step-by-step instructions. For example, N1 said, looking at his model, "*I found this and then I got this and put them together and found these...*" N3, again looking at his model, said "*I would guess make the wheels and then just make a bottom line*", "*And then one part right there is down so a person can turn on that and then that part's right there and there's just another layer right there*". Regardless of the level of detail, the participants in both groups depend on the deictic terms "*this*", "*that*" and "*there*" to link their verbal instructions with the actual object, either a Lego piece or the model.

Summary of Discourse Competency

Overall, both groups demonstrated skills in maintaining and extending a conversation, with multiple and shifting topics and sub-topics, for one hour. There were important differences. The ADHD group introduced more topics than did the Non-ADHD group, but the Non-ADHD group maintained longer topic sequences than did the ADHD group. The ADHD group tended not to use transitional markers to signal the introduction of a new topic, often resulting in an erratic flow for the conversation. The ADHD group expressed more statements referring to objects/events in the study context that were directly observable, while the Non-ADHD group tended to use statements expressing events/objects that were not directly observable in the study context. This indicated that the ADHD participants tended to focus more on the "here-and-now" than did the Non-ADHD participants. The ADHD group, in maintaining and extending topics, tended to make more ambiguous references, often failed to use transitional markers to signify a

new topic or sub-topic, did not consistently offer the listener enough background information for easy comprehension, and tended to talk about topics with which they were familiar and that were psychologically close to them. The Non-ADHD group was more likely to talk about topics that were more psychologically distant and conceptually more abstract. The ADHD participants engaged in more self-talk than did the Non-ADHD participants. For all participants, self-talk emerged as a problem-solving activity, characterized by low volume, that took on a variety of forms and did not necessarily contain a grammatical subject (which was replaced by a psychological subject). All participants provided the Researcher with expository discourse regarding instructions. The level of detail varied considerably across the participants. Three ADHD and three Non-ADHD participants provided very general instructions, one ADHD and two Non-ADHD participants gave general step-by-step instructions, and one ADHD participant gave very detailed instructions. Those participants who provided more detailed instructions tended to link their verbal instructions to the action of looking at the Lego model.

Strategic Competency

Strategic competency consists of the verbal and non-verbal strategies that may be called upon to compensate for breakdowns in communication. A null response is an example of a breakdown in a communicative act. The study examined the types of communicative breakdown and identified the strategies participants used in their attempts to compensate for the breakdown. Breakdowns in the conversation occurred under three conditions: (a) self-initiated repairs, (b) other-initiated repairs prompted by Researcher, and (c) abandoned utterances and null responses.

Self-Initiated Repairs

All participants engaged in self-initiated repairs. This shows that the ADHD and Non-ADHD participants were monitoring the conversation (or their part of the conversation) and made attempts to correct problem areas in their utterances. The Non-ADHD group made self-initiated repairs in 20.6% of their total utterances (n = 1,795). The ADHD group made self-initiated repairs in 8.6% of their utterances (n = 2,030). Thus, the Non-ADHD group made twice as many self-initiated repairs as did the ADHD group. An important factor that contributed to breakdowns and the requirement for self-initiated repairs was the pace of the utterances. Those participants, regardless of group, who spoke quickly (i.e., A3, A4, N1 and N4) made more repairs and had more abandoned utterances. These participants also tended to use more fillers, such as "*like*", "*um*" and "*ah*" in their utterances than did the other participants.

The most frequent type of self-initiated repairs made by both groups was changes to syntactic forms that modified the meaning of the utterance. Of the self-repairs made by both groups by changing the syntactic form (n = 304), the ADHD group accounted for

23.7% of these, while the Non-ADHD accounted for 76.3%. The participants who made repairs of syntactic forms the most were also the fastest talkers in their group.

Changes to syntactic form occurred in several ways: changes to a single word, a phrase, or a sentence. For example, A1 changes personal pronouns in the following utterance:

> ***A1:*** *My^ I asked my Mom if I can buy that, she said no. [Response to Request for Information – Extend Topic – A1 points to a picture on the advertisement page]*

A1 repairs his first word from "*my*" to "*I*" that clarified his underlying proposition. Similarly, A3 self-repairs his utterance:

> ***A3:*** *I wil^ I'm trying to make them myself. [Statement of Events/Objects Not directly Observable – Extend Topic – A3 is talking about re-building a Lego model]*

A3 transformed "*I wil^*", a personal pronoun and a present tense verb, to a contracted personal pronoun with a past tense verb "*I'm trying*" that made his proposition consistent with the topic and understandable for the listener. N1 changes verbs in the following episode:

> ***N1:*** *Only if a bad guy comes along and does^ tries to do this, these two will shoot it. [Statement of Directly Observable Events/Objects – Extend Topic – N1 shows the Researcher the cannons he built into his Lego model and demonstrates the consequences for the 'bad guy' by making a shooting sound]*

N1 changes verbs from "*does*" to "*tries*" indicating a change from a present singular tense to past plural tense that modified the proposition underlying his utterance to make the proposition clearer.

In the three episodes described above, the participants modified a single word that facilitated listener understanding of their utterance and its underlying proposition. Participants in both groups showed skill in modifying single words to make their utterances more effective. There was no apparent pattern regarding the type of word most likely to be changed. Participants changed personal pronouns, adjectives, verbs and/or nouns. The particular word that was changed appeared to depend upon the underlying proposition of the utterance and the speed at which a participant talked. Syntactic form changes also involved phrases and sentences.

In the following episode, A2 repaired his reference to the Lego instructions:

A2: *They would look at the piece of paper pretty closely. [Statement of Events/Objects Not Directly Observable – Extend Topic – A2 is describing instructions to help another person build his model]*

Researcher: *Look at paper. [Imitation – Maintain Topic – the Researcher writes down A2's description]*

A2: *The paper^ the instructions very closely. [Statement of Events/Objects Not Directly Observable – Extend Topic]*

In his last utterance, A2 modifies the phrase "*the paper*" to a less ambiguous reference "*the instructions*", thereby facilitating understanding of his directions. This episode also illustrates the use of circumlocution as another form of repair. A2 used the phrase "*the*

piece of paper" in his first utterance and clarified this reference in his last utterance. Circumlocution is described later in this section.

In the next episode, A5 repairs his utterance by changing a series of single word verbs:

> ***Researcher:*** *All over the place. [Statement of Events/Objects Not Directly Observable – Extend Topic – the Researcher had just described an incident in which a participant had squeezed a bag of Lego pieces until it exploded and Lego pieces flew around the study room]*
>
> ***A5:*** *And they^, yeah, then ya had to go^ look^ find^ get them all. [Statement of Events/Objects Not Directly Observable – Extend Topic]*

A5 changes the 3rd person personal pronoun "*they*" to the appropriate 2nd person personal pronoun "*ya*" or "*you*" and then searches for the appropriate verb until he resolves the problem with the verb "*get*" and completes his thought.

A3 repairs twice in the following episode to complete his thought:

> ***A3:*** *It^ it ge^ it^ it gets^ shows up wrong I just go back over it and do it again. [Statement of Events/Objects Not Directly Observable – Extend Topic – A3 is explaining his strategy to solve problems building Lego models]*

A3 repairs his first utterance by completing the word "get" while repeating the personal pronoun "*it*" and then changes the proposition by repairing the phrase again by modifying the verb from "*gets*" to "*shows*".

N3 repairs his utterance by adding an adverb:

Researcher: *You are truly an engineer. [Statement of Events/Objects Not Directly Observable – Extend Topic – the Researcher observes N3 fixing his Lego model that had fallen apart]*

N3: *This is very en^ very easy engineering, though. [Statement of Events/Objects Not Directly Observable – Extend Topic]*

N3 uses the Researcher's noun "*engineer*" and tries to transform it into a verb in this utterance and repairs his utterance by adding information about the nature of the task being "*easy*".

Self-initiated repairs to utterances by changing the syntactic form of phrases and sentences tended to improve communication by clarifying the referent, modifying verbs or by adding an adjective or adverb to modify the noun or verb. In episodes such as those described above, the repairs did assist the listener to understand the participant's utterance better. There was, however, a tendency for the ADHD group to have more difficulties repairing phrases and sentences than the Non-ADHD group had. The repairs by ADHD participants did not always result in more effective communication. For example:

Researcher: *How do you know it is wrong? [Request for Information – Extend Topic – A4 had commented that sometimes his Lego model building goes wrong]*

A4: *Null response.*

Researcher: *What do you do? [Request for Clarification – Maintain Topic]*

A4: *Cause I know ho^ because I know how, ummm^ I know what^ how I gonna build my thing [Response to Request for Clarification – Extend Topic]*

A4 made four repairs and a filled pause before he completed his thought. A4's repairs appear to be several attempts to express a single underlying proposition. That proposition describes his problem-solving strategies when building Lego models. In the last part of the utterance, however, he omits the verb "am" and does not specify a referent for "*my thing*" thus leaving the listener to infer the referent and fill in the missing verb. A4 also did not respond to the Researcher's first question, resulting in a breakdown and necessitating another request by the Researcher.

Similarly, A1 talks about the Lego model he wants:

A1: *I do want to buy a space ship. [Statement of Events/Objects Not Directly Observable – Extend Topic]*

A1: *Oh, but my Mom^ I can't yet^ want a big space ship thing like that long. [Statement of Events/Objects Not Directly Observable – Extend Topic – A1 indicates the size for 'that long' with his hands]*

In his last utterance, A1 appears to be expressing three propositions simultaneously regarding the topic. The first two propositions appear to be about not being able to have the model because of something to do with his mother. The last part of his utterance repeats the proposition about a big space ship mentioned in his first utterance and adds the notion of size accompanied with hand motions. He does not repeat the 1st person personal pronoun that would complete the utterance such that "*I can't yet^ I want a big space ship thing like that long.*" Although the general argument underlying A1's utterance is understandable, the listener must infer from his repairs the overall proposition underlying his comments.

A3 describes to the Researcher how he uses his hands as binoculars by forming his hands into circles and putting them to his eyes:

A3: *I would like^ far back on the hill^ tell the people^ they're not barely^ see, when I put my hands up like this. [Statement of Directly Observable Events/Objects – Extend Topic – A3 looks at the Researcher as he uses his hands as binoculars]*

A3: *I could see them very close. [Statement of Directly Observable Events/Objects – Extend Topic – A3 laughs]*

A3 makes four attempts before he successfully completes his thought. Each attempted repair appears to have a different underlying proposition. The listener must shift his focus, with each repair, to a different proposition, which results in a confused and confusing utterance. A3 does make his repair more effective by connecting his utterance to the action of putting his hands to his eyes like binoculars. This utterance/action combination is supported by his last utterance that clarifies for the listener the result of using his hands as binoculars, namely he can see people better, or "*very close*".

While the ADHD participants had more difficulty repairing phrases and sentences, participants in the Non-ADHD group also demonstrated some difficulty, although not as much as did the ADHD group. For example, N4 talks about computers in the following episode:

N4: *A bra^ there's a brand new^ co^ ah, I almost^ it'd be^ I almost thought you were gonna say a Pentium 2000 that [Person's Name] had. [Statement of Events/Objects Not Directly Observable – Initiate Topic]*

N4's utterance is a mixture of at least four propositions. It would appear that the first three phrases "*a bra^ there's a brand new^ co*" go with "*it'd be*" while the phrase "*ah, I almost*" goes with the last part of his utterance. It would appear the proposition regarding computers was intercepted by a proposition about the Researcher's prior utterance, resulting in a series of repairs. The conflicting propositions are resolved in the last part of his utterance when he chooses one of the propositions.

Although both groups did repair their utterances with phrases and sentences, the Non-ADHD participants made more effective repairs. Another type of self-initiated repair made by all participants was repetition. Self-repair by repetition was accomplished by repeating a single word or phrase. Of all the self-repairs made through repetition 39.8% were made by the ADHD group and 60.2% were made by the Non-ADHD group.

Both groups used two types of repetitions. One form of repetition was to repeat a single word. For example:

A1: *Yeah, My^ my Mom hired him.*

A3: *Yeah, they can't see blue^ blue, the only colour that they can see is yellow.*

A4: *On^ on the^ the Lego lady put the white hat.*

A5: *Finally, I^ I accidentally fell into this place that's even deeper.*

N1: *Cause^ cause there's no Pokemon Lego.*

N2: *No, but I^ I have that there.*

N3: *Yeah, that^ that man won't like you if you break his car.*

N4: *Yeah, cause you'll make^ make the Lego model if you never give up.*

N5: *But I can't find it^ it anymore.*

In these episodes, repeating a word did not change the syntactic form of the word or modify the underlying proposition. Another form of repetition did. The first sound(s) of a word was begun then repaired by repeating the word. For example:

A1: *And build something and then put it on t^ to the other thing.*

A1: *N^ not in the street, in my back yard.*

A3: *I just fig^ I just figured it out.*

A3: *I almost bus^ bust that out.*

A4: *And d^ dis little door.*

A4: *And you can't see, then you go like that and then you j^ just build it.*

A5: *The b^background.*

A5: *This guy's airbo^ airborne.*

N1: *Yeah, I have a lot of mo^ models at my house.*

N1: *Som^ sometimes they fall off.*

N2: *I got it for my birthday fr^ from my Mom.*

N2: *I'll be eight in Jul^ July first.*

N3: *And then sh^ she can go right here.*

N4: *A^ a^ all^ all that I do is I just never give up.*

N4: *I didn't add on, I t^ traded.*

N5: *N^ n^ not much.*

In this type of repair, the word is progressively expressed rather than repeated whole. Of all the repairs made through repetition, the Non-ADHD group made 19.2% of them using this type of progressive repair compared to 12.8% for the ADHD group. The remaining repetitions were made using either single words or phrases. For example:

N3: *Yeah, that ^ that man won't like you if you break his car.*

A3: *Hold on, I think^ I think I just did one.*

A4: *On^ on the^ the Lego lady put the wh^ white hat.*

N4: *Looking out, yeah, because^ because there'd be^.*

These types of repairs simply repeated a word or phrase without changing the syntactic form or meaning.

Another type of self-initiated repair involved the speaker identifying the problem. For example:

A1: *I've, umm, when I was a baby^ I mean when I'm^ um, my friend was a baby he ate Lego piece.*

A4: *Would you be able to like^ like kinda draw the^ I^ I don't know how to pronounce it, it's kinda that.*

N1: *I can make a Lego^ a Lego sculpture of a^ of a big Pichacho [a Pokemon character]. No, I mean not a Pichacho, a boat.*

N3: *And then you put – do you know what that's called?*

N4: *I forget what I'm talking about but sometimes I go walking up the stairs and then I forget what I'm talking about. What try^ what was I about to do? What does that mean?*

Discourse markers characterize these self-identified repairs. A1 and N1 use the marker "*I mean*" to signal a repair. A4, N3 and N4 signal their repair using a question. A4 and N3 direct their question to the Researcher while N4 first directs the question to himself and then to the Researcher.

Another type of repair used was circumlocution, in which a paraphrase or description of a word is used when a word is unknown. Of the self-repairs made using circumlocution, the ADHD group made 70.8% and the Non-ADHD group made 29.2%. The following episodes illustrate circumlocution by participants in each group.

Researcher: *What is that thing in there? [The Researcher points to a Lego piece in A1's hand]*

A1: *Ahh, a telephone type thing.*

Researcher: *Ahh, okay.*

A1: *So she can talk to him.*

A1: *He has the thing that he doesn't have, the telephone, he has that.*

A1: *I think he has a telephone, though.*

Researcher: *Oh, what do you call that again? [Researcher points to a Lego piece]*

A3: *The windows.*

A3: *You known, like a little glass window over a space helmet.*

Researcher: *Yeah, okay.*

Researcher: *What is that? [Researcher points to Lego piece]*

A4: *Dis is supposed to be a laz^ ah^ light thing that goes^ that has lights.*

Researcher: *What would you call it? This, what would you call that? [Researcher points to Lego piece]*

A4: *Umm, a life guard sitter.*

N1: *And this tower, the tower thingy.*

N4: *She couldn't have^ you didn't have time to cour^ but if it was somebody^ but if it was two bully^ two bullies after someone then she'd probably climb down and s^ or she'd probably just speak it out.*

Researcher: *Oh, right and what might that be? [Researcher points to a sticker depicting a life preserver]*

N5: *I don't know.*

Researcher: *It's just there.*

A5: *Some life.*

Researcher: *Oh, right.*

A5: *One of those life tubes or something.*

These episodes illustrate different ways circumlocution was used. A1 and N1 use the pronoun "*thing*" or "*thingy*" to describe a walkie-talkie and lifeguard stand respectively. A3 and A4 provide interesting descriptions of the objects they are trying to name. A3 describes the visor on a helmet as " *a little glass window over a space helmet*". While this may be considered an accurate description of a visor, A3 uses eight words to describe a single word. A4 begins to pronounce the word "laser" but, describes it instead as a "*light thing*" that "*has lights*". This description expresses the functional quality of the laser. Similarly, A4 describes the lifeguard stand as a "*life guard sitter*". This is precisely the

function served by the stand (i.e., a place for the life guard to sit while observing the water and swimmers). N1 describes the stand according to its size (i.e., "*the tower thingy*"), which is another qualitative aspect of the object. N4 describes a megaphone in terms of its functional use. His use of "*she'd probably just speak it out*" refers to the probability that the lifeguard would use the megaphone to talk to the bullies while remaining seated on the stand. Similarly, N5 describes a life preserver in terms of a "*life tube*" which reflects the one of the functions of the object, namely to save or preserve someone's life; in conjunction with its shape, it is a round tube. The circumlocution used by the participants appears to reflect a general pronoun "thing" to indicate an object and/or descriptions of some functional aspect of the object either as a physical attribute, such as shape and size, or by its use, such as an object to sit upon or to talk into so others can hear the speaker.

