Language Use in Children With Attention Deficit Hyperactivity Disorder

Margaret Mathers
Grad Dip (Ling); Dip. Sp Thy (Cumberland)

A thesis submitted in fulfilment
of the requirements for the degree of
Doctor of Philosophy

March 2007
DECLARATION

I hereby certify that the work embodied in this thesis is the result of original research and has not been submitted for a higher degree to any other University or Institution.

(Signed)
Numerous people have supported and contributed to the production of this thesis.

Firstly, I sincerely thank my principal supervisor, Dr Alison Ferguson, for her untiring assistance and guidance. I would also like to acknowledge the financial support provided through the Australian Postgraduate Association, and the School of Education and Arts at the University of Newcastle for assistance with grants to attend conferences and funding for statistical support.

Thanks are also due to the families and the children who generously gave of themselves. I hope that you will all be suitably rewarded. In particular, I am grateful to the parents and children from the Newcastle - Hunter ADHD Support Group; the children, parents and staff of Bishop Tyrell Anglican College, Newcastle Grammar School, Our Lady of Lourdes Primary School, Tarro, St John’s Primary School, Lambton, St Patrick’s Primary School, Wallsend, St Phillip’s Christian College, Waratah, and St Therese’s Primary School, New Lambton.

Special thanks to my friends and colleagues in the Speech Pathology programme at the University of Newcastle, in particular Julie Thomson, Liz Spencer, and Sally Hewat. To Kim Colyvas, my statistical consultant, thank you for a job so well done and for your patience and encouragement. Thanks also to Jane Robertson, Andrew Murray,
and Emily Walkom; without your time, input and effort, I doubt I would have reached this stage.

To my family, we’ve trodden this path together; thank you for bearing with me. To David, my loyal and long-suffering husband, you were wonderful; we did it! To my children, David, Daniel, Charlie, Tess, and Julia, thanks for putting up with my irritability and absences; let’s go to the beach! Mum and Dad, I hope you are proud; Steve, I’m sure you’re whooping from above; keep your watchful and loving eye on us and all our future endeavours won’t you; hopefully nothing will ever take this long again!

... Nothing we do is complete ...

No statement says all that could be said ...

We lay foundations that will need further development ...

We may never see the end results, but that is the difference between the master builder and the worker.

Excerpts from Romero’s Prayer, attributed to K Untener
PUBLICATIONS AND PRESENTATIONS

The following journal articles and conference presentations resulted from work on this thesis.

Journal Articles


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GLOSSARY OF ABBREVIATED TERMS

ADHD
Attention Deficit Hyperactivity Disorder; used in this thesis to cover all subtypes

CELF
Clinical Evaluation of Language Fundamentals (Semel, 1987; Semel, 1995; Semel, 1998); a standardised test of language

DSM
Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 1980, 1987, 1994); contains checklist often used to diagnose ADHD

ELS
Expressive Language Score; one of the composite scores on the CELF related to expressive language ability

GI
Grammatical Intricacy; a way of quantifying complexity by calculating the proportion of clauses in a text that occur in clause complexes

LI
Language Impairment; a generic and self explanatory term referring to problems with language
OR
Odds Ratio; a statistical term meaning the likelihood of the occurrence of a particular event

RLS
Receptive Language Score; one of the composite scores on the CELF related to receptive language ability

SALT
Systematic Analysis of Language Transcripts; a programme for analysing and managing information from the analysis of discourse

SFL
Systemic Functional Linguistics; a sociolinguistic approach to the study of language

SLI
Specific Language Impairment; impairment in either the comprehension or expression of language, or both, that has no obvious cause

TLS
Total Language Score; in the CELF, this is the composite score derived from adding the receptive and the expressive language scores

TOPL
Test of Pragmatic Language (Phelps-Terasaki & Phelps-Gunn, 1992)

TTR
Type/token ratio; a measure of lexical diversity derived from the proportion of total words in a text that are new words
Questions continue to be raised about the language abilities of children who have a diagnosis of Attention Deficit Hyperactivity Disorder (ADHD). Recent conceptualisations of ADHD and also of language difficulties have acknowledged that aspects of context may contribute to the manifestations of these complex conditions. In the past, investigations of the language of children who had a diagnosis of ADHD appear to have been hampered by reliance on models of language impairment that emphasised formally measured language abilities and largely disregarded the role of context.