Table 22 shows the percentage distribution for the types of self-initiated repairs for both groups. There were substantial differences between the two groups.

Table 22

Percentage of Self-Repairs by Type

	ADHD		Non-ADHD	
	%	N	%	N
Syntactic Form	41.1	72	62.9	232
Repetition	49.1	86	35.2	130
Circumlocution	9.7	17	1.9	7
Total	100	175	100	369

The most common type of self-initiated repair used by the ADHD group was repetition, followed by changes to the syntactic form and circumlocution. The Non-ADHD group used changes to the syntactic form the most frequently, followed by

repetition and circumlocution. The ADHD group appeared to have more difficulty repairing longer strings of words in phrases and sentences than did the Non-ADHD group. A less frequent repair strategy involved the speaker identifying a problem using discourse markers.

Other-Initiated Repairs

The other conversational partner (viz., the Researcher) also identified repairs. There were fewer instances of these types of repairs than the self-initiated ones. Other-initiated repairs did, however, indicate a breakdown in the communicative act. The following illustrate the types of other-initiated repairs:

A5: *I'm trying to, from here. [A5 looks at the instructions and taps his finger on the table as he speaks to indicate 'here']*

Researcher: *Umhum.*

A5: *I'm trying to find out what I can do to make it without using the con^con^con^ [18 second pause – A5 looks at his hands resting in the table] ahh, constructions.*

Researcher: *structions.*

A5: *Instructions.*

Researcher: *Yes, good for you.*

This episode demonstrates how a listener may support the speaker's attempt to find a word. A5's three repairs of the first syllable "*con*" suggests that he has identified the problem area but is unable to remedy it. The 18-second pause is a very long time in a conversation between two people. This long pause indicates the struggle A5 has to find the desired word. He uses the marker "*ahh*" to indicate a resolution in the word

"*constructions*". The Researcher, however, does not repeat the first syllable "con" but utters the last two syllables "*structions*". This suggests that the Researcher has understood A5's problem area and offers his support in the form of the last part of the word. A5 is able to use the term "*structions*" and add the missing first syllable "in" to form the word "*instructions*". This is the word A5 was trying to say in the first place.

It is not apparent from this episode whether A5 was trying to express an unknown word or had a temporarily forgotten a known word. Prior to this episode, A5 had been using the instructions to guide his model building but neither he nor the Researcher had actually said the word "instructions". About two minutes before this episode, the Researcher asked A5 about his problem-solving strategies and A5 replied: "*Hum, well, I knew^ keep on having to look at the^ [A5 points to the instruction booklet on the table in front of him]*". It may be that not expressing the word, while using the object, may have contributed to A5's difficulty in finding (or recalling) and expressing the word "*instructions*". After this episode, A5 said the word "instructions" two more times (the Researcher said it three more times). This suggests that once the word "instructions" was in A5's lexicon; it was available to be used and was used. Prior to saying the word "instructions", it was a known and used object but not apparently readily available in A5's lexicon and thus he had difficulty retrieving the word.

A4 demonstrates another condition for other-initiated-repairs. In this episode, A4 had commented that he was unsure of the placement of a Lego piece because the picture on the Lego box showed only one side.

Researcher: *Why would they only give you one side on that picture?*

A4: *Because it's a picture like of a like a car like cartoon have.*

Researcher: *What do you mean by cartoons?*

A4: *I don't know.*

Researcher: *I don't quite follow, but anyway.*

Researcher: *So, you hafta take a guess about what's on the other side, right?*

A4: *Null.*

In this episode, a breakdown occurs because A4 identified a problem building the Lego model. He knew a Lego piece was located on one side, shown in the picture on the Lego box, but hesitated putting the piece on because there was no picture to guide the building for the other side of the model. A4 did not appear to realize that the model was symmetrical and thus it was not necessary for the picture to depict both sides of the model; the parts located on the left side were located in the same position on the right side of the model. The response given by A4 was apparently unclear and the Researcher attempted to clarify the underlying proposition, thus repairing the conversation. A4's response did answer the Researcher's question ("*I don't know*") but did not clarify his proposition. The Researcher expressed his lack of understanding (a discourse marker for A4) and re-stated his question. A4 did not respond to the Researcher's question. Thus, A4's response effectively ended the Researcher's quest for clarification. In this episode, the other-initiated repair was not successful in clarifying the topic and the topic ended and a new one was introduced.

The other-initiated repairs by the Researcher consisted of contributing parts of a word a participant was attempting (e.g., "*structions*" for the word "*constructions*") and asking questions to clarify his understanding. The other-initiated repairs often allowed the topic to proceed, but other times the repairs were unsuccessful in maintaining the topic.

Abandoned Utterances and Null Responses

Another form of breakdown occurred as the result of abandoned utterances and null responses although both were infrequent. The ADHD group, as a percentage of total utterances, abandoned 0.64% of their utterances (n = 13) while the Non-ADHD group abandoned 0.33% of theirs (n = 6). The ADHD group made null responses (or failed to respond to the Researcher's questions) in 3.3% of their utterances (n = 67) while the Non-ADHD group failed to respond in only 0.4% of their utterances (n = 7).

In an abandoned utterance, the talk either stops abruptly or fades out into silence. The repair strategy for abandoned utterances was, either the speaker continued to speak after the pause to maintain the current topic or to introduce a new one, or the abandoned utterance created an opportunity for the listener to take his turn-at-speaking.

The ADHD group accounted for 90.5% of all the null responses (n = 74) for both groups across all sessions while the Non-ADHD group accounted for only 9.5%. Failure to respond to questions created a breakdown in the topic and the conversation. The options available to the Researcher were to attempt repairs by pursuing the topic with follow-up questions, ignore the null response and continue to make his own response, or end the topic. For example:

A2: *What does this part go do? [Request for Information – Initiate Topic - A2 looks down at his chair]*

Researcher: *I don't know. [Response to Request for Information – Extend Topic]*

Researcher: *What do you think that is, anyway? [Request for Information – Extend Topic]*

A2: *Null Response. [A2 stands up in front of his chair]*

Researcher: *What do you think that part could be? [Request for Clarification – Maintain Topic – A2 looks at the model on the table in front of him]*

A2: *Null Response.*

A2: *I did it on the wrong part. [Statement of Directly Observable Events/Objects – Initiate Topic]*

The Researcher answers and re-phrases A2's question to which A2 does not respond. The Researcher re-phrases his question again, and again A2 does not respond. The topic regarding identification of a Lego part ends when A2 introduces another new topic (i.e., the discovery of a building error). A2's null responses, in effect, avoided the topic and the subsequent repairs presented by the Researcher. For A2, failing to respond to the Researcher's question was the most common strategy. During the study he made one repair by changing syntactic forms and he failed to respond to questions 17 times. In this episode, it is not clear whether A2 simply didn't "hear" the Researcher's question because his attention was focused on the model or he did hear the question but chose to ignore it. There was, however, another episode in which A2, at first, appeared to ignore a question. For example:

Researcher: *So, what do you think you're going to do about that one? [Request for Information – Extend Topic]*

A2: *Null Response. [6-second pause – A2 looks down at the table]*

A2: *Hum. [Response to Assertive – Maintain Topic – A2 looks at the instructions]*

A2: *[5 second pause – A2 shrugs his shoulders]*

A2: *I don't know. [Response to Request for Information – Extend Topic]*

A2: Maybe we're gonna hafta put it right here. [Statement of Directly Observable Events/Objects – Extend Topic]

It appeared at first that A2 did not hear the Researcher's question given the relatively long pause between the question and any kind of response. There was an 11 second pause between the Researcher's question and A2's response to that question. It may be that A2 was considering his options when he was looking at the instructions. This suggests that participants chose to answer some questions while ignoring others, perhaps because they were attending to other stimuli. In this case, it was obvious that A2 understood the Researcher's question, so understanding the question was not an issue.

Summary of Strategic Competency

Breakdowns in communication occurred under three conditions: self-initiated repairs, other-initiated repairs and abandoned utterances and null responses. It is interesting to note that communications broke down during self-initiated and other-initiated repairs, precisely so the participants could make repairs to make the communication more effective. Thus, breakdowns were, in these cases, actually not breakdowns but attempts to improve the communication by temporarily stopping communication. Abandoned utterances and null responses, however, were breakdowns in communication.

The ADHD group most often used repetition to self-repair their utterances, while the Non-ADHD group most often made changes to the syntactic form. The Researcher initiated repairs by contributing words or syllables for the participant. Abandoned utterances and null responses were breakdowns that provided opportunities for

participants to choose to repair their utterance and maintain the topic, take their turn-at-speaking, or introduce a new topic.

Chapter 7

DISCUSSION and CONCLUSIONS

This section discusses the findings within the context of the research questions posed for this study. The research questions, stated in Chapter 5, will be answered in two parts. Two questions, a) "How do the ADHD and Non-ADHD participants compare in their communicative competency within the study context?" and b) "What is the nature and extent of any observed differences in the communicative competency of the ADHD and Non-ADHD participants?" will be addressed in one section. The final research question, "What aspects of language may affect the communicative competency of children with ADHD in the classroom?" will be addressed in a separate section.

In Chapter 3, communicative competency was described as the amalgamation and synthesis of four components. These components function in unison to frame a system of "knowledge and skill required for communication" (Canale, 1983, p. 5). Like an onion, communicative competency may be viewed as different layers that move from the external to the internal; from the most visible to the more imperceptible.

Grammatical competency is the outer layer. It consists of the language features that are most readily visible (viz., phonology, morphology and syntax). As more layers are peeled back, subtle and qualitative shifts occur. In grammatical competency, this shift was found to occur in the semantic aspects of the language. The sounds of the words and their sequencing into sentences have meaning. From the sounds of the language and ordered words, semantics, or meaning, emerges. The meaning arising from the grammatical aspects of language connects to another qualitatively different layer.

Sociolinguistic competency links the grammatical aspects to the social context and shifts communication to another level of abstract meaning. In addition to the grammatical structures and meaning, speakers and listeners must now also inculcate social norms and meaning. This represents movement to increasingly more abstract aspects of communicative competency. Discourse competency is an even more abstract layer connecting the grammar to social contexts to different forms of verbal and non-verbal discourse. Strategic competency is infused through all the layers by providing strategies that compensate for breakdowns in communication. The essential nature of communicative competency is revealed by progressively moving from the outer, visible layers to the inner, more imperceptible abstract layers. This discussion, like the analysis of the participants' communicative competency, moves from the outermost layers to the innermost ones. Appendix L presents a concrete example of the interrelationships among the four components of communicative competency.

Comparison of the Groups and the Nature of Observed Differences

Overall, on the surface, the ADHD group was remarkably similar to the Non-ADHD group within the study context. Participants in both groups completed the research tasks in the Introductory, Building, Instruction, Play and Ending phases of the study. Both groups of participants responded to the Researcher's questions, asked questions and were otherwise fully engaged in the study. The conversational interaction between the participants and the Researcher appeared, at the time, appropriate. The Researcher had expected the ADHD participants to demonstrate higher levels of activity that might disrupt the session. This expectation was based on his review of the literature (e.g., APA, 1994; Barkley et al., 1983) and his first impressions when meeting the ADHD

participants in their homes. This expectation for higher levels of disruptive behaviour by the ADHD participants was not met. The ADHD participants were as active, or passive, as were the Non-ADHD participants. In all of the 10 sessions, only one participant from the Non-ADHD group (N3), showed higher activity levels than did the other participants. In one instance, N3 left his chair and moved around the table to stand in front of the camera and look directly into the one-way mirror. This occurred near the end of the session. N3 had demonstrated a previous tendency to move around by standing next to his chair and moving along the table to his left as he built the Lego model.

The Researcher's field notes (which he completed after each session) showed no disruptive behaviours, with the exception of N3, nor any conversational interactions that might be considered inappropriate or noteworthy. Yet, something about the interactions with the ADHD participants appeared, to the Researcher, to be peculiar.

Grammatical Competency

Grammatical competency examined the participants' use of the phonological, morphological, syntactic and semantic features of the language and their ability to manipulate these to form words and phrases. The two groups were comparable for general levels of language production, phonology, morphology, and syntax.

The comparable level of language production within the study context appears contrary to previous findings (e.g., Barkley et al., 1983; Zentall, 1988; Zentall, et al., 1983) and the description in the DSM-IV (APA, 1994). In Chapter 3, two factors affecting language production were identified: medications and task structure. Medications reportedly reduce the amount of talk produced by children with ADHD (Barkley et al., 1983; Swanson, et al., 1993; Hoagwood et al., 2000). Three of the ADHD

participants (A2, A3 and A4) were reportedly on their usual medication schedule on the day of the study. The MLU and Syntactic Complexity scores for A2, A3 and A4 were similar to those of the other participants. Thus, the demonstrated levels of language production by the medicated ADHD participants in this study were consistent with the language production for all participants. The effects of medication on the language production of the medicated ADHD participants did not appear to be a substantive factor in this study.

The literature also indicates that task structure can influence language production. The literature showed that unstructured tasks and conditions tended to elicit more talk than did structured tasks and conditions (Cunningham & Siegel, 1987; Lorch, et al., 1999; Roberts et al., 1984; Sanchez, et al., 1999; Zentall, et al., 1983). In this study, the task structure and conditions were designed specifically to facilitate the participants' talk. The creation of supportative tasks and conditions was based on a synthesis of the findings from a range of research studies. The task, building a Lego model, was selected to be intrinsically meaningful to the participants (Bredekamp & Copple, 1997; Cambourne, 1988, 1995; Gilles, et al., 1988; Wortham, 1998). The selection of the Lego model was based on the findings that novel, brightly coloured, and moveable stimuli tend to draw and keep the attention of all children (Butter, 1987; Zentall, 1989). Children's "motivation" and "performance" of the research task is enhanced by immediate reinforcement (Tripp & Alsop, 1999). In this study, the immediate rewards were the snack (selected by the participants) and the Lego model, which the children were permitted to keep. This suggests that the study conditions were an important factor enabling language production, even in the presence of medication.

Overall, the participants produced over 3,800 utterances. This relatively high level of language production provided a rich source of information for a comprehensive examination of communicative competency. It also provided some confidence that the language demonstrated in the study is representative of the children (in a similar environment).

The phonological analysis showed that all participants demonstrated appropriate competence in producing the sounds of the language. At the phonological level, the groups were indistinguishable. In contrast, Javorsky (1996) found significant group differences on measures of phonology, indicated by scores on subtests of the Woodcock-Johnson Psycho-Educational Battery. Javorsky used a battery of seven standardized tests to evaluate the comorbidity of ADHD with language learning disabilities. The differences between the conditions created in this study and those in Javorsky's suggest that standardized tests, while useful tools for some applications, may be limited in their analytic power and ability to detect the subtleties in language.

The morphological analysis showed similarities in the participants' use of personal pronouns, pronouns, verbs, and adverbs. In this study, both groups showed very similar type-token ratios for personal pronouns, pronouns, verbs and adverbs. With respect to these parts of speech, none of the participants attained the 0.50 level indicating "normal" lexical diversity (Fletcher, 1985). Only verbs came the closest to the 0.50 level for both the ADHD group (TTR= 0.31) and the Non-ADHD group (TTR= 0.31). All the other parts of speech were well below the 0.50 level. This suggests, using Fletcher's "yardstick" of 0.50, that the lexical diversity for both groups for these parts of speech was not "normal". It indicates that the participants tended to use the same words more often.

For personal pronouns, the low TTR for the ADHD (0.05) and the Non-ADHD (0.03) groups may be explained, in part, by the number of lexical items available. In the English language, there are 31 personal pronouns distributed across 1st, 2nd, and 3rd persons. When speakers refer to the people involved in the act of communication (e.g., *I* includes the speaker or writer of the message), their lexical choice is limited by the selection of 1st, 2nd or 3rd person personal pronoun. Thus, the narrow lexical range for personal pronouns is influenced by the very structure of the English language. Similarly, the participants' use of pronouns is, again, impacted by the number of lexical items in the English language that are pronouns. There are more pronouns than personal pronouns and this is reflected in the higher TTR for both groups (i.e., 0.13).

There are more verbs in the English language than personal pronouns and pronouns combined. The participants' TTR for verbs indicates that their lexical diversity was closer to "normal" but still below the 0.50 mark. The participants had more different types of verbs in their lexicon, and thus, available to be used, which they did. Similarly, adverb use showed higher TTRs than pronouns or personal pronouns but was still below the 0.50 mark. There may have been restrictions on the range of verbs and adverbs related to the nature of the task, the types of questions the Researcher asked, and the nature of the interaction that may account for the relatively narrow lexical diversity in verbs and adverbs shown by the participants.

The syntactical analysis of clause and phrase structures showed similarities in the ways participants combined words into larger units. The research literature does not directly address the syntactic structures of children with ADHD. However, the studies by Purvis and Tannock (1997) and Tannock et al., (1993) imply that children with ADHD

may have difficulties at the clause, phrase or word level. The results of this study do not support this implication.

The semantic analysis showed overall similarities under the category "Contextual Meaning". The analysis of contextual meaning looked at the ways participants related context to lexical meaning. Two aspects, referencing and perspective-taking, were examined. The influence of context (referencing) was examined by looking at words with shifting referents, such as nouns, pronouns and personal pronouns, that is, words that make reference to something else for their interpretation. All participants used words with shifting referents without providing the listener with an anaphoric or shared reference to clarify the meaning of the referent, but the ADHD participants exhibited higher frequencies. Both Purvis and Tannock (1997) and Tannock et al., (1993) also reported higher frequencies of ambiguous references by children with ADHD. Clear references allow the listener to follow the speaker's utterances that clearly link the context to the speaker's propositions. Vague or ambiguous references that do not make the relation between the context, the lexical meaning and the underlying proposition obvious are more likely to be misunderstood by the listener. Luria (1982) observes that "comprehension is always aimed at searching for the context of an utterance" (p. 170). When references to the context are missing or vague, the result may be a breakdown in the communication or an unfortunate misunderstanding. Purvis and Tannock (1997) point out that ambiguous references can result from a "failure to take into account the needs of the listener" (p. 141). This study, consistent with Purvis and Tannock, found that one source of ambiguous references was failure to take into account the listener's perspective.

Perspective-taking was examined by looking at the participants' use of deictic terms regarding person, place and time. In general, the groups were similar in their use of person and aspects of place deixis. Both groups used the 1st person personal pronouns the most frequently, followed by the 3rd person and the 2nd person. While some aspects of perspective-taking are addressed in the research literature (e.g., Purvis and Tannock, 1997), aspects of person and place deixis are not directly addressed.

The similarities in language production, general levels of grammatical complexity, phonology, aspects of morphology, syntax and aspects of semantics suggest that, in terms of the language development milestones discussed in Chapter 2, all participants appear to fall within the range of typical language development for similar aged children.

At the level of grammatical competency, differences in the participants' morphological structures were evident. The ADHD group used slightly more personal pronouns and pronouns than did the Non-ADHD group. The Non-ADHD group also showed more variation in their use of common and proper nouns and verb forms. They also showed more frequent use of common and proper nouns, personal pronouns, verbs and adverbs than did the ADHD group. Underlying this finding is a connection to the participants' vocabulary. Given the inherent relationship between words, meaning, thinking and speaking described by Vygotsky (1934/1987), vocabulary size and development have important implications for conveying meaning. Crystal (1981a) points out that vocabulary size, taken in isolation, tells only part of the story. More important questions of how well a child uses a word, in what relation to other words and in what kinds of situations are left unanswered by measures of vocabulary size alone. However,

underlying vocabulary size is the development of morphological skills that provides the foundation for learning new words and learning words from context. Vocabulary is an important, albeit partial, aspect of language development. There is also an assumption that children with larger vocabularies have a larger pool of words to draw from in which to express their thoughts more effectively. This is the assumption underlying types and tokens for TTR. The Non-ADHD group used more types of common and proper nouns and verbs. This indicates that the Non-ADHD group exercised their lexical choices more often than did the ADHD group.

The syntactic analysis showed the Non-ADHD group had greater variability regarding the Index of Productive Syntax (a general measure of grammatical complexity). The analysis of clause and phrase structures showed a tendency for the Non-ADHD group to use slightly more complex clause and phrase structures.

In the semantic analysis, substantial differences between the two groups began to emerge. The analysis of lexical meaning showed that the ADHD participants substituted pronouns for an object's name more often than did the Non-ADHD participants. The analysis of contextual meaning looked at the ways the participants related context to lexical meaning regarding reference and perspective-taking. The ADHD participants had more instances of failing to provide anaphoric or shared situational references than did the Non-ADHD group. The ADHD group tended to use nouns, personal pronoun and pronouns without the benefit of appropriate references to link the word to the context. The ADHD participants had more difficulty distinguishing between a and an to make clear references. The problems with the articles *a* and *an* created an underlying disjunction between the article and the word. When the Researcher heard a certain article,

such as *a* there was an expectation that the word which followed would be concordant with the article. For the ADHD participants, the article and following word were not always concordant. The articles used by the participants provide the listener with a specific marker or signal that changes with the next word. There was a multiplier effect in which over a number of utterances and topic changes the disjunction between the article and the following words distracted the listener away from underlying propositions and shifted the listener's attention to the disconcordance between the article and the word it was intended to modify. The flow of the conversation was thus interrupted.

The ADHD group tended to interrupt more often to complete the Researcher's utterance. All of the ADHD participants appropriated the Researcher's propositional and grammatical structure to make their predication about the completion of his utterance. In contrast, one Non-ADHD participant inferred his predicted sentence completion from the Researcher's utterance rather than using the Researcher's explicitly stated proposition or structure. This suggests that the ADHD participants were more dependent upon the Researcher's propositional and grammatical structure than were the Non-ADHD participants. The tendency of the ADHD participants to be more dependent upon the Researcher was a pattern that was repeated and elaborated in the other components of communicative competency.

The analysis of place deixis showed that the ADHD participants tended to link the deictic terms *this* and *here* with physical actions such as pointing to the object, holding the object up for the Researcher to view, or demonstrating either with the object or through body motions. Within the immediate context of the study, the connection between the deictic term and the object was clear and did not interfere with the flow of

the topic. But without the situational context, meaning is not clear. The linkage between deictic terms and physical action also indicates a connection between the context and the language of the ADHD participants. The ADHD participants tended to show more direct and immediate connections between their actions with objects and words than did the Non-ADHD participants. This suggests, consistent with their tendency to appropriate the Researcher's propositional and grammatical structure to complete his utterances, that the ADHD participants were more bound to their context than were the Non-ADHD participants. Similar to the pattern found in the analysis of referencing, the ADHD participants also tended to use deictic terms without anaphoric or shared situational references for the listener.

There were substantial differences revealed in the analysis of time deixis. The ADHD group made twice as many references to the present time, indicated by the word *now*, than did the Non-ADHD group. The Non-ADHD made more references to the past and future than did the ADHD group. The ADHD participants' use of the present time, again, indicates a closer connection to the immediate context within a time frame that was in the "here-and-now".

Barkley (1995) suggests that children with ADHD have an altered sense of time. He argues that ADHD is an "impairment in inhibiting behaviour and waiting for responding" (p. 47). In short, children with ADHD have difficulties delaying or inhibiting a response to a signal, message or event they experience and their reaction or response to it. The ability to delay or inhibit a response, according to Barkley (1995) provides the foundation for separating feelings from facts, creating a sense of the past and the future, using self-talk to control behaviour and the ability to divide incoming messages into parts

(analysis) and recombine those parts into new outgoing messages or responses (synthesis).

The ability to delay a response, according to Barkley (1995), means that an event is kept "actively alive in our mind for some time after the event has past" (p. 46). This allows us to think about the event and compare it with our past experiences, from which emerges a sense of our personal history. Our references to the past allow the past to guide our responses to events in the moment. Thus, according to Barkley, our past learning guides our current behaviour.

The ability to refer backward to the past also enables us to look forward to the future to make "educated guesses about what will happen next because we have thought about our past and used it to construct a guess about the future" (Barkley, 1995, p. 47). Referring backward to the past and forward to the future creates a mental window on time. Barkley argues that children with ADHD have a narrow window on time because of their difficulties inhibiting a response. That is, according to Barkley, children with ADHD "respond too quickly to refer to their past experiences and consider what those might teach them about the present events" (p. 47). Consequently, they are less prepared for the future and "they are likely to carom through life, from crisis to crisis" (Barkley, 1995, p. 47).

Barkley (1997) presents an elaborated model of his earlier ideas in which he uses his model to predict deficits associated with ADHD. With respect to time, Barkley's model predicts that, "discourse with others should reflect fewer references to time, the past and especially the future" (p. 78). The findings in this study are consistent with the predictions of Barkley's model regarding references to the past and to the future. The

ADHD participants did make fewer references to the past and to the future than did the Non-ADHD participants. However, contrary to Barkley's model, the ADHD group overall made slightly more references to time across all the temporal categories than did the Non-ADHD group.

While this study did not examine the ADHD participants' ability to delay or not delay a response, there are indictors suggesting that factors other than deficits in behavioural disinhibition may be at work here. The overall similarities between the two groups on several measures of communicative competency suggest that problems with abstraction, and higher level cognitive functioning appear to be more salient rather than behavioural disinhibition.

The concept of time is an abstract one. It is at a stage in the development of abstract thinking that depends on logical memory (or the "rooting stage", see p. 38) to make internal connections to internal operations. The ADHD participants in this study appear to need (at least functionally) concrete objects to assist in the link to internal operations. For example, the ADHD participants tended to link physical actions with deictic terms suggesting a focus on the "here-and-now". They also expressed more conceptual domains related to the "here-and-now" (see discussion below). The ADHD participants tended to be more focused on physical, concrete activities and this focus was reflected in their language. Abstract concepts and the process of abstraction in general appeared to be more difficult for the ADHD participants than for the Non-ADHD participants.

In terms of Vygotsky's four stages of development from the external to the internal, the ADHD participants appear to be located at Stage 3, in which the child solves

internal mental tasks on the basis of external signs. The Non-ADHD participants tend to solve internal mental tasks using internal signs represented by Stage 4, the "rooting stage". The close connection shown by the ADHD participants to the external signs in the immediate context suggests that the difficulties they appear to have with time may be accounted for by looking at their level of development in terms of abstractions rather than their behavioural disinhibition.

The analysis of conceptual domains also showed substantial differences. The ADHD group used adverbs to express primarily *Location* and *Temporal* domains, whereas the Non-ADHD group expressed *State-Quality* and *Temporal* domains more often. The ADHD participants used adverbs expressing specific locations within the study room (e.g., "*here*" and "*there*") or general locations still within the study room (e.g., "*somewhere*"). Similar to the findings regarding time deixis, the ADHD participants also expressed temporal relations using the word "*now*" to express an action or thought occurring within the immediate study context. The Non-ADHD group used adverbs to express more abstract relations regarding *State-Quality* that intensified or added a qualitative aspect to the meaning of a verb or verb phrase.

The ADHD group used adjectives to express domains related to *Sensory* and *Logical* qualities more than did the Non-ADHD group. These domains expressed characteristics about objects in the study context, such as sight, size, number, and condition. The Non-AHD group expressed relations of *Affective* qualities and *Relations*, and particularly *Judgments*, more than did the ADHD group. These domains expressed more abstract relations regarding feelings, opinions, beliefs or evaluations. In their use of adjectives to express conceptual domains, the ADHD participants tended to express

relations to objects that could be seen and counted rather than domains requiring more abstract connections, such as comparisons.

The major differences in the groups' use of main verbs was for the domains *Action with Object* and *Sensory Stative*. The ADHD participants expressed more verbs related to actions with objects than did the Non-ADHD participants. The Non-ADHD participants expressed more verbs related to *Sensory Stative* concepts than did the ADHD participants. The *Sensory Stative* domain included verbs related to passive sensory experiences such as *hear*, *see*, and *know*. The pattern for verbs was similar for the other concept domains. The ADHD group tended to talk about objects while the Non-ADHD group tended to talk about more abstract concepts.

It is interesting to note that both groups were almost identical in their expression of nouns. One explanation may be the way in which the nouns were coded as animate, inanimate, concrete, abstract, count and noncount. These categories may have been too broad and may not have captured the subtle nuances to distinguish different types of nouns. Another explanation may the nature and influence of the study task. That is, building the Lego model provided the participants with a set of concrete objects that were common to all participants. All participants referred to these objects throughout the study. Alternatively, the similarities between the two groups may reflect the more direct connection with persons, places or things (nouns) within the study context.

The analysis of the participants' grammatical competency showed that the ADHD participants tended to focus on their immediate activities in the "here-and-now". The Non-ADHD participants, while also in the "here-and-now", also conveyed more abstract

concepts. The participants' skills in these aspects of grammatical competency provided the foundation for expressing their sociolinguistic competency.

Sociolinguistic Competency

The sociolinguistic analysis looked at the ways utterances are understood. The focus of this analysis was the extent to which communicative functions are appropriate within a given sociocultural context. Overall, all participants demonstrated generally appropriate sociolinguistic competency within the study context. That is, the participants' mean percent of assertiveness across the entire study was approximately 42% for the ADHD group and 35% for the Non-ADHD group. Given that 50% was the level of symmetry, the participants, generally, were not conversationally assertive by dominating the conversation (as indicated by percentages well over 50%). They expressed levels of conversational assertiveness appropriate to the different phases in the study. The issue of conversational assertiveness is not directly addressed in the research literature. The research literature does, however, indirectly provide insights into the assertiveness levels of children with ADHD. The DSM-IV describes the hyperactive symptom "often talks excessively" and the impulsive symptoms "blurts out answers before questions have been completed", "often has difficulty awaiting turn", and "often interrupts or intrudes on others" that are similar to the concept of conversational assertiveness. These four symptoms may be associated with elevated levels of conversational assertiveness. However, the meaning of the term "often", in the DSM-IV description, as an indicator of the magnitude of the symptom depends on the situation. "Often" in some situations could mean assertiveness levels at or above the 50% mark or in other situations, as in this study, assertiveness levels below the 50% mark that appear to be appropriate for the situation.

Zentall et al. (1983) reported that children with ADHD were more verbally and nonverbally active during listening tasks and during transitions between study tasks by making exclamations, interruptions and commands. This finding describes the ADHD children's manifest behaviours, which are indirectly associated with levels of physical assertiveness; it also implies that the children with ADHD were more conversationally assertive by making exclamations, interruptions and commands. Cunningham and Siegel (1987) found that children with ADHD were, generally, more controlling, less cooperative and more likely to violate situational rules than the Non-ADHD controls. Cunningham and Siegel's finding is more directly associated with levels of conversational assertiveness than is Zentall et al's. Children who are more controlling may also be more controlling linguistically as well as behaviourally. However, Cunningham's and Siegel's finding that children with ADHD were more likely to violate situational rules was not supported in this study.

Just as the study conditions were a substantive factor promoting language production, they also supported the participants' sociolinguistic competency. The informal and relatively unstructured study conditions, in conjunction with a task the participants found intrinsically motivating and rewarding, were important factors in the generally appropriate levels of conversational assertiveness observed in this study.

All participants generally responded to the Researcher's questions and statements, thereby maintaining and extending the conversational topics. On the surface, the participants could, and did, carry on a conversation while engaged in other activities. The participants' demonstrated ability to carry on a conversation also indicated an associated ability to adjust their behaviour according to changes in the sociocultural context. That is,

as the topics and tasks for the phases changed, the participants adapted and made corresponding changes to their conversation. This indicates that the participants were, at some level, monitoring the situation and adjusting their behaviour and communication levels accordingly. At a general level, this finding appears somewhat contrary to research studies showing that children with ADHD do not monitor their conversations (e.g., Giddan, 1991; Purvis & Tannock, 1997; Tannock, et al., 1993; Westby & Cutler, 1994).

Differences between the groups were found in the two aspects of sociolinguistic competency that were examined: the influence of the situational context and the conversational interaction.

The findings regarding the influence of the situational context showed that the ADHD group maintained the pattern that first emerged in the analysis of grammatical competency. The ADHD group continued to show evidence of their context-boundedness. The ADHD group made twice as many statements about events and/or objects directly observable (ASCO) in the study room. A significant modification to Fey's (1986) definition of ASCO was made. Fey's definition included events and/or objects that could "potentially" be directly observed but did not necessarily have to be in the immediate context. In this study, ASCO was re-defined to limit the directly observable events/objects to the immediate situation. This modification allowed for an obvious separation between "potentially" observable and "directly" observable events and/or objects. On the basis of this definition of ASCO, the ADHD group made more statements that clearly linked them directly to the immediate sociocultural context. This definition also clarified the situational focus of the Non-ADHD group. The results show this group made more statements about events and/or objects that were not directly

observable in the study room. The Non-ADHD group showed less dependence on the immediate context than did the ADHD group.

The pattern of context-boundedness displayed by the ADHD group was also reflected in their choice of conversational topics. The ADHD group tended to talk about events and/or objects with which they had direct personal experience. The psychological distance, with the speaker being the center, of the ADHD group's topics was closer to the speaker than was the distance indicated by the topics chosen by the Non-ADHD group. This is a further indication of how the ADHD group maintained their focus on the immediate and personally relevant situation through their choice of statements and topics.

The conversational interaction with the ADHD participants was different than that of the interaction with the Non-ADHD participants. The ADHD group was less responsive to the Researcher's questions and had a higher percentage of null responses than did the Non-ADHD group. One explanation for this finding could be that the ADHD participants were distracted by their activities during the session and thus were not paying attention. However, the conversational assertiveness levels of both groups across all the study phases were similar indicating that all participants were monitoring the conversation, at least on some level, and were paying attention to the sociocultural context. In each phase there was a different activity focus. All participants were engaged in a variety of hands-on activities that helped maintain their interest and focus during the study. The ADHD participants consistently showed lower responses to the Researcher's questions and more null responses regardless of their activities. Distraction does not appear to account for the lower response levels in this study. An alternative explanation may be that the ADHD participants did not hear the questions. There were, however,

several instances in which the ADHD participants answered the Researcher's question some time after he asked it (in one case 2 minutes later). This suggests that the ADHD participants did hear the Researcher's questions but chose not to respond. A third alternative may be that the ADHD participants were engaged in selective responding. That is, when they were engaged in a specific activity, such as building, and the Researcher asked a question, they chose to respond or not to respond depending on the immediate situation, such as the specific question asked by the Researcher (e.g., ones requiring a yes/no response versus ones that required a longer, narrative response), or their level of concentration on the task at that particular moment. Thus, the ADHD participants chose to respond depending on various situational and personal factors at that moment.