This thesis describes a study designed to test the hypothesis that important differences in language use exist between children who have a diagnosis of ADHD and their peers without ADHD, when specific language impairment has been excluded. A second goal of the study was to investigate the impact of aspects of context, specifically text type and mode of expression, on the language use of these children.

The study was community-based. Attempts were made to match the children for age (eight to twelve years), gender, level of education, and socio-economic status. Two standardised language tests were administered to each child, and only children who had achieved results within the normal range were accepted into the study. The sample
group consisted of eleven children who had a previous diagnosis of ADHD, and eleven control children. Discourse analysis based on a Systemic Functional Linguistics approach was used to describe spoken and written samples from three different examples of text type that were created by each child. Comparisons were made for multiple variables, and any observed differences were examined using a combination of quantitative and descriptive techniques.

The results showed differences between the groups for clause structure, thematic structure, macro textual organisation, lexico-grammar, behaviours surrounding spoken language, and conventions of written language. There were differences noted in the way the text type and the mode of expression appeared to affect the outcomes. The differences were discussed and interpreted as evidence of a greater degree of difficulty shown by the children with ADHD with regard to the organisation and complexity of their texts.

Clinical implications suggest that careful linguistic analysis of spoken as well as written language of children with ADHD may be warranted even in the absence of the diagnosis of specific language impairment. Such analyses may not only identify potentially problematic areas with respect to language use within everyday contexts, but may also highlight areas where particular intervention may be beneficial.
1.1. Overview of Thesis

There is a strong association between Attention Deficit Hyperactivity Disorder (ADHD) and language difficulties. Knowledge about these difficulties remains fragmented. Both ADHD and language have been extensively studied, and there exists a large amount of sometimes disparate information about ADHD, and also about language, its use, and its disorders. Recently, the significance of context has been given increased importance as a factor in both the presentation of the symptoms of ADHD and in the conceptualisation of language and its disorders.

This thesis describes a study that attempted to identify and explain possible differences in the language use of children with ADHD compared to that of typically developing children, and also to examine the effect of aspects of context on patterns of language use. Results showed that differences in language use existed in the sample of children studied, and that aspects of context, specifically the mode of expression and the text type used, influenced language use. The approach adopted for the research utilised key elements of knowledge. Firstly, ADHD was conceptualised as having a strong
social dimension, meaning that the core difficulties of ADHD give rise to problematic behaviours in particular social contexts. Secondly, language use, including its problematic use, was conceptualised from a sociolinguistic perspective. This means that the study used methods that highlighted the interrelationship of language and context. In particular, analyses guided by Systemic Functional Linguistics (SFL) were used. The thesis will argue that this approach not only presented a suitable framework for investigating language use in children with ADHD, especially those who were not identified as language impaired, but also that it offered insights into the importance of potential differences in language use, and how they interrelate with aspects of context.

This chapter presents an overview of ADHD, together with an outline of different approaches to the understanding of language. Some key points will be emphasised in an effort to highlight issues of importance that require consideration when an investigation of language in children who have ADHD is being undertaken. Firstly, regarding ADHD, the salient characteristics, methods of diagnosis, possible causes, and current treatments are described. Several unresolved issues in the understanding of ADHD are then introduced. These include the nature of the disorder itself, and views that provide alternatives to the commonly presented medical model of states of disease and wellbeing. Other issues mentioned include the known heterogeneity of the ADHD population, particularly among children, and the nature of the assortment of conditions that frequently accompany a diagnosis of ADHD, including language disorders. Each of these is important because of its significance in contextualising ADHD. The notion of context and its potential role as a crucial factor in ADHD is of particular interest in this thesis, and is discussed in detail.
A précis of theories of language is also presented in this chapter. A broad spectrum of theoretical orientations exists concerning language and language development in general. Methods for investigating the apparent language difficulties associated with ADHD have encompassed this range of possible orientations. Each theoretical orientation entails an understanding of how communication works, what constitutes a communication problem, how these problems may be detected, and how interventions may be best planned and implemented. On the one hand are more formal approaches to language. These typically concentrate on linguistic forms and structures that are objectively assessed using standardised tests and normative comparisons, for example syntax and semantics. Contrasting with these are the functional approaches. These assess language using a variety of instruments including more descriptive tools, and many of these include some reference to the context in which the communication occurs. Compared to formal methods, functional approaches tend to give far more consideration to aspects of the context in which communication is embedded.