When the ADHD participants did respond to the Researcher, they tended to make more statements or comments that extended the topic and fewer statements that maintained the topic than did the Non-ADHD participants. This suggests that the ADHD participants were generally paying attention to the conversation and were monitoring the Researcher's utterances as well as their own in order to contribute to the maintenance of the conversation. However, masking the ADHD participants' ability to conduct a conversation were the contributions of the Researcher. The Researcher contributed more to maintain the conversation than did the ADHD participants. The evidence for this situation is seen in the types of statements the ADHD participants made to maintain the conversation. The two most frequently made statements were responses to the Researcher's statements (RSAS) and responses to the Researcher's questions (RSIN). This indicates that the ADHD group were able to maintain the conversation primarily by

responding to the Researcher's statements and questions. This meant that the bulk of maintaining and extending topics was done by the Researcher. This conversational support allowed the ADHD participants to focus on other aspects of the conversation, such as introducing new topics. The combination of the Researcher's conversational support and the influence of situational and personal factors appeared to support the ADHD participants' communicative competency. The result is that, at a general level, they maintained the conversation within the study context.

When the ADHD participants made their statements they tended to interrupt the Researcher more than did the Non-ADHD participants. This finding is consistent with the research literature (APA, 1994; Cunningham & Siegel, 1987; Zentall et al., 1983). When the ADHD participants interrupted they did so primarily to initiate a topic. This suggests that when topics came to mind, the ADHD participants would, impulsively, start a new topic regardless of the topic currently being discussed. This is also consistent with the research literature regarding the impulsive behaviour of children with ADHD (APA, 1994).

When the ADHD participants did interrupt they did so to make statements about events and/or objects that were directly observable in the study room. This suggests that the objects and activities in the room provided stimulus for the immediate introduction of a new topic. The tendency for the ADHD group to interrupt to initiate a topic appears contrary to previous findings that they were monitoring the conversation and were able to maintain and extend the conversation. It may be that the ADHD group, similar to their selective responding, also engaged in selective monitoring. This suggests that, depending upon the stimuli in the immediate situation, the ADHD participants "tune-in" to or "tune-

out" the stimuli to which they attend. Alternatively, the selective responding and monitoring may be a type of coping mechanism developed by the ADHD participants. That is, when an ADHD participant "tuned-out" and missed some part of the conversational topic, or when the required response was deemed too onerous, for whatever reasons, the participant opted not to respond to the Researcher's question or, alternatively, initiated a new topic.

Vygotsky (1934/1993) argued that children who face difficulties because of a "defect" such as a physical disability or learning difficulties, attempt to overcome their difficulties by compensating for their "defects" in other ways. He observed that:

> *always and in all circumstances*, development, complicated by a defect, represents a creative (physical and psychological) process. It represents the creation and re-creation of a child's personality based on the restructuring of all the adaptive functions and on the formation of new processes - overarching, substituting, equalizing - generated by the handicap, and creating new roundabout paths for development. (p. 34)

Thus, a child with ADHD, faced with difficulties communicating their ideas to others, creates, either consciously or unconsciously, "roundabout" ways to deal with their difficulties. In the case of selective responding and selective monitoring, the main compensatory strategy appears to be one in which they retreat from the immediate situation, thereby temporarily solving their communication difficulties. This reprieve, however, tends to create other problems for the child, such as increased social expectation by their parents, friends or teachers to answer a question or to maintain the current topic in a conversation.

There was a noticeable difference between the two groups with respect to eye contact. The ADHD participants made significantly less eye contact with the Researcher than did the Non-ADHD group. Eye contact between conversational partners is an important mechanism for exchanging nonverbal information, such as when to take a turn-at-speaking. The lack of eye contact by the ADHD participants was consistent with their tendency to interrupt the Researcher to initiate new topics. That is, because they do not monitor the nonverbal aspects of the conversation, they miss important nonverbal clues and cues regarding appropriate times to introduce a new topic or to respond to their conversational partner.

Speakers must also provide the listener with background information, such as anaphoric or shared situational references about the topic, so the listener may understand the speaker. The Non-ADHD group tended to use orienting terms, such as *you know*, to keep the listener informed about the topic. The ADHD participants tended to introduce topics and propositions without the use of orienting or transitional markers and relative clauses. The listener was left to infer background information from previous utterances or ask participants to clarify their references. The result was more work for the listener to keep track of the conversation with the ADHD participants.

The analysis of sociolinguistic competency showed that the tendency for the ADHD participants to focus on their activities in the immediate context located in the "here-and-now", demonstrated at the grammatical level, was not only continued but further elaborated at the sociolinguistic level. The conversations with the ADHD participants were generally understandable with the immediate study context. However,

the conversational interactions required more work by the Researcher to maintain and extend the conversations.

Discourse Competency

Discourse competency looked at the ways participants connected their grammatical forms into a meaningful whole in different genres. All participants were able to support a conversation with multiple and shifting topics and subtopics for up to one hour, thereby demonstrating one component of their discourse competency. There are indications in the literature that children with ADHD have problems with connecting grammatical forms to create a unified text. Tannock et al., (1993) found that children with ADHD showed a higher frequency of sequence and cohesion errors, suggesting breakdowns in global coherence. Mentis (1994) defines global coherence as the "overall semantic connectedness of the discourse and the relevance of each utterance to the topic under discussion" (p. 34). The general success of the ADHD participants' ability to conduct a conversation in this study was, in part, due to the nature of the topics they chose to talk about and the Researcher's background knowledge of those topics. The ADHD participants' global coherence was based on topics reflecting their personal interests and experiences. They were able to maintain local coherence (i.e., the logical connections between two consecutive utterances) at a general level because their utterances were relevant to the general topic about which they had some knowledge and experience. It would appear that they had a schema or a mind map of the topic under discussion that permitted them to make the connections between their utterances and the topic. When opportunities arose to change to another topic, the ADHD participants appeared reluctant to shift and tended to re-direct the conversation back to the initial

topic. The ADHD participants, unlike their Non-ADHD peers, tended to stay with topics about which they had some personal connection. On the surface, this strategy assisted the ADHD participants in maintaining conversational interactions with some degree of success.

The Researcher's background knowledge also assisted the ADHD participants in maintaining local and global coherence. The Researcher was able to "fill in" any gaps in those utterances of the ADHD participants' that did not maintain local and global coherence. For example, the Researcher provided Pokemon character names in a discussion with an ADHD participant. The Researcher's background knowledge also helped to maintain the conversation by knowing the referents to which an ADHD participant was referring. For example, in the discussion of Pokemon characters, the Researcher knew who the characters were and had some notion about their unique characteristics. The ADHD participant could then talk about Pokemon characters (a topic of personal interest and experience) and share his global knowledge through semantically contingent utterances. Thus, the ADHD participants' overall and general ability to conduct and maintain a conversation was contingent upon the topic under discussion and the conversational support by the Researcher. The end result was a conversation that demonstrated one aspect of their discourse competency.

All participants used self-talk to assist their problem-solving efforts. Self-talk was considered in this study to be part of the discourse competency because self-talk represented discourse that was qualitatively different than a conversation or an expository discourse.

Language has a public function. It is directed at others, it has a social, communicative function, and it has a private function through self-directed speech that is not intended for others. This type of speech has an important self-regulatory function. Vygotsky (1934/1987) pointed out that self-talk is a transitional form of speech in the development of higher cognitive processes, such as abstract thinking and organizing information. Vygotsky (1934/1987) argued that as children engage in problem-solving, their language is directed toward a solution to the problem. The more complex the problem is, the greater the importance played by speech. Self-talk is connected to behaviour. Children talk to themselves about the actions and activities they are doing. Self-talk helps children make their behaviour more deliberate by bringing their actions into their conscious awareness. Once children are conscious of their actions, their actions may be linked to their language. Self-talk may then help children control their behaviour.

All participants engaged in self-talk during the Building Phase of the study. In this phase, all participants encountered problems building the Lego model. It was during these "problem" moments that self-talk emerged. For the three ADHD participants who also engaged in self-talk in other phases (Play and Ending), the moments during which self-talk emerged were also moments during which they were engaged in a manipulative activity with an object(s). Thus, self-talk emerged to solve a problem during a manipulative activity.

The participants' self-talk seemed to facilitate communication, that is, communication with themselves. Self-talk functioned to bring their physical activities into conscious awareness and under the direction of their speech to solve a problem, which is consistent with Vygotsky (1987/1934). Self-talk was used as a tool for planning.

In these instances, self-talk was akin to a mental checklist. For example, A5 asks himself: "*Oh, wonder what this is? Where does that go?*", or N4 says, "*Huh, what's this? Oh, it's this, I think. Yeah, cause if you do something wrong then it stops the entire thing because that ladder won't be able to go on*". In these instances, self-talk seemed to verbalize the participants' thinking and organizing processes. From this verbalized plan, the participants typically engaged in an activity, directed by the self-talk, to solve the problem. Thus, this process united the problem that prompted the self-talk, the self-talk that verbalized the problem and sought a solution, and the ensuing action that solved the problem. Self-talk brought action and thinking together into a unified whole, thereby allowing the participants to maintain or exert voluntary control over their behaviour. Actions that would be the opposite of voluntary control, such as breaking the Lego model or leaving the scene in frustration, were not manifested by any participant, despite the problems they encountered. It would appear that self-talk might also ameliorate frustration that could hinder the problem-solving process, by facilitating actions that solve the problem.

Also consistent with Vygotsky (1987/1934) is the finding that the participants replaced the grammatical subject or verb in their utterances with a psychological subject or verb. For example, the subject I was often omitted from self-talk utterances. Since self-talk is directed to oneself, there is no functional need to include the subject (the speaker) because the subject is already implied in the self-talk utterance.

The finding that all participants engaged in self-talk supports the findings of Berk and Potts (1991) regarding children (aged 6 to 12 years) with ADHD and the findings of Berk (1986), Bivens and Berk (1990), Frauengalss and Diaz (1985) and Winsler, Carlton

and Barry (2000) regarding the self-talk by school children without ADHD. The finding that ADHD participants engaged in self-talk is, however, contrary to observations that children with ADHD do not use self-talk (Giddan, 1991; Westby & Cutler, 1994).

Regarding the Instruction phase of the study, all participants provided, at a general level, some type of instruction regarding how to build the model as requested by the Researcher. The participants complied with the Researcher's request thereby demonstrating their understanding of the norms underlying the social context (sociolinguistic competency). The expository discourse varied in length and detail. The research literature tends to focus on narrative discourse (e.g., Lorch et al., 1999; Sanchez et al., 1999; Zentall, 1988) in conjunction with other difficulties such as reading (August & Garfinkel, 1990; Kupietz, 1990; Purvis & Tannock, 2000; Warren & Flynt, 1995).

The results showed that the patterns of communication demonstrated by the ADHD participants at the sociolinguistic level, such as ambiguous references and a focus on the "here-and-now", were also evident at the discourse level. Similar to Barkley et al. (1983) and Zentall (1988), the ADHD and Non-ADHD participants were alike in their overall verbal discourse. The findings at the sociolinguistic level indicated that both groups were able to conduct a conversation. However, conversations with the ADHD participants tended to require more work on the part of the Researcher to maintain the conversation. At the discourse level, the Researcher supported the conversations for all of the participants. The ADHD participants required more support from the Researcher than did the Non-ADHD participants. This support was in the form of revising the ADHD participant's grammatical structure and form or their pronunciation. Such support is consistent with Vygotsky's (1934/1987) notion of zone of proximal development.

According to Vygotsky, the "difference between the child's actual level of development and the level of performance that he achieves in collaboration with the adult, defines the zone of proximal development" (p. 209). The research literature regarding language and ADHD provide indications of the "actual level of development" of children with ADHD. That is, they show difficulties with global coherence and production deficits (Purvis & Tannock, 1997; Tannock, et al., 1993). The ADHD children in those studies demonstrated their actual level of development called forth by the study task, such as retelling a story without the assistance or aid of an adult or competent peer. In this study, with adult assistance, the ADHD participants demonstrated overall competencies in topic management while revealing a consistent pattern of difficulties such as ambiguous referencing and a focus on the "here-and-now". Through collaboration with an adult, the ADHD participants were able to conduct a conversation within the bounds of the immediate study context. This has significant implications for instruction and classroom learning (see *Implications for Learning in the Classroom*).

Vygotsky (1934/1987) points out that while a child can do more collaboratively than independently, the child's zone of proximal development is not unlimited. Vygotsky writes: "what collaboration contributes to the child's performance is restricted to limits which are determined by the state of his development and his intellectual potential" (p. 209). This implies that the difficulties demonstrated by the ADHD participants may continue despite collaborative instruction regarding conversational skills. However, it may be suggested that such instruction provides the child with ADHD with a larger repertoire of skills than s/he may develop independently.

The analysis of expository discourse did not identify substantial differences across the groups in this study. Those participants who did provide more detailed instructions shared a tendency to refer directly to the model in front of them and to use deictic terms such as "*there*", "*here*" and "*it*" to refer to specific model parts.

Strategic Competency

All participants used strategies to repair breakdowns or to improve the effectiveness of their communication. This indicated that all participants were monitoring their conversations, at least on a general level, and chose to make repairs. The research literature does not directly address repair strategies but does provide some indication of repair strategies. For example, Zentall et al. (1983) found that children with ADHD tended to use more fillers (e.g., *um*, and *ahh*) than did controls. This study found an increase in the use of fillers by those participants, regardless of group, who spoke fast. Panagos and Prelock (1997) point out that prosody (i.e., patterns of tone, stress and rhythm) is a way of organizing communication through the interaction of discourse, grammar and phonology during speech production. In the expression of an utterance and its underlying logical proposition(s), speakers use intonation, stress and rhythm to shift information focus, change word boundaries, create and modify tone units, and organize stress in clauses, phrases and words, all of which contribute to meaning. The fast talkers may have been modifying their prosodic patterns to maintain the pace of the utterances by combining fillers and false starts that resulted in more self-initiated repairs.

Summary of the Comparison and Differences Between the Groups

The participants' manifest physical behaviours did not differentiate the two groups. The ADHD participants were as active or as inactive as their Non-ADHD peers. On the surface, and at the outermost layers of communicative competency, the ADHD participants were also comparable to the Non-ADHD participants. Thus, within the supportative conditions created in this study, the ADHD participants demonstrated appropriate levels of general communicative competency.

However, underlying these surface features, substantial differences between the two groups first emerged at the semantic level of the grammatical competency layer. At the level of meaning, the ADHD participants showed the initial signs of the difficulties that were translated and elaborated across the other components of communicative competency.

The ADHD participants were more dependent upon, and more sensitive, to their physical and social environment. Their dependence on the physical environment was reflected in the language they used to refer to events/objects that were directly observable in the immediate study context, their use of time deixis that kept the conversation rooted in the "here-and-now", their choice of topics that were psychologically close, their expression of conceptual domains that emphasized those relations that could be seen and counted, and their over use of pronouns to substitute for nouns when naming objects, which resulted in ambiguous references that were compounded by their tendency not to use shared situational references. The ADHD participants appeared to have the most difficulty with cognitive functioning underlying their inability to make transitions from concrete propositions to more abstract ones and back to the concrete, by using more

ambiguous references and by their dependence on the context for references to objects and/or activities.

The ADHD participants seemed to be more dependent on the social context than were their Non-ADHD peers. They depended more on the Researcher to maintain the conversation and provide lexical structures that the ADHD participants could appropriate for their own use. The dependence of the ADHD participants on the physical and social context substantially, and negatively, affected their ability to communicate clearly and effectively.

Language Aspects Affecting Communicative Competency in the Classroom

This section addresses the final research question, "What aspects of language may affect the communicative competency of children with ADHD in the classroom?". The results show that the predominant difficulties for the ADHD participants in this study were language features related to cognitive functioning. The ADHD participants had difficulty expressing conceptually abstract and complex relations and ideas that were independent of their immediate sociocultural context.

The relative independence of the Non-ADHD participants' language and communication appeared to reflect their ability to translate and transform the immediate situational stimuli into grammatical and lexical structures, such as their use of nouns as referents. These grammatical and lexical structures allowed the Non-ADHD participants to express their thoughts outside of the confines of the immediate situation. Their grammatical and lexical structures appear to be relatively independent of any specific sociocultural context, thus providing the medium to express complex and abstract thoughts that were more generic and suitable to different sociocultural contexts. That is,

the Non-ADHD participants' language transcended the confines of the immediate situation because their language, and thus their communication, could be generalized to other contexts in different places and times and still retain the meaning of their thoughts and ideas. The ADHD participants, typically, did not demonstrate this ability.

The ADHD participants, given their sensitivity to the immediate sociocultural context and the context boundedness of their language, appeared to have more problems translating their thoughts to sociocultural contexts beyond the immediate ones than did the Non-ADHD participants. Thus, the language and communication patterns demonstrated by the ADHD participants, on the one hand, appeared to facilitate a superficial level of communication while, on the other hand, appeared to impose restrictions on their ability to express abstract concepts not immediately manifest in the sociocultural context. They were able to conduct a conversation and demonstrate appropriate levels of sociolinguistic and discourse competency within the study context. However, the surface features of the ADHD participants' communicative competency appeared to mask difficulties with subtle, but nevertheless critically important, aspects of language and communication. It is these subtle nuances of language and communication that may be overlooked by teachers in a busy classroom.

In Chapter 4, each of the four components of communicative competency was linked to the relevant learning outcomes described in the British Columbia *English Language Arts K to 7* curriculum for Grades 1 to 4 (which matched the grades of the participants). The prescribed learning outcomes provide a basis for the teachers' and parents' expectations for childrens' language learning and communication performance. Given the context-boundedness of the language and communication used by the ADHD

participants, it is likely that those learning outcomes requiring abstraction, synthesis and analysis would prove problematic for these children.

In light of the difficulties demonstrated by the ADHD participants in the morphological and semantic aspects of language, it is likely that they will have problems with all of the learning outcomes associated with grammatical competency:

- Describe the sequence of the main events in a story orally, in writing, or by using pictures (Grade 1; Semantics; MoE, 1996, p. 14).
- Identify explicit connections between works they have read, viewed or heard (Grade 1; Semantics; MoE, 1996, p. 16).
- Demonstrate abilities to use basic grammar when speaking (Grade 1; Morphology; Syntax; MoE, 1996, p. 20).
- Identify connections between ideas and information and their own experiences (Grade 1; Semantics; MoE, 1996, p. 22).
- Identify specific details in communications in response to tasks or questions (Grades 2-3; Semantics; MoE, 1996, p. 36).
- Demonstrate abilities to use grammatically correct language when speaking and when writing simple sentences (Grades 2-3; Morphology, Syntax; MoE, 1996, p. 42).
- Sort, organize, and represent specific information (Grades 2-3; Semantics; MoE, 1996, p. 44).
- Determine accurate pronunciation, meaning, and spelling of unfamiliar words through the use of print or electronic dictionaries (Grade 4; Phonology; Morphology; Syntax; Semantics; MoE, 1996, p. 56).

- Use grammatically correct language when writing and speaking, including consistent verb tenses and correct pronoun references (Grade 4; Morphology; Syntax; MoE; 1996, p. 64).

The learning outcome that calls on children with ADHD to identify the sequence of main events orally or by using pictures may be within their capability. An important component of this learning outcome is the use of pictures to assist children with ADHD to describe the sequence of events. In this study, the ADHD participants who provided detailed instructions did so by referring to the model before them. Aids, such as pictures or models, may provide children with ADHD with a memory assistant that allows them to focus on describing the sequence of events rather than trying to recall the sequence from memory. Furthermore, research findings showing that children with ADHD can identify the sequence of main events (Tannock et al., 1993; Zentall, 1988) support the notion that children with ADHD can describe such events. The findings by Purvis and Tannock (1997) that children with ADHD had difficulty retelling fictional narratives may indicate that more abstract stories, that is, stories not directly related to the ADHD childrens' personal experiences, may prove to be problematic for children with ADHD.

The ADHD participants may have difficulty making explicit connections between the works they have read, viewed or heard and clearly expressing those connections with their own experiences. The findings in this study indicate that the ADHD participants tended to focus on the immediate context and those experiences psychologically close to their personal experiences. They may have more difficulty making explicit those connections that are more abstract conceptually and more psychologically distant to them. The clear expression of the connections between ideas and information and their

own experiences may, again, prove problematic especially if those ideas and information tend to be abstract and outside their own personal experiences. The clear expression of those connections may also be impeded by the tendency of the ADHD participants to make ambiguous references that interfere with the identification of clear references, which may further confuse the listener.

Sorting, organizing and representing specific information did not appear to be problematic for those ADHD participants who provided detailed instructions to the Researcher. They did, however, depend heavily on the physical model before them to describe their building sequence. It may be more problematic for the ADHD participants to sort, organize and represent information that is more conceptually abstract and not immediately visible. The ADHD participants in this study may have difficulty using grammatically correct language when speaking, including consistent verb tenses and correct pronoun references. While there were some problems with verb tenses, the primary difficulties for the ADHD participants appeared to be in their substitution of pronouns for nouns, resulting in ambiguous references that may confuse the listener.

The ADHD participants did not, typically, take listener needs into account by making shared situational references clear. The following learning outcomes associated with sociolinguistic competency may be impacted negatively by the ADHD participants' tendency to exclude the listener from their communication:

- Demonstrating appreciation for the work and ideas of others (Grade 1; MoE, 1996, p. 24).

- Interacting with others; speak in turn; listen actively, providing verbal and non-verbal responses appropriate to their stages of development and to their cultures (Grade 1; MoE, 1996, p. 30).
- Providing constructive feedback to others, showing appreciation and support (Grades 2-3; MoE, 1996, p. 46).
- Listening actively, responding verbally and non-verbally; seeking opinions and consider the responses of others; demonstrating a willingness to support others by offering compliments and encouragement (Grades 2-3; MoE, 1996, p. 52).

By excluding the listener from a conversation, the ADHD participants may not always be cognizant of the contribution of others to the conversation. The ADHD participants may not demonstrate an appreciation for the work and ideas of others or provide constructive feedback because they may have missed the others' contribution to the conversation.

Interacting with others, speaking in turn, listening actively, and providing verbal and non-verbal responses may prove to be problematic. The ADHD participants in this study showed a tendency not to speak in turn by interrupting more than the Non-ADHD participants. The ADHD participants tended to listen and respond selectively. They did provide general verbal and non-verbal responses, but with a tendency to make more null responses. While the ADHD participants did demonstrate a certain level of active listening, they tended to respond more often to the Researcher's questions than to seek his opinions or clarification on their own.

Other learning outcomes associated with sociolinguistic competency that may be problematic are:

- Demonstrating an awareness of how register and pacing should be adjusted according to content and audience (Grade 4; MoE, 1996, p. 64).
- Showing willingness to revise the form, content, sentence structure, and language of their work; responding formally and informally to the communications of their peers (Grade 4; MoE, 1996, p. 68).

The ADHD participants' register and pace were, generally, appropriate within the informal and relatively unstructured study context with an adult audience. However, they often used register to introduce new topics, typically by interrupting the conversation. In a more formal and structured classroom, the use of register to introduce new topics may not be appropriate or appreciated. Furthermore, the fast pace used by some of the ADHD participants resulted in more self-initiated repairs that interrupted the flow of the conversation.

The ADHD participants did show their willingness and their ability, through self-initiated repairs, to revise the form, content, sentence structures and language of their work. However, these self-initiated repairs were not always successful in clearly expressing their thoughts.

There are learning outcomes that are not directly linked to the problems demonstrated by the ADHD participants in this study. These learning outcomes, however, are associated with aspects of communication that may be negatively impacted by problems shown by the ADHD participants in their communicative competency. The learning outcomes are:

- Demonstrating an awareness of difference in the ways in which people use language in various contexts, including home, the playground, and the school (Grade 1; MoE, 1996, p. 32).
- Demonstrating an understanding that language changes in different contexts (Grades 2-3; MoE, 1996, p. 54).
- Demonstrating an awareness of how to use language to develop and maintain friendships and relationships in school (Grade 4; MoE, 1996, p. 72).
- Demonstrating respect for others by communicating their ideas and information in an orderly fashion (Grade 4, MoE, 1996, p. 74).

These learning outcomes are based on a more conceptually abstract understanding of the general purpose of communication. Canale (1983) defined communication as the "continuous evaluation and negotiation of meaning on the part of the participants" (p. 4). In order to evaluate and negotiate, both conversational partners need to be aware, on some level, of what meanings are being negotiated. Shared meanings are easier to negotiate and result in clear transmission and reception of ideas, thoughts and intentions. The ADHD participants, however, tended to focus on their own meanings, thereby excluding their conversational partner. In this context, it is difficult to negotiate shared meanings since there is no shared meaning. One conversational partner must then seek clarification of the meanings in order to maintain the conversation. Although the activities in this study did not directly address the learning outcomes described above, there is some indication that the demonstrated levels of communicative competency by the ADHD participants in this study may not suffice to meet teachers' or parents' expectations regarding these learning outcomes.

Some of the learning outcomes associated with discourse competency target the same language aspects identified in grammatical competency that are potentially problematic. Those learning outcomes are:

- Identifying connections between their thoughts and feelings and their reading, viewing, or listening experiences (Grade 1; MoE, 1996, p. 16).
- Identifying connections between ideas and information and their own experiences (Grade 1, MoE, 1996, p. 22).
- Showing a willingness to revise the form, content, sentence structure, and language of their work (Grade 4; MoE, 1996, p. 68).

In these learning outcomes, the focus shifts from demonstrating the basic language features at the grammatical level to making connections between the grammatical forms and meanings into a meaningful whole across different genres. The problems shown by the ADHD participants regarding grammatical competency may prove to be similarly problematic at the discourse level.

The ADHD participants may also have difficulty with the following learning outcomes:

- Predicting, retelling, and sequencing events and ideas from selections they have read, heard, or viewed (Grades 2-3; MoE, 1996, p. 36).
- Interpreting their impressions of simple and direct stories, poetry, other print material, and electronic media; locating specific details in stories, poems, mass media, and audio-visual media; demonstrating an awareness of relationships among the elements of story structure, including plot, setting, and characters (Grade 4; MoE, 1996, p. 58).

- Collecting specific information from a variety of sources, including print, oral discussions, electronic media, and computer technology; sorting, organizing and representing specific information (Grades 2-3; MoE, 1996, p. 44).
- Managing and organizing information by grouping and sorting into charts, webs, subtopics, or logical sequences (Grade 4; MoE, 1996, p. 66).

These learning outcomes emphasize a more abstract conceptual understanding of the relationships between and among different types of text materials. The ADHD participants in this study demonstrated some competence in organizing information with the referent object in plain view. They also predicted the conclusion of the Researcher's utterances. Typically, however, they tended to appropriate his grammatical form and propositions in order to do so. Without the support from situational stimuli and the adult, grammatical forms, predicting, retelling, and sequencing of events and ideas may be more difficult.

Similarly, interpreting their impressions of stories, poetry and other media may be troublesome, given the tendency of the ADHD participants to express conceptual domains located in the "here-and-now" for events and objects that were directly observable. Demonstrating an awareness of relationships among the elements of story structure, plot, setting and characters may, again, place difficult demands upon the ADHD participants' ability to abstract and synthesize conceptually complex and abstract features of text, given their propensity for the concrete and "here-and-now" conceptual relations. They may not have problems with locating specific details in stories, if the information is at a literal level, that is, the "answer" may be found in the text. If,

however, the specific details are at a nonliteral level requiring interpretation, analysis and synthesis of information, problems are likely to occur.

The ADHD participants may have little difficulty collecting information. Judging by the topics covered in this study regarding bees, wasps, sabre-tooth tigers, BMX racing, Pokemon characters and Lego models, the ADHD participants do collect information from a variety of sources including their own experiences and learning from others (e.g., a sibling). Difficulties may emerge sorting, organizing and representing specific information by grouping and sorting into charts, webs, subtopics, or logical sequence. Organizing information and representing specific information in different types of formats calls upon levels of interpretation, analysis and synthesis that were not demonstrated by the ADHD participants in this study. However, A4 did use drawing to represent his ideas regarding the sequence of building the Lego model in the Instruction Phase. It may appear that certain levels of specificity for certain types of organizing may be within the competence of the ADHD participants in this study.

There were other learning outcomes associated with discourse competency that were beyond the focus of this study. Those learning outcomes are:

- Distinguishing between make-believe and reality in print and non-print materials (Grade 1; MoE, 1996, p. 18).
- Demonstrating a willingness to experiment with written, visual, kinesthetic, dramatic, oral, and electronic forms of communication (Grade 1; MoE, 1996, p. 26).

- Demonstrating an interest in using information from documents, news broadcasts, newspapers, and electronic sources (Grades 2-3, MoE, 1996, p. 40).
- Demonstrating a willingness to experiment with communication forms to respond to, inform and entertain others (Grades 2-3; MoE, 1996, p. 48).
- Creating and presenting a variety of personal and informational communications, including written and oral poems, stories, explanations, informal oral reports and dramas, personal letters, and illustrated charts or posters (Grade 4, MoE, 1996, p. 70).

It may be suggested that those learning outcomes requiring active, kinesthetic learning using different mediums, such as drawing, that emphasize personal connections may be less problematic for the ADHD participants given their demonstrated propensity to actively engage in concrete communication that is personally relevant to them. These activities are well within the zone of proximal development shown by the ADHD participants.

The learning outcomes identified with strategic competency consisted of two types of skills, namely, asking questions and predicting meaning:

- Asking questions as an aid to understanding when reading, listening or viewing (Grade 1, MoE, 1996, p.12)
- Asking and responding to questions before, during, and after reading, viewing, or listening (Grades 2-3, MoE, 1996, p. 34).
- Predicting unknown words by using picture clues, their knowledge of language patterns and letter-sound relationships (Grade 1, MoE, 1996, p. 12).

- Predicting the meaning of unknown words by using structural analysis, context clues, and graphic clues (Grade 4, MoE, 1996, p. 56).

Within the study context the ADHD participants were more likely to respond to the Researcher's questions than to ask questions or seek clarification. Furthermore, some ADHD participants had difficulty finding the appropriate word without the assistance of the Researcher. Thus, left to their own devices, these participants did not appear to apply their knowledge of language patterns, structural analysis or context clues to find the appropriate word. In light of the findings of this study, achieving the learning outcomes associated with strategic competency may be somewhat problematic for children with ADHD.

In summary, this study has specific implications for classroom learning primarily in areas that relate to abstract concepts and relationships. These concerns become increasingly apparent as the learning outcomes for Grades 1 to 4 progress from the relatively concrete to the more abstract. This progression also reflects increased expectations to move beyond the immediate sociocultural context. This progression from the concrete, immediate context, in place and time, to the more abstract and distant may prove particularly challenging for ADHD children, given their level of cognitive development.

Conclusions

The results from this study demonstrate that the ADHD children in this study have substantial difficulties with certain aspects of language and communication. Within this study differences in communicative competency, as compared to manifest physical behaviour, distinguished the ADHD group from the Non-ADHD group. The physical

manifestations, typically ascribed to ADHD, did not appear to be a substantive factor that impeded the participants' ability to communicate their thoughts and ideas. Physical behaviours (e.g., pointing to objects as they spoke) were used by the ADHD participants to support, not impede, their communication. The primary impediment to clear communication emerged by "peeling back" the layers of communicative competency to reveal difficulties with cognitive aspects of grammatical, sociolinguistic and discourse competency. This study showed that language is a substantial factor in understanding children with ADHD, even where no specific language impairment is indicated. Emanating from the substantive role of language is the fundamental role of communication. While the ADHD participants demonstrated difficulties with specific language features, it was in their use of the language to communicate that substantive differences between the two groups become apparent.

The ADHD participants were strongly connected to the immediate study context through their language and communication. They talked about events and objects that were directly observable in the immediate study context. They tended to talk about topics that were personally relevant and psychologically close. They tended to maintain this connection even when provided opportunities to extend the conversation to topics that were more psychologically distant. The ADHD participants' language showed them to be context-bound.

The study conditions, including the physical and social, were important in facilitating the participants' production of language and engagement with the study task of building and talking about the Lego model. Although all participants exhibited their communicative competency, the ADHD participants revealed aspects of their

communication that tended to hinder the clear expression of their thoughts. The primary difficulty shown by the ADHD participants was in the cognitive aspects of their language and communication.

This study identified different levels of communicative competency. The surface features of the ADHD participants' communicative competency appeared appropriate within the study context. However, underlying their apparent communicative competency was a consistent pattern in which the ADHD participants used similar language structures and features as did the Non-ADHD participants, but they did so either more or less often. Using the language structures and features more or less often created a qualitatively different pattern of conversational interaction with the ADHD participants in this study.

The results from this study have implications beyond the sample of 10 participants. There are implications associated with the classroom and implications for understanding ADHD.

Implications for Learning and Teaching in the Classroom

The ADHD participants' communicative competency with respect to the curriculum learning outcomes suggests that the ADHD participants are likely to face difficulties for the majority of the language arts learning outcomes they encounter in the classroom. The implication is that these ADHD children may face a rather bleak academic future. This interpretation is borne out by research studies identifying a host of academic deficits associated with ADHD. The identified deficits range from difficulties with reading (August & Garfinkel, 1990; Pisecco, Baker, Silva, & Brooke, 2001; Purvis & Tannock, 2000), problems with study skills and strategies (Dowdy, Patton, Smith & Polloway, 1998; O'Neill & Douglas, 1991), problems with listening comprehension

(Hamlett, Pelligrini & Conner, 1987; Shroyer & Zentall, 1986), and writing difficulties (Graham, Harris, MacArthur, & Schwartz, 1991). The results of this study indicate that, underlying the surface features of communication, are specific skills that may be remediated to assist the children with ADHD to learn more effectively in the classroom.

The study findings suggest that efforts to remediate the difficulties faced by the ADHD children in the classroom should include expanding intervention efforts from behavioural modification to include language and communication. This does not necessarily entail the creation of new techniques or strategies. The research literature is fecund with appropriate strategies and specific techniques aimed at solving specific problems encountered by children with ADHD (e.g., Cherkes-Julkowski, et al., 1997; McCarney, 1994; Rief, 1997; Wendt, 2001). For example, Cherkes-Julkowski et al. describe a range of classroom language demands, such as "processing large amounts of language", "engage in self-talk" and "read efficiently" and provide tools to address those demands (p. 129). Similarly, Wendt (2001) offers strategies for school-based interventions including teacher preparation and instructional strategies, such as "frequent feedback", "action-oriented tasks" and "multisensory teaching" (pp. 61-68).

The focus on language and communication does entail shifting the remediation focus from what ADHD children do to what they do and say. It entails working collaboratively with the ADHD children to make explicit the subtle, but critically important nuances of language and communication, thereby allowing the children to expand their repertoire of language and communication skills so they can learn to communicate their knowledge more effectively.