Many of the studies in the literature regarding language and ADHD have investigated Specific Language Impairment (SLI), and have used standardised formal tests that target specific linguistic skills. Others studies have used functional methods to explore elicited samples of language for the presence and significance of pre-determined variables of interest that were the focus of the research. The diversity of approaches in research methods has meant that the information derived from the literature produces a rather piecemeal overall picture of language and how it appears to be affected by ADHD. There is an abundance of information that has not coalesced into a firm knowledge base, at least in part due to fundamental differences in the conceptualisation of language. As a further complication, children with ADHD
characteristically present with heterogeneous symptoms and behaviours, which means that potential generalisation of the findings of the research is limited. Thus there is no precise view about how ADHD affects language, what sort of language difficulties ADHD might predispose a child to and under what circumstances, or how these potential language difficulties might best be detected. Without such a knowledge base it remains difficult to address other questions that have been raised. Important consequences such as the nature of educational and psychological interventions rest on better knowledge about the role of language and the nature of the language difficulties associated with ADHD.

This situation prompted this study, which was conducted in order to respond to two research questions. Firstly, in the absence of other possible confounding factors, can differences be detected and described in the language use of children with a diagnosis of ADHD, when compared to the language use of children without that diagnosis? Secondly, how do variations in context affect the patterns of language use demonstrated by children with a diagnosis of ADHD, when compared to the language use of children without ADHD?

Because the relationship between ADHD and SLI is not clear, it was decided to investigate language abilities that were not potentially confounded by SLI, and to explore language functioning from a more broadly-based perspective, namely language use. Given the pervasive nature of the problems that are experienced by children with ADHD, it is likely that potential differences in language use between the two groups of children in the study would be problematic, or at least not benign. However, it was not intended that only difficulties with language would be observed. The study attempted to concentrate on describing the language use of the children as richly as possible, which
would include describing language difficulties. The symptoms associated with ADHD, including language difficulties, have been described as being contextually related. This thesis proposes that the theoretical perspective of sociolinguistics is particularly suitable for the exploration of language abilities in children who have been diagnosed with ADHD because of its orientation to context.

Chapter 2 explains the functional approach that was adopted for this research. The study used discourse analysis that was guided by Systemic Functional Linguistics (SFL). Discourse analysis, which has gained acceptance as a tool both in research and in clinical settings, was selected as the method for analysing the language samples because it provides a way of illustrating what children actually do with their language in everyday situations. Through discourse analysis, the way that language actually functions in a specific context is described, and the particular linguistic resources that the speaker or writer has used to achieve the desired function of the communication are identified. SFL is described in Chapter 2, with emphasis on its conceptualisation of language as a system of options made within situational contexts. SFL takes context as well as meaning into account, and provides a framework with which to describe the grammatical elements of the data from a functional perspective.

Chapter 3 describes the design and implementation of the study. From the outset, it was assumed that SLI and ADHD were separate diagnostic categories. This meant that attempts were made to keep the two conditions separate, but to anticipate that they may possibly co-occur in children with ADHD. SLI was identified by a score of one or more standard deviations below the mean on either of two standardised tests that were administered in the very early phases of the study. Children with standardised test outcomes that were indicative of SLI were excluded from further participation. This
step attempted to ensure that the eventual sample group was made up of children with ostensibly normal language development for their age.