A guiding principle for remediation is suggested by Vygotsky (1934/1987). He argued that to bring behaviours that are unconscious and involuntary under conscious, voluntary control one must make visible what is otherwise invisible. Vygotsky wrote: "to become consciously aware of something and master it you must first have it at your disposal" (p. 189). That is, one needs to bring those aspects of communicative competency that are problematic and that create impediments to effective communication to the attention of the ADHD child. Once a specific problem is brought into the conscious awareness of the child, it becomes subject to manipulation that changes the nature of the problem from an unconscious deficit to one that has potential to be consciously controlled by the child. Vygotsky (1934/1993) observed that for "abnormal" children, higher cognitive processes are more underdeveloped than the elementary ones. Consequently, they "represent the weakest link in an abnormal child's chain of symptoms. Therefore, this is where all educational efforts should be directed, in order to break the chain at its weakest point" (p. 199). Rather than working with the more elementary processes of overt behaviour, another approach is to target the weakest developmental link, higher cognitive processes such as those involved in language and communication, in order to remediate the underdevelopment of the higher cognitive processes.

The findings from this study suggest several strategies teachers may use to facilitate classroom learning for children with ADHD. The following strategies may be incorporated into the daily routine in any classroom. They do not require special equipment or materials but do require some planning by teachers.

Teachers should be aware that the surface language features used by children with ADHD may not reliably indicate their level of communicative competency. The surface features may, indeed, mask underlying language structures that impede communication. For example, the ADHD participants in this study consistently substituted pronouns for nouns, resulting in ambiguous referents. Consequently, the ADHD participants often had problems clearly identifying the subject. This language pattern was not readily apparent at the superficial level but emerged upon closer examination of the ADHD participants' grammatical competency.

The basic parts of speech within grammatical competency provide the foundation for more sophisticated language use at the sociolinguistic and discourse levels. Teachers should consider how ADHD children utilize the basic parts of speech, such as nouns, verbs, adjectives and adverbs, to identify potential problems, such as referencing, that will hinder effective communication. Instruction in grammar may also provide ADHD children with more vocabulary choices that, in turn, will improve their linguistic repertoire of skills. Direct instruction in the basic parts of speech may be accomplished as part of meeting the learning outcomes relevant to grammar.

The ADHD participants demonstrated sensitivity to their context and the objects and activities within it. This suggests that the physical environment in the classroom can play a critical role in facilitating the child's learning. Rief (1997) suggests altering seating arrangements periodically, providing easy access to "materials and independent learning activities", posting "all schedules, calendars and assignments" and having "models and visual displays for student reference" (pp. 134-135). In conjunction with the physical environment, Wendt (2001) suggests the creation of a "positive, warm, and inviting

classroom climate" (p. 69) to help create a positive relationship between the teacher and the child with ADHD. It is also in the best interests of all students to learn in such an environment.

Associated with the context sensitivity of the ADHD participants, was a firm connection to their personal experiences and to events and objects they could see, hear and touch. The objective is to make abstract ideas and instructions as concrete as possible using "here-and-now" examples and action-oriented tasks to make clear the connections. As noted above by Rief (1997), display models and other stimulating materials in the classroom provide a tangible aid for making connections among concepts. They are the external signs that may be used for solving internal mental tasks. With respect to problem-solving, self-talk emerged for all participants as a method to verbalize their problems and create an aid in the solution of the problem. This suggests that self-talk should be encouraged in the classroom as an aid to problem-solving rather than viewed as a behavioural problem.

The ADHD participants did demonstrate some knowledge of the standard conventions regarding conversational etiquette. Their communicative competency would be improved, however, through direct instruction in how to conduct a conversation. Such instruction may include showing how eye gaze is used to identify an appropriate time and place to take a turn at speaking and how discourse markers, such as *oh* and *You know I told you about*, can be used to signal a new topic, extend a topic, or provide anaphoric or shared situational references for the listener. Instruction in conducting a conversation also includes associated issues such as considering the listener's background knowledge, active listening and offering encouragement and support to the conversational partner.

Children with ADHD need more time to make connections. This was evidenced in several instances in this study by the time-lag between Researcher questions and the participants' responses. This suggests that in the classroom more time may be required by the child with ADHD to complete assignments, to respond to teacher questions, and to compete homework tasks. More time could be offered by allowing the child more time to respond to questions and pre-planning with the child when the teacher might ask her/him a question (e.g., when the teacher moves toward the child, the child could expect the next question to be directed to her/him). This strategy could also be combined with the teacher asking questions that are within the child's zone of proximal development. Consequently, the child may be more successful in answering questions in class, which has a positive impact on her/his self-esteem. Children with ADHD (or all children in the class) may be offered opportunities to make decisions about the academic tasks. They may, for example, have the opportunity to choose to answer any five of ten math problems or, in an language arts assignment, choose to complete a reading selection or a written assignment. ADHD children may be given alternative test options such as open-book exams or verbal responses on exams rather than written, to assist the ADHD child to demonstrate her/his knowledge. Decision-making opportunities assist children with ADHD in organizing and planning their tasks based on their personal knowledge and experience. It also helps them move beyond the certainty of the "here-and-now" and into the future.

Children with ADHD require more scaffolding and support. In the classroom, teachers may expect children with ADHD to need more assistance, and the teachers should recognize the importance of offering that assistance, from the beginning to the end

of an assignment or unit. Additional assistance may be in the form of peer-tutoring, the use of task-oriented activities or stimulating materials. Helping the child with ADHD learn how to organize and plan their learning using, for example, checklists, agendas and planning, provides important and necessary scaffolding.

The results of this study show that ADHD is not only manifested behaviourally, but cognitively. The cognitive functioning of children with ADHD has, to date, been underemphasized. Cognitive aspects are critical in the development of voluntary control of behaviour. Working at the cognitive levels creates opportunities for children with ADHD to develop compensatory mechanisms that allow them to meet the language and social expectations described in the language arts curriculum. Incorporating even a few of the preceding strategies into the daily teaching routine will benefit not only children with ADHD but other children as well.

Implications for Understanding ADHD

The finding that language and communication were fundamentally critical characteristics distinguishing the ADHD and Non-ADHD participants supports arguments for a re-conceptualization of ADHD (Barkley 1997, 1998; Cherkes-Julkowski et al., 1997; NIH, 2000; Shaywitz et al., 1994a, 1994b; Tannock & Marinussen, 2001) away from a primary focus on behaviour. The study suggests that cognitive functioning is a significant factor in the difficulties children with ADHD express. It would appear, based on the findings from this study, that ADHD cannot be considered to consist merely of deficits in focusing attention or of problems with the voluntary control of behaviour. There appear to be substantial underlying cognitive factors.

Cognitive factors are implicated in studies of neurobiological components of ADHD. In Chapter 3, it was noted that structural differences in the brain suggested that children with ADHD are simply born different than other children. The differences in brain structure would have an impact on the functioning of neurotransmitters that affect cognitive functioning such as language. Consequently, one might expect to observe difficulties in those cognitive functions affected by the neurobiological and neurochemical factors. The results of this study indicated that the cognitive functioning in relation to language was, indeed, different for those participants diagnosed with ADHD than for those Non-ADHD participants.

According to the NIH (2000), "there is no independent valid test for ADHD" and they call for "additional efforts to validate the disorder" (p. 183). In statements regarding the direction for future research, the NIH's first statement is that "basic research is needed to better define ADHD" including "studies of cognitive development, cognitive processing" (p. 186). In light of the findings from this study, there may be a diagnostic component of communicative competency that could be developed to assist in the identification of children with ADHD. This study provides some preliminary support for the notion that cognitive processes can be utilized as a diagnostic tool.

This study, in addition to highlighting the importance of communicative competency, also offers insights into specific aspects of language and communication. It provides a real, concrete basis upon which to plan school-based interventions and develop remediation strategies for the classroom and for the home. By examining the communicative competency of a child with ADHD, areas that may require further development can be identified. Specific strategies may then be focused on remediating

specific problems, such as the substitution of pronouns for nouns. Such interventions will assist children with ADHD to maximize their academic potential.

The results of this study imply a different approach to ADHD. Rather than working from the external to the internal through an emphasis on manifest behaviours, this study suggests the opposite; work from the internal to the external. Instead of trying to "normalize" children with ADHD through an assortment of behavioural modification techniques or medications, shift the focus to identifying ways to help the children develop their ability to express themselves and create ways to organize, synthesize, analyze and interpret information for their own use. It would appear that efforts to "normalize" the behaviour of children with ADHD have been less than satisfactory (e.g., NIH, 2000). A cognitive approach utilizing communicative competency, may offer a viable alternative.

If the weakest links, as observed by Vygotsky (1934/1987), in the developmental chain of children with ADHD are higher levels of cognitive functioning, then remediation techniques targeted at internal cognitive processes may be prove effective in mediating the voluntary control of external behaviours.

Future Research

Given the dearth of information regarding the communicative competency of children with ADHD, the field is relatively wide open for research. Several research avenues are implicated in this study.

This study needs to be replicated. Replication may provide confirmation that the methodology developed for this study is reliable and valid.

Research could be conducted to explore further the four components of communicative competency. That is, studies could be designed to examine specific

aspects of grammatical competency, such as the use of verbs, the influence of the situational context within sociolinguistic competency, or the structure of narratives and expository discourse.

An examination of communicative competency could be conducted in the classroom. Children's communication patterns could be examined within the context of the classroom to identify factors that impact, positively and negatively, on the children's ability to communicate clearly and effectively.

This study provides a starting-point from which to develop our understanding of the cognitive and behavioural aspects of ADHD. The results from this study show specific areas that promote and hinder communication. Based on this concrete knowledge, practical solutions may be developed to assist children, their parents and teachers. ADHD may then be viewed, not as a myth (Armstrong, 1995; 2000) nor a mystery (Okie, 1998), but as a real condition with underlying cognitive processes that can be developed and transformed to bring behaviour under voluntary control. Language and communication is, as MacGinitie (1969) observed, key to understanding human nature and achievement. That human achievement includes people diagnosed with ADHD.

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Appendix A

DSM-IV diagnostic criteria for ADHD (Diagnostic and Statistical Manual – IV, APA, 1994, pp. 83-85).

A. Either (1) or (2):

1. Six (or more) of the following symptoms of **inattention** have persisted for at least 6 months 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.

2. Six (or more) of the following symptoms of **hyperactivity-impulsivity** have persisted for at least 6 months to a degree that is maladaptive and inconsistent with developmental level:

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 or restlessness).

d. Often has difficulty 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 settings (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 exclusively during the course of a Pervasive Development 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).

Code based on type:

314.01 Attention-Deficit/Hyperactivity Disorder, Combined Type: if both Criteria A1 and A2 are met for the past six months

314.00 Attention-Deficit/Hyperactivity Disorder, Predominantly Inattentive Type: if Criterion A1 is met but Criterion A2 is not met for the past 6 months

314.01 Attention-Deficit/Hyperactivity Disorder, Predominantly Hyperactive-Impulsive Type: if Criterion A2 is met but Criterion A1 is not met for the past 6 months

314.9 Attention-Deficit/Hyperactivity Disorder Not Otherwise Specified: This category is for disorders with prominent symptoms of inattention or hyperactivity-impulsivity that do not meet the criteria for Attention-Deficit/Hyperactivity Disorder.

Appendix B

Sample Letter to School District Superintendents

Date

Dear XXX:

I am a PhD candidate in Education at the University of Victoria. I am conducting a study for my dissertation that examines the language structure of children diagnosed with attention deficit hyperactive disorder (ADHD) compared with children not diagnosed with ADHD.

Language is one of the features that define us as human beings. Language helps us identify and manipulate the objects around us. The study of child language reveals the complexity of learning and using language. Most of the child population learns to speak the language, to read and write consistent with widely held expectations. There are, however, children who have difficulties. In particular, there are children, whose behaviour is characterized by inattention and/or overactivity, who tend to have more problems than most children learning to talk, to read and write, and to express their thoughts and feelings consistent with widely held expectations of appropriate behaviour. These children may have ADHD.

Children with ADHD experience learning and behavioural difficulties (i.e., problems with mental processing and social interactions) most often manifested in distractibility and inattention (e.g., excessive daydreaming, forgetfulness, disorganization, losing things) and hyperactivity (e.g., excessive running or climbing, fidgeting) and impulsivity (e.g., impatience, difficulty in delaying responses, blurting out answers in class, problems waiting turns). Because of these difficulties, ADHD children tend to develop social, emotional, developmental, academic and/or social problems.

It is logically consistent to assume that if language is an integral part of human development then language should also be an integral part of the development of ADHD. Language use by ADHD children is often overlooked in the research literature.

This study is intended as a first step toward explicating the language development of ADHD children. The study examines the structure, function and development of ADHD children's language. The study will show that the analysis of language is necessary and vital to our understanding of the disorder. This has implications for the diagnosis and management of the disorder as well as for developing teaching strategies appropriate for ADHD children. The study asks children to build a Lego model and talk about the process of building in a one-hour session. The children's behaviours and talking are recorded for later analysis.

I am requesting your authorization to contact the principals of the schools the study participants attend in order to obtain the principals' authorization to approach individual teachers. The parents of the children are aware that their child's teacher will be contacted.

The teachers of the participants in the study will be asked to complete a short rating scale (the Vanderbilt AD/HD Diagnostic Teacher Rating Scale - VADTRS) regarding the child's academic and social behaviour in her/his class (attached). The rating scale will take about 10 minutes of the teacher's time. The VADTRS is one measurement confirming the primary disorder of ADHD or the absence of ADHD. The child's parents will be asked to complete the Home Situations Questionnaire-Revised regarding their child's behaviour at home.

Completing the VADTRS does not mean that the teacher is making or contributing to a diagnosis of ADHD. The main selection criteria for the ADHD group is an existing diagnosis by a medical doctor, psychologist, or psychiatrist as reported by the child's parents. The VADTRS (completed by the teacher) and the HSQ-R (completed by the parents) provide further confirmation of a diagnosis of ADHD (or not) that helps me interpret participants' activities and language use during the study.

The information provided by the teacher is strictly confidential. The data and files are kept in a locked cabinet accessed only by me. Furthermore, the study does not use participants' or teachers' names; code numbers, or pseudonyms, are assigned to participants to identify individual results. The teacher's participation is completely voluntary.

This study has been approved by the University of Victoria Human Research Ethics Committee (Certificate of Approval attached).

I would appreciate it if you would contact me as soon as possible with your response. I would be happy to provide you with further information about the study. You can reach me at XXX-XXXX (or email at XXXX). My supervisor is Dr. M. Mayfield (XXX-XXXX).

Thank you for your co-operation and assistance.

Yours truly,

Terry Rennie
PhD Candidate

Appendix C

Sample Letter Sent to School Principals

Date

Dear XX:

I am a PhD candidate in Education at the University of Victoria. I am conducting a study for my dissertation that examines the language structure of children diagnosed with attention deficit hyperactive disorder (ADHD) compared with children not diagnosed with ADHD. I have received permission from School District 61 to contact you regarding the study (see attached letter).

The study examines the structure, function and development of ADHD children's language. The study, I anticipate, will show that the analysis of language is necessary and vital to our understanding of the disorder. This has implications for the diagnosis and management of the disorder as well as for the development of teaching strategies appropriate for ADHD children. The study asks children to build a Lego model and talk about the process of building in a one-hour session. The children's behaviours and talking are recorded for later analysis.

I am requesting authorization to contact the teacher of one of the participants in my study (see attached "Letter to Child's Teacher"). The parents of the children are aware that their child's teacher will be contacted.

The participant's teacher will be asked to sign a form consenting to participate in the study and to complete a short rating scale (the Vanderbilt AD/HD Diagnostic Teacher Rating Scale – VADTRS) regarding the child's academic and social behaviour in her/his class (see attached). The rating scale will take about 10 minutes of the teacher's time. The child's parents have completed the Home Situations Questionnaire-Revised (HSQ-R) regarding their child's behaviour at home.

Completing the VADTRS does not mean that the teacher is making or contributing to a diagnosis of ADHD. The selection criteria for the ADHD group is an existing diagnosis by a medical doctor, psychologist, or psychiatrist as reported by the child's parents. The VADTRS (completed by the teacher) and the HSQ-R (completed by the parents) provide information about the child's behaviour in different settings. This helps me interpret participants' activities and language use during the study.

The teacher's participation is completely voluntary (see attached letter to the teachers). The information provided by the teacher is strictly confidential. The data and files are kept in a locked cabinet accessed only by me. Furthermore, the study does not use participants' or teachers' names; code numbers, or pseudonyms, are assigned to participants to identify individual results.

This study has been approved by the University of Victoria Human Research Ethics Committee (Certificate of Approval attached).

I would appreciate it if you would contact me as soon as possible with your response. I would be happy to provide you with further information about the study. You can reach me at XXX-XXXX (or email at XXXX). My supervisor is Dr. M. Mayfield (XXX-XXXX).

Thank you for your co-operation and assistance.

Yours truly,

Terry Rennie
PhD Candidate

Appendix D

Sample Letter Sent to Participant's Teacher

Date

Dear (Teacher's Name):

I am a PhD candidate in Education at the University of Victoria. I am conducting a study for my dissertation that examines the language structure of children diagnosed with attention deficit hyperactive disorder (ADHD) compared with children not diagnosed with ADHD. I have received authorization from the principal of your school and the superintendent of your school district to contact you regarding the study.

The study examines the structure, function and development of ADHD children's language. The study, I anticipate, will show that the analysis of language is necessary and vital to our understanding of the disorder. This has implications for the diagnosis and management of the disorder as well as for the development of teaching strategies appropriate for ADHD children. The study asks children to build a Lego model and talk about the process of building in a one-hour session. The children's behaviours and talking are recorded for later analysis. (Child's Name)'s and his parents have completed this phase of the study.

Another component of the study involves measures of the child's behaviours at home and at school. (Child's Name)'s parents have completed the Home Situations Questionnaire-Revised (HSQ-R). I am requesting that you complete a short (about 10 minutes) rating scale (the Vanderbilt AD/HD Diagnostic Teacher Rating Scale - VADTRS) regarding (Child's Name)'s academic and social behaviour in your classroom.

Completing the VADTRS does not mean that you are making or contributing to a diagnosis of ADHD. The selection criteria for the ADHD group is an existing diagnosis by a medical doctor, psychologist, or psychiatrist as reported by the child's parents. The VADTRS and the HSQ-R help me interpret (Child's Name)'s activities and language use during the study.

The information you provide is strictly confidential. The data and files are kept in a locked cabinet accessed only by me. Furthermore, the study does not use participant's names; code numbers, or pseudonyms, are assigned to individuals to identify results obtained from individual participants. Your participation is completely voluntary and at no time will you or the child be identified by name either verbally or in writing.

This study has been approved by the University of Victoria Human Research Ethics Committee (Certificate of Approval attached).

I would appreciate it if you would contact me as soon as possible with your response. I would be happy to provide you with further information about the study. You can reach me at XXX-XXXX or email me at XXXX. My supervisor is Dr. M. Mayfield (XXX-XXXX).

Thank you for your co-operation and assistance.

Yours truly,

Terry Rennie
PhD Candidate

Appendix E

Parental Ratings of Participant's Behaviour at Home

Table E1

Parental Rating of Participant's Behaviours at Home Using the HSQ-R

Does this child have problems paying attention or concentrating in any of these situations? If so, indicate how severe these attentional difficulties are.

	ADHD					Non-ADHD				
	A1	A2	A3	A4	A5	N1	N2	N3	N4	N5
Situations										
While playing alone	0	0	4	5	2	0	0	0	0	0
While playing with other children	7	7	5	7	2	0	0	0	0	0
Mealtimes	7	8	5	7	2	0	0	0	0	2
Getting dressed	3	8	8	8	2	0	0	0	4	2
While watching TV	6	6	0	0	4	0	0	0	0	0
When visitors are in your home	6	8	2	7	3	2	0	0	0	2
When you are visitng someone else	6	9	2	5	2	2	0	0	0	2
At church or Sunday school	0	9	9	0	0	0	0	0	0	0
In supermarkets, stores, restaurants, or other public areas	5	9	8	5	3	2	0	0	0	0
When asked to do chores at home	5	9	8	4	3	0	0	0	0	2
During conversations with others	0	7	5	3	3	0	0	0	0	1
While in the car	0	7	2	7	0	0	0	0	0	0
When father is home	0	7	0	0	0	0	0	0	0	0
When asked do do school homework	9	8	9	6	4	2	0	0	4	2
Total Rating Scores	54	102	67	64	30	8	0	0	8	13
Mean Parental Rating	3.9	7.1	4.8	4.6	2.1	0.6	0	0	0.6	0.9

Note: Ratings range from None = 0 to Mild = 1 to Severe = 9

Appendix F

Teachers' Rating of Participants using the VADTRS

Table F1

Teacher Ratings of Participants' Inattentive Behaviour at School

	ADHD			Non-ADHD				
Criteria	A2	A3	A5	N1	N2	N3	N4	N5
Fails to give attention to details or makes careless mistakes in school work	1	2	2	0	0	1	1	2
Has difficulty sustaining attention to tasks or activities	1	2	3	1	0	1	1	0
Does not seem to listen when spoken to directly	1	2	2	0	0	1	0	1
Does not follow through on instructions and fails to finish school work (not due to oppositional behaviour or failure to understand)	2	2	0	0	0	1	1	0
Has difficulty organizing tasks and activities	2	1	3	1	0	1	1	2
Avoids, dislikes, or is reluctant to engage in tasks that require sustained mental effort	2	3	1	1	0	1	1	1
Loses things necessary for tasks or activities (school assignments, pencils, or books)	1	2	3	1	0	2	0	1
Is easily distracted by extraneous stimuli	2	2	3	1	0	1	1	1
Is forgetful in daily activities	1	1	2	0	0	1	1	1

Rating Scale:

0 = Never

1 = Occasionally

2 = Often

3 = Very Often

Note: No rating scale provided for A1 and A4

Table F2

Teacher Ratings of Participants' Hyperactive Behaviours at School

	ADHD			Non-ADHD				
Criteria	A2	A3	A5	N1	N2	N3	N4	N5
Fidgets with hands or feet or squirms in seat	0	1	2	1	0	1	1	0
Leaves seat in classroom or in other situations in which remaining seated is expected	1	1	2	0	1	1	1	0
Runs about or climbs excessively in situations in which remaining seated is expected	0	0	1	0	1	0	1	0
Has difficulty playing or engagin in leisure activities quietly	2	1	0	0	2	1	0	0
Is 'on the go' or often acts as if 'driven by a motor'	1	1	1	0	1	0	0	0
Talks excessively	2	0	0	0	3	1	0	1

Rating Scale:
0 = Never
1 = Occasionally
2 = Often
3 = Very Often
Note: No rating scale provided for A1 and A4

Table F3

Teacher Ratings of Participants' Impulsive Behaviours at School

	ADHD			Non-ADHD				
Criteria	A2	A3	A5	N1	N2	N3	N4	N5
Blurts out ansers before questions have been completed	2	1	1	0	1	0	0	0
Has difficulty waiting in line	1	2	1	0	2	1	0	0
Interrupts or intrudes on others (e.g., butts into conversations or game)	1	2	0	0	2	1	0	0

Rating Scale:
0 = Never
1 = Occasionally
2 = Often
3 = Very Often
Note: No rating scale provided for A1 and A4

Table F4

Teacher Ratings of Participants' Behaviour at School

	ADHD			Non-ADHD				
Criteria	A2	A3	A5	N1	N2	N3	N4	N5
Loses temper	1	2	0	0	0	1	0	1
Actively defies or refuses to comply with adults' requests or rules	1	2	0	0	0	0	0	1
Is angry or resentful	1	2	0	0	0	0	0	1
Bullies, threatens or intimidates others	2	1	0	0	0	0	0	0
Initiates physical fights	2	0	0	0	0	0	0	0
Lies to obtain goods for favors or to avoid obligations (i..e, 'cons' others)	1	1	0	0	0	0	0	0
Is physically cruel to people	1	1	0	0	0	0	0	0
Has stolen items of nontrival value	0	0	0	0	0	0	0	0
Deliberately destroys others' property	0	1	0	0	0	0	0	0
Is fearful, anxious, or worried	1	1	0	0	0	0	0	3
Is self-conscious or easily embarrassed	1	2	1	0	1	1	0	2
Is afraid to try new things for fear of making mistakes	2	2	2	0	0	0	0	3
Feels worthless or inferior	1	0	0	0	0	1	0	1
Blames self for problems, feels guilty	1	0	0	0	0	1	0	0
Feels lonely, unwanted, or unloved; complains that 'no one loves him/her'	0	1	0	0	0	0	0	0
Is sad, unhappy, or depressed	1	1	0	0	0	1	0	2

Rating Scale:

0 = Never

1 = Occasionally

2 = Often

3 = Very Often

Note: No rating scale provided for A1 and A4

Table F5

Teacher Ratings of Participants' Academic Performance

	ADHD			Non-ADHD				
Criteria	A2	A3	A5	N1	N2	N3	N4	N5
Reading	2	1	4	2	5	3	3	3
Mathematics	3	3	2	2	4	3	3	4
Written expression	1	1	2	2	3	4	3	3

Rating Scale:

1 to 2 = Problematic

3 = Average

4 to 5 = Above Average

Note: No rating scale provided for A1 and A4

Table F6

Teacher Ratings of Participants' Classroom Behavioural Performance

	ADHD			Non-ADHD				
Criteria	A2	A3	A5	N1	N2	N3	N4	N5
Relationship with peers	2	2	3	3	4	3	4	2
Following directions/rules	2	2	2	3	5	3	3	3
Disrupting class	2	3	2	3	3	3	3	4
Assignment completion	1	1	2	3	5	2	3	4
Organizational skills	2	2	1	2	5	2	3	3

Rating Scale:

1 to 2 = Problematic

3 = Average

4 to 5 = Above Average

Note: No rating scale provided for A1 and A4

Appendix G

Parental Consent and Permission Forms

PARENTAL CONSENT FORM FOR CHILD'S PARTICIPATION IN THE STUDY ENTITLED, "LITERALLY SPEAKING: THE LANGUAGE OF ATTENTION DEFICIT HYPERACTIVITY DISORDER"

This research project is studying the language use of children with attention deficit hyperactivity disorder (ADHD) compared with children without ADHD. If you authorize your child's participation, your child will be asked to build and play with a Lego model. During the building of the model your child will be asked to describe the building sequence and to describe how he built the model. You will be asked to complete a questionnaire (the Home Situations Questionnaire-Revised) regarding your child's behaviours at home. Your participation and your child's should require, in total, about two hours of your time. You may view the video at the end of the session, or at another mutually agreed time, if you wish. A summary of the results will be provided to you and the final report will also be available.

Your participation and your child's participation is completely voluntary and you or your child can withdraw from the study at any time, without explanation. You have the right to refuse to answer any questions you do not wish to answer and your child also has the right to refuse to answer any questions or do anything he does not wish to do.

The study session with your child will be audiotaped and videotaped and the tapes will be destroyed immediately after your child's responses are coded in written form without using your child's name.

The camera operator is not part of the research team. At the conclusion of the session, the videotape is turned over to the principal investigator. The camera operator does not have access to any of the data after it has been recorded. The camera operator has signed a confidentiality agreement to maintain the confidentiality of the data.

The data collected in the study will remain confidential. The data will be kept in a locked filing cabinet. Only the researcher will have access to the data. Your real name and your child's real name will not be attached to any published results, and your anonymity will be protected by using code numbers, or pseudonyms, to identify results obtained from individual subjects.

Name:_____ Signature of Parent:_____
(Please Print)

Date:_____

Appendix G

PERMISSION TO USE TRANSCRIPTIONS OBTAINED DURING THE STUDY "LITERALLY SPEAKING: THE LANGUAGE OF ATTENTION DEFICIT HYPERACTIVITY DISORDER" IN ANY PUBLIC EXHIBITION OR PUBLICATION

The video and tape recordings from the study session will be transcribed into a written coded form. The written form then becomes the basis for analyzing and interpreting what your child says and does.

I _____ understand that the transcription will not identify me and/or my child. Our anonymity is protected by using code numbers, or pseudonyms, to identify results obtained from individual participants. Any verbal or written presentation will not include the real names of my child or myself.

I hereby grant Terry Rennie permission to use written transcriptions of the video and/or tape recordings of my child, as outlined above, in any public exhibition or publication.

Name: _____ Signature of Parent:_____
(Please Print)

Date: _____

Appendix H

Categories for Conceptual Domains

Following is a list of the categories, derived from Lund and Duchan (1983), for adverbs, adjectives, verbs and nouns used to examine the participant's conceptual domains.

1. Adverbs

- Temporal (e.g., *tonight, yesterday, on Wednesday*).
- Location (e.g., *in the tree, over there*).
- Characteristic of action (e.g., *slowly*)
- Instrument (e.g., *with a brush*).
- Accompaniment (e.g., *with my brother*).
- State of person (e.g., *cheerfully*).
- Causation (e.g., *because its old*).
- Motivation (e.g., *because I want it*)
- Recurrence (e.g., *twice, a lot*).
- State – Quality (e.g., (*barely, really*).
- Other

2. Adjectives

- Sensory Qualities:
    - Vision (e.g., *bright, blue*).
    - Sound (e.g., *shrill, loud*).
    - Touch (e.g., *smooth, cold*).
    - Taste (e.g., *sweet, yucky*).

- Smell (e.g., *stinky*, *delicious*).
- Other

- Logical Qualities
  - Shapes (e.g., *round*).
  - Size (e.g., *big*).
  - Number (e.g., *three*).
  - Substance (e.g., *wooden*).
  - Condition (e.g., *new*, *broken*).
  - Other
- Affective Qualities
  - Feelings (e.g., *happy*, *sad*).
  - Bodily states (e.g., *hungry*, *sleepy*).
  - Judgments (e.g., *friendly*, *cruel*).
  - Other
- Relations
  - Possession (e.g., *my*, *mommy's*).
  - Exclusivity (e.g., *only*, *this*).
  - Qualification (e.g., *enough*, *many of*).
  - Relative position (e.g., *first*, *next*).
  - Comparison (e.g., *more*, *bigger*).
  - Opposition (e.g., *this one's big*).
  - Disappearance (e.g., *all gone*).
  - Other

3. Verbs

- Pro-verbs state a general action that could be applied in several situations (e.g., *do*, *go* and *fix*).
- Change of state verbs describes action that changes the state of material or people (e.g., *cut*, *bake*, and *eat*).
- Action of body describes verbs related to actions involving the body (e.g., *sit down*, *run*, and *sleep*).
- Action with object describes verbs that are related to some action (e.g., *throw X*).
- Sensory stative verbs relate to passive sensory experiences (e.g., *hear*, *see*, *feel* and *know*).
- Sensory process verb relate to active sensory experiences (e.g., *listen*, *look*, *touch* and *think*).
- Deictic verbs depend on placement and direction of movement of the speaker and listener (e.g., *bring-take*; *come-go*).
- Locomotion verbs express a manner of moving (e.g., *run*, *walk* and skip).
- Function verbs are related to the uses for objects and what can be done with or to them (e.g., *sweeps*, and *buys*).
- Other

4. Nouns

- Animate nouns refer to people, animals and other items having life (e.g., *my sister*, *the cat*, and *a tree*).
- Inanimate nouns refer to all others (e.g., *book*, *model* and *car*).
- Concrete nouns refer to tangible referents (e.g., *the cat*, and *a tree*).

- Abstract nouns refer to nontangible referents (e.g., *love*, *success*; Lund & Duchan, 1983, pp. 213-214).
- Count nouns refer to individual entities, such as books, Lego pieces or cars.
- Noncount nouns refer to an "undifferentiated mass or notion, such as butter, music or advice" (Crystal, 1988, p. 96). Noncount nouns are also known as "mass" nouns.

Appendix I

Codes for Conversational Acts to Profile Social-Conversational Participation*

Utterance Level

Assertive Conversational Acts

1. Requestives: Solicit information or actions

    a. Requests for Information (RQIN): All forms of questions (including tags, e.g., "This is fun, isn't it?") designed to solicit new information from the conversational partner, e.g., "Why you sad?" "Where my mommy?" "You want you momma?" "Wanna say it?"

    b. Requests for Action (RQAC): Any forms that solicit the performance of some action by the partner, e.g., "Put blue," "Stick 'em in hard," "Gimme that," "You say it."

    c. Requests for Clarification (RQCL): All questions that seek clarification of some prior utterance, e.g., "What?" "Huh?" "No?" "A blue Play-Doh?"

    d. Requests for Attention (RQAT): Utterances that add no new information to the conversation but seek attention or acknowledgment from the partner, e.g., "Hey, look," "Now watch," "See this?" "Jason!" "Know what?" "Guess what."

2. Assertives: Label, report facts, state rules, explanations and so forth.

    a. Comments (ASCO): Identifications and descriptions of observable objects and events, e.g., "Have birthday party," "That Vincey," "They hanged up."

    b. Statements (ASST): Reports of mental events, evaluations, statements of rules, explanations, and so forth, that are not directly observable, e.g., "Hafta squish it together," "You 'posed to blow it," "This don't go in here," "I wanna play that," "Better clean up," Those not for play with."

    c. Disagreements (ASDA): Comments or statements that deny a proposition of some prior assertation, e.g., "No way, Jose," "I not silly," "That not mine," "No," or that indicate refusals to comply with requests, e.g., "I not telling you," "No."

3. Performatives (PERF): Claims, jokes, teasing, protests, and warnings that are accomplished just by being produced, e.g., "Look out!" "Don't step on it!" "Don't just breathe!" "That's mine!" "Hey, wanna play hide and see poop!" (laughs), "Can't catch me."

4. Responsive Conversational Acts: Provide information requested or acknowledge assertives and performatives.

a) Responses to Requests for Information (RSIN): Attempts to provide new information requested by the partner.

b) Responses to Requests for Action (RSAC): Verbal accompaniments to the performance of an action requested by the partner.

c) Responses to Requests for Clarification (RSCL): Attempts to repeat or otherwise clarify a prior utterance following the partner's request for clarification.

d) Responses to Requests for Attention (RSAT): Responses to attentional requests that serve to acknowledge the partner and to indicate that the partner may continue, e.g., "What?" "Yeah."

e) Responses to Assertives and Performatives (RSAS): Simple acknowledgments of or agreements with prior partner utterances that add no new information to the prior utterance, e.g., "Oh," "Yeah," "Sure," "I know," "Okay," "Right." Utterances containing an RSAS plus some assertive act are coded under the appropriate assertive category.

Imitations (IMI): Utterances that repeat all or part of the previous utterance, including its intonation pattern, and that include no new information, e.g., RQIN: "What do you want?"; IMI: "What you want?"; ASST: "I like cookies." IMI: "Like cookies."

Other: Any utterances that do not fit clearly under the above categories.

Discourse Level

Initiate Topic: Utterances that either do not follow a prior utterance or that introduces new information that is not related to information from a prior utterance.

Maintain Topic: Utterances that are related to some prior utterance and that fulfill the speaker's obligations but that add no new, nonsolicited information.

Extend Topic: Utterances that are related to a prior utterance and that extend the established topic by adding new semantic details or by shading appropriately to some related topic.

Extend Topic-Tangential: Utterances that are related tangentially to some aspect of a prior utterance but do not seem to extend the topic in an adequate manner.