The goal of the study’s experimental tasks was to engage a small group of young children in enjoyable tasks that attempted to reflect appropriate, naturalistic and meaningful contexts for them. The tasks were designed so that samples of language use that were elicited would resemble the language used by the children in normal circumstances when they were at school. The tasks reflected three different types of texts, namely the narration of a created story, a recount, and a procedural text. Both spoken and written modes of expression were investigated. Variables were identified in the texts and measures related to these variables were compared between the children with ADHD and those with no diagnosis of ADHD.

Chapter 4 presents the results of the study. These showed that differences between the children with ADHD and the control children were observed in the texts for aspects of language use, specifically clause structure, thematic structure, macro textual organisation, and lexico-grammar. Furthermore, the mode of expression and the text type were found to have an effect on the differences that were observed between the two groups of children. Observed differences were analysed using a combination of statistical and descriptive methods.

In Chapter 5 the observed differences between the two groups of children with the organisation and complexity of discourse are discussed. It is suggested that the children with ADHD demonstrated less suitable options in language use than their non-ADHD counterparts, even though both groups of children ostensibly had normally developing language ability. These results agreed with previous observations in the
literature about the difficulties with the organisation of discourse that children with ADHD appear to have. It is of interest that the methods used in this study have been able to replicate those earlier observations. However, this study has elaborated on these observations by adding that these difficulties appeared to have been sensitive to aspects of context in language use, in particular the mode of expression and the text type. The possible relationship between language use and these aspects of context is also discussed in Chapter 5, and implications regarding the assessment and treatment of language difficulties associated with ADHD are explored.

The thesis concludes with remarks about the unique contributions that have been made in terms of the association of language and ADHD. In particular the suitability of the framework of SFL as an investigative approach, and its clinical potential as a means of identifying areas that require intervention, is summarised. Such new information offers a contribution to our understanding of the way children with ADHD use their language.

1.2. Attention Deficit Hyperactivity Disorder

1.2.1. Introduction

ADHD has been extensively studied and a large amount of information has been published about the condition. This information includes general descriptions of the presenting symptoms, causative factors, and trends in diagnosis and treatment. Other issues continue to be debated, and these include the nature of the disorder itself and of possible subtypes, the heterogeneity of identified populations, and the significance of what have been termed co-morbid conditions, which are other defined conditions that the person with ADHD may also be diagnosed as having.
1.2.2. What is known about ADHD

ADHD has been the focus of intense research activity. In summary, ADHD is usually described as a significant and pervasive disturbance, or combined disturbances, of attention, activity level, and impulse control. It has been reported as affecting people of all ages, and is said to be one of the most commonly occurring behaviour problems of childhood. ADHD has been described as a “paradigm for a true biopsychosocial disorder, raising critical questions between genetic, biological, and environmental factors” (Tannock, 1998, p65). Such a statement gives an indication of the multiplicity of facets to the aetiology, description, diagnosis, and treatment of ADHD. Biederman (2005) notes that the disorder is associated with significant financial and social distress, and also generally with poor vocational and academic outcomes. It is generally agreed that children who have a diagnosis of ADHD are highly at risk of experiencing significant social, behavioural, and educational difficulties, and a very high proportion of these children are also known to experience problems with their language.

Characteristics of ADHD

ADHD is characterised by behaviours that display developmentally inappropriate levels of hyperactivity, impulsivity, and/or inattention. Although it may be diagnosed at any age, ADHD is thought to be present from birth or to develop in early childhood. It is generally agreed that boys are affected more often than girls, particularly during childhood. Symptoms of the disorder may continue to affect children through to adolescence and into adulthood, especially symptoms related to inattention (see review by Skounti, Philalithis, and Galanakis, 2007). Faraone, Sergeant, Gillberg, and Biederman (2003) in their review of fifty recent studies worldwide, found that the prevalence of the condition is similar throughout the world in children aged between six
and twelve years. They found that estimates of prevalence ranged between 2.4% to 19.9%, depending on the diagnostic system used. Skounti, Philalithis, and Galanakis, (2007) suggested that these differences in prevalence rates most likely were the result of differences in the methodological approaches taken, rather than reflecting inherent differences in the populations.