* Each conversational act is coded at two levels of specificity: the utterance level and the level of discourse function. (Fey, 1986, pp. 72-73)

Appendix J

LARSP Profiles of Clause and Phrase Structures

Table J1

Clause Structures as a Percentage of Total Clauses

	ADHD		Non-ADHD			ADHD		Non-ADHD	
	%	N	%	N		%	N	%	N
Stage I	7.2	23	10.5	40	**Stage V**				
					Coord-1	7.2	23	16.0	61
Stage II					Coord-1+	0.6	2	1.3	5
SV	6.9	22	11.2	43	Sub S	0	0	1.3	5
SO	0.9	3	0.5	2					
AX	3.4	11	2.1	8	**Stage VI**				
VO	2.8	9	0.5	2	Passive	0.3	1	1.3	5
					Complex VP	6.6	21	7.3	28
Stage III					Complement	5.3	17	2.9	11
SVC	1.6	5	0.8	3					
SVO	34.4	100	21.5	82	**Stage VII**				
SVA	4.1	13	3.7	14	"there" clauses	1.9	6	6.8	8
					Adverb connect	1.9	25	2.1	26
Stage IV									
SVOA	7.5	24	7.8	30					
SVdOi	0.6	2	0.5	2					
AAXY	4.1	13	1.8	7					

The clause structures shown above include only the main structures in the LARSP profile. Therefore, the percentages in Table J1 do not sum to 100. Following is a list of the abbreviations used in the LARSP profile for clauses:

Stage II	
SV	Subject-verb
SO	Subject-object
AX	Adverbial with another sentence element
VO	Verb-object
Stage III	
SVC	Subject-verb-complement
SVO	Subject-verb-object
SVA	Subject-verb-adverbial
Stage IV	
SVOA	Subject-verb-object-adverbial
SVdOi	Subject-verb-determiner-indirect object
AAXY	Adverbial-adverbial with other sentence elements

Stage V	
Coord-1	Coordination with another sentence element
Coord-1+	Coordination with more than one sentence element
Sub S	Subordinate clause with a single subject
Stage VI	
Passive	Passive constructions
Complex VP	Complex verb phrases
Complement	Complementation - elements of clause structure required for the completion of verb meaning
Stage VII	
"there" clauses	Begin with an "empty", unstressed "there"
Adverb connect	Adverbial connectivity

The LARSP profile for phrase structures, similar to the one for clauses, includes the main structures. Consequently, the percentages do not sum to 100.

Table J2

Phrase Structures as a Percentage of Total Phrases

	ADHD		Non-ADHD			ADHD		Non-ADHD	
	%	N	%	N		%	N	%	N
Stage I	44.8	749	42.2	808	**Stage IV**				
					NPPrNP	1.3	22	1.9	35
Stage II					XcX	0.1	2	0.5	10
DN	0.5	8	0.4	8	NegV	2.1	36	3.2	61
AdjN	0.3	5	0.2	3	NegX	0.8	14	1.3	26
NN	0.2	4	0.4	8	Aux (2)	0.3	5	0.4	8
PrN	0.6	10	0.7	13					
Vpart	2.2	37	1.5	28	**Stage V**				
IntX	0.5	9	0.4	7	Postmod	0	0	0	0
Stage III					**Stage VI**				
PrDN	0.1	2	0.6	11	NP Initiator	0	0	0.2	3
Pron-P	21.2	355	25.4	487	NP Coord	0.3	5	0.4	5
Pron-O	13.7	230	10.6	203					
Cop	3.4	57	2.3	44					
Aux	7.3	122	7.6	145					

The following list describes the abbreviations used in the LARSP profile for phrases:

Stage II	
DN	Determiner-noun
AdjN	Adjective-noun
NN	Noun-noun
PrN	Prepostion-noun
Vpart	Verb-particle
IntX	Intensifier with another element
Stage III	
PrDN	Prepostion-determiner-noun
Pron-P	Personal pronoun
Pron-O	Other pronoun
Cop	Copulas
Aux	Auxiliaries

Stage IV	
NPPrNP	Noun phrase-preposition-noun phrase
XcX	Coordinator ("c") with two other elments
NegV	Verbal negation
NegX	Clausal negation
Aux (2)	Two auxiliaries
Stage V	
Postmod	Postmodification phrases
Stage VI	
NP Initiator	Noun phrase initiators
NP Coord	Noun phrase coordination

Appendix K

Frequencies

Following are the frequencies for the charts presented in the text.

Table K1

Frequencies by Place Deixis

	ADHD	Non-ADHD
Here	25	13
There	27	18
Come(s)	5	3
Go(es)	24	20
This	49	56
That	68	55
Total	198	165

Table K2

Frequencies and Percentages for ASCO and ASST Statements

	A1	A2	A3	A4	A5	N1	N2	N3	N4	N5
ASCO	163	124	232	182	226	153	68	116	89	23
ASST	128	52	204	97	92	195	51	126	263	62
Total ASCO+ ASST	291	176	436	279	318	348	119	242	352	85
Percent of ASCO	56.0	70.5	53.2	65.2	71.1	44.0	57.1	47.9	25.3	27.1
Percent of ASST	44.0	29.5	46.8	34.8	28.9	56.0	42.9	52.1	74.7	72.9
Total Percent	100	100	100	100	100	100	100	100	100	100

Table K3

Frequencies for Participants' and Researcher's Assertiveness in the Study

	Intro	Build	Instruct	Play	End	Total	Percentage
A1	4	221	10	44	37	316	44.0
Researcher	36	230	18	81	37	402	
Total	**40**	**451**	**28**	**125**	**74**	**718**	
A2	10	190	7	8	15	230	35.2
Researcher	53	275	20	34	41	423	
Total	**63**	**465**	**27**	**42**	**56**	**653**	
A3	9	218	44	187	38	496	45.7
Researcher	36	200	56	245	53	590	
Total	**45**	**418**	**100**	**432**	**91**	**1086**	
A4	16	177	107	35	7	342	41.3
Researcher	58	311	85	22	11	487	
Total	**74**	**488**	**192**	**57**	**18**	**829**	
A5	2	137	79	96	17	331	44.9
Researcher	32	158	62	121	33	406	
Total	**34**	**295**	**141**	**217**	**50**	**737**	
N1	14	236	86	86	18	440	46.8
Researcher	37	232	102	98	31	500	
Total	**51**	**468**	**188**	**184**	**49**	**940**	
N2	0	54	2	73	5	134	24.4
Researcher	26	165	26	170	28	415	
Total	**26**	**219**	**28**	**243**	**33**	**549**	
N3	3	177	19	53	24	276	35.5
Researcher	41	272	43	96	49	501	
Total	**44**	**449**	**62**	**149**	**73**	**777**	
N4	3	189	23	172	33	420	53.5
Researcher	34	135	17	149	30	365	
Total	**37**	**324**	**40**	**321**	**63**	**785**	
N5	2	53	8	24	7	94	21.7
Researcher	51	120	41	104	24	340	
Total	**53**	**173**	**49**	**128**	**31**	**434**	

Table K4

Frequencies for Participants' Responses to Researcher's Questions

	Participant Responses	Researcher's Questions	(P/R)*100 = Percent
A1	78	80	97.5
A2	84	101	83.2
A3	114	124	91.9
A4	94	125	75.2
A5	67	74	90.5
N1	112	113	99.1
N2	100	100	100.0
N3	74	77	96.1
N4	62	64	96.9
N5	80	81	98.8

Table K5

Frequencies for Maintaining and Extending Topics

	ADHD	Non-ADHD
Maintain	623	798
Extend	1398	1120
Total	2021	1918

Table K6

Number of Responses to Researcher's Non-Question Utterances

ADHD		Non-ADHD	
A1	206	N1	296
Researcher	421	Researcher	535
A2	116	N2	166
Researcher	431	Researcher	387
A3	253	N3	225
Researcher	612	Researcher	578
A4	176	N4	266
Researcher	543	Researcher	478
A5	186	N5	119
Researcher	418	Researcher	309

Table K7

Frequency of Topic Introduction by Type of Conversational Act

	ADHD					
Conversational Acts	A1	A2	A3	A4	A5	TOTAL
ASCO	54	37	64	35	52	242
RQIN	11	26	20	18	8	83
ASST	15	4	21	12	8	60
RQAT	0	2	0	6	0	8
PERF	0	0	0	1	0	1
RSIN	0	0	1	0	0	1
TOTAL	80	69	106	72	68	395
	Non-ADHD					
	N1	N2	N3	N4	N5	TOTAL
ASCO	33	25	44	39	6	147
RQIN	26	3	2	13	4	48
ASST	12	1	18	20	2	53
PERF	0	1	4	1	0	6
RQAT	2	1	0	0	0	3
RQCL	1	0	0	1	0	2
RQAC	0	0	1	0	0	1
RSCL	0	0	1	0	0	1
TOTAL	74	31	70	74	12	261

Table K8

Frequency of Extending Topic by Type of Conversational Act

	ADHD					
Conversational Acts	A1	A2	A3	A4	A5	TOTAL
ASCO	101	81	164	146	166	658
ASST	108	40	162	67	74	451
RSIN	33	33	33	38	22	159
RQIN	3	17	22	12	2	56
RSCL	3	5	17	13	9	47
RQCL	0	2	4	6	0	12
RQAT	2	2	0	3	1	8
ASDA	0	0	3	0	0	3
TOTAL	250	180	405	285	274	1394
	Non-ADHD					
	N1	N2	N3	N4	N5	TOTAL
ASST	168	42	103	212	48	573
ASCO	109	41	66	46	17	279
RSIN	47	35	26	23	28	159
RQIN	12	0	5	27	0	44
RSCL	12	2	4	7	2	27
ASDA	11	0	1	3	0	15
RQCL	9	0	0	1	0	10
RQAC	0	1	1	1	4	7
PERF	0	1	4	0	0	5
RQAT	0	1	0	0	0	1
TOTAL	368	123	210	320	99	1120

Table K9

Frequency of Maintaining Topic by Type of Conversational Acts

	ADHD					
Conversational Acts						
	A1	A2	A3	A4	A5	TOTAL
RSAS	78	57	43	34	64	276
RSIN	31	37	47	25	29	169
ASST	5	8	19	18	9	59
RSCL	3	6	12	5	3	29
ASCO	8	6	2	1	8	25
RQAT	1	0	5	12	0	18
RQCL	2	3	5	4	2	16
OTHER	0	0	12	1	0	13
IMI	0	1	5	2	2	10
PERF	5	1	1	2	0	9
ASDA	1	0	0	1	0	2
RQIN	0	1	0	0	1	2
	Non-ADHD					
	N1	N2	N3	N4	N5	TOTAL
RSAS	75	95	73	46	50	339
RSIN	55	56	31	32	47	221
ASST	15	8	5	31	12	71
RSCL	14	17	11	5	2	49
RQCL	13	3	2	11	0	29
ASCO	11	2	6	4	0	23
ASDA	6	1	3	3	1	14
IMI	6	2	4	1	0	13
PERF	1	1	6	2	0	10
RQIN	3	0	1	6	0	10
RQAT	4	1	1	1	0	7
OTHER	2	0	0	3	0	5
RSAC	1	0	0	0	3	4
RQAC	0	1	0	0	0	1

Table K10

Frequency of Self-Talk During Building Phase

	Frequency of Self-talk	Number of Utterances	Percent
A1	36	286	12.6
A2	84	283	29.7
A3	60	251	23.9
A4	31	243	12.8
A5	42	172	24.4
TOTAL	253	1235	
N1	16	327	4.9
N2	5	136	3.7
N3	4	251	1.6
N4	17	210	8.1
N5	11	107	10.3
TOTAL	53	1031	

Appendix L

Interrelationships Among Communicative Competency Components

The analysis of the communication with the participants showed different layers, like an onion, that comprise communicative competency. The analysis moved progressively from the external to the inner layers; from the most visible to the more imperceptible. The components of communicative competency, as noted in Chapter 4, are interrelated. The speakers' language choices expressed at the grammatical levels affect the appropriateness of their communicative functions within a sociocultural context (sociolinguistic competency) that impact upon the meaning of their verbal texts (discourse competency) and the strategies used to compensate for breakdowns (strategic competency). To illustrate the interrelatedness of communicative competency the following example traces one aspect of the participants' language choices from the grammatical to the sociolinguistic to the discourse levels. This example shows how a relatively small difference in the ADHD participants' use of the pronoun *it* affects their ability to communicate effectively.

The morphological analysis of grammatical competency revealed some differences in the participants' use of noun forms. The ADHD group used somewhat more personal pronouns and fewer common and proper nouns than did the Non-ADHD group. Closer examination showed that the ADHD group used more 3rd person personal pronouns (44.1%) than did the Non-ADHD group (38.6%). Further analysis showed that the ADHD group used the 3rd person personal pronoun *it* more (64.9%) than did the Non-ADHD group (55.2%).

The personal pronoun *it* also appeared in the semantic analysis (for grammatical competency). The analysis of lexical meaning showed that the ADHD participants tended to substitute the pronoun *it* for an object's name (a noun). This was also consistent with the result from the morphological analysis that showed that the ADHD participants used fewer common and proper nouns than did the Non-ADHD group. The analysis of lexical meaning indicated that the ADHD participants used fewer nouns because they tended to substitute personal pronouns for nouns. In the analysis of referencing, the pronoun *it* again reappears. The ADHD participants used the pronoun *it* to refer to objects without making appropriate anaphoric or shared references for the listener. The ambiguous reference to an unnamed object left the listener without any guides regarding the objects about which the ADHD participants were talking. The ADHD participants made more ambiguous references (i.e., failed to provide anaphoric or shared references for the listener) than did the Non-ADHD participants. This reduced the effectiveness of the ADHD participants' communication in this study.

The pronoun *it* also appeared in the analysis of person deixis. Again, the ADHD participants used more 3rd person personal pronouns (37.9%) for person deixis than did the Non-ADHD group (32.6%). The results indicated that the ADHD participants showed a tendency to make more inappropriate use of person deixis. In this case the tendency for the ADHD group was to shift their references from the 2nd person *you* to the plural 1st person *we*. These shifts between 2nd and 3rd person meant that the reference also shifts from one that includes the addressee but excludes the speaker (*you*) to one that includes the speaker (*we*). These shifts in association with ambiguous references make the

speaker's utterances and underlying proposition more difficult to follow and the speaker's meaning more susceptible to misunderstanding.

Thus far, the analysis showed the development within grammatical competency has moved from differences in nouns, to specifying the type of noun, to identifying the specific personal pronoun (*it*). This pronoun is then used to substitute for nouns, or known words, but shared references linking the pronoun *it* to objects are not made resulting in ambiguous references. Ambiguous references continue to be made with other pronouns, again, without the benefit of shared references. The resulting utterances tend to confuse the listener.

The analysis moves from grammatical competency to sociolinguistic competency. The pronoun *it* reappears in the analysis of listener's background knowledge. The analysis shows that the ADHD participants tend to link hand motions and physical demonstrations to deictic terms (such as the pronoun *it*) while the Non-ADHD participants also use semantic referents such as nouns. At the level of sociolinguistic competency, the influence of the personal pronoun *it* has undergone a change. It has moved from differences in word use, to replacement for nouns in referencing, to physical links to objects. The propensity of the ADHD participants to link actions to objects that substituted for lexical descriptors suggests that they tend to be more dependent on context than the Non-ADHD participants. The finding that the ADHD participants tended to be more context-bound was also supported by the analysis of their topics and statements.

The analysis looked at discourse competency. The pronoun *it* is, again, an issue in the analysis of the ADHD participants' topic maintenance. They continue to make ambiguous references using the pronoun *it* which, at the discourse level, is found to

interfere with local coherence. The result is utterances that leave the listener to infer meaning, which reduces the effectiveness of the ADHD participants' communication.

In summary, the small differences in the use of a single pronoun at the grammatical level are magnified in its use at the sociolinguistic and discourse levels in this study. The end result is that the communicative competency of the ADHD participants was compromised because of the way they expressed their ideas and the types of grammatical and linguistic structures they employed to do so. The impact of using the pronoun *it* is magnified and becomes more complicated when the effects of all the other grammatical and linguistic structures, such as interruptions and numerous topic changes are considered. This one illustration exemplifies a pattern common to the ADHD participants' communicative competency revealed in this study.

Appendix M

UVIC Human Research Ethics Committee Certificate of Approval

University of Victoria
Human Research Ethics Committee

CERTIFICATE OF APPROVAL

Principal Investigators	Department/School	Supervisor
Terry J. Rennie **Graduate Student**	**CMFD**	**Dr. M. Mayfield**

Co-investigator(s):
N/A

Title: Literally Speaking: The Language of Attention Deficit Hyperactivity Disorder

Project No.	Start Date	End Date	Approval Date
136-99	**26 Apr 99**	**30 Jun 00**	**26 Apr 1999**

Certification

This is to certify that the University of Victoria Ethics Review Committee on Research and Other Activities Involving Human Subjects has examined the research proposal and concludes that, in all respects, the proposed research meets appropriate standards of ethics as outlined by the University of Victoria Research Regulations Involving Human Subjects.

J. Howard Brunt,
Associate Vice-President, Research

This Certificate of Approval is valid for the above term provided there is no change in the procedures. Extensions/minor amendments may be granted upon receipt of "Request for Continuing Review or Amendment of an Approved Project" form.

Office of Vice President Research
Room 424, Business & Economics Building
P.O. Box 1700,
Victoria, BC V8W 2Y2

Tel: (250)721-7968
Fax: (250)721-8960
Email: lalleman@uvic.ca