**Causes of ADHD**

It is not known what causes ADHD. To date, the diagnosis of the condition has relied heavily on descriptions of the symptoms. Recent advances in genetic studies, neuroimaging and neurophysiological assessment have focused on the neurobiological nature of the condition (Tannock, 1998). In recent years this has meant that more objective techniques such as electroencephalography (EEG) and biofeedback have become more commonly used in clinical practice, usually as adjuncts to the descriptive diagnostic tools.

In a review of the literature Spencer, Biederman, and Mick (2007) reported the generally held view that ADHD is highly genetic. They reported that studies have shown that the condition may indeed be inherited, and that particular genes may be associated with its occurrence. In this same report, the authors also observed that other factors, including biological and psychosocial adversity, have been identified as possible contributory factors. Diet and food additives were not shown to cause the disorder, nor has there been a direct causal link demonstrated between it and lead contamination.

Other factors appear to be risk factors that might predispose children to developing ADHD. These include maternal smoking and alcohol consumption during
pregnancy, low birth weight, poor maternal physical and mental health. Spencer, Biederman, and Mick (2007) also cautioned that psychosocial adversity might predict the emergence of maladaptive behaviours generally, rather than be specific indicators of ADHD.

Spencer, Biederman, and Mick (2007) reported on several studies that have investigated the neurobiology of ADHD. Although not yet clearly understood, these investigations have highlighted the possible biological origins of the many symptoms that have been associated with ADHD. In a review by Biederman (2005), the author stated that, “…structural and functional imaging studies consistently implicate dysfunction in the fronto-subcortical pathways and imbalances in the dopaminergic and noradrenergic systems in the origin of core symptoms.” (Biederman, 2005, p. 1218). Such information indicates not only the possible aetiology of the disorder but also points to areas of potential in the search for effective treatments.

**Diagnosis of ADHD**

The Diagnostic and Statistical Manual for Mental Disorders Fourth Edition (DSM-IV) is the recommended clinical tool for the diagnosis of behavioural disturbances in children and in particular for the diagnosis of ADHD, and is in widespread clinical practice (American Psychiatric Association, 1994). First published in 1994, DSM-IV consists of checklists that are designed to be administered by a specialist medical practitioner. In Australia this is usually a psychiatrist or paediatrician. Scores derived from the use of the diagnostic scales categorise those affected as having one of three possible subtypes of ADHD according to the pattern of symptoms that are observed. These subtypes are termed predominantly hyperactive, predominantly inattentive, or predominantly combined hyperactive/inattentive ADHD. The symptoms must occur in
at least two settings (usually at home as well as at school), must be able to be described as significantly adversely affecting the child’s ability to function as expected for his or her developmental age, and cannot be explained by other developmental difficulties or disorders. Tables 1.1 to 1.3 summarise the DSM-IV criteria for problems associated with hyperactivity, impulsivity, or inattention.

### Table 1.1 Criteria for the diagnosis of ADHD (inattentive type)

<table>
<thead>
<tr>
<th>INATTENTION</th>
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<tbody>
<tr>
<td><strong>Six or more of the following symptoms for at least six months that is maladaptive and inconsistent with developmental level; fewer than six symptoms of hyperactivity-impulsivity</strong></td>
</tr>
<tr>
<td>- Often fails to give close attention to details or makes careless mistakes</td>
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<tr>
<td>- Often has difficulty sustaining attention in tasks or play activities</td>
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<td>- Often does not seem to listen when spoken to directly</td>
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<td>- Often does not follow through on instructions; fails to finish tasks</td>
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<tr>
<td>- Often has difficulty organizing tasks and activities</td>
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<td>- Often avoids, dislikes, or is reluctant to engage in tasks that require sustained mental effort</td>
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<tr>
<td>- Often loses things necessary for tasks or activities</td>
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<tr>
<td>- Is often easily distracted by extraneous stimuli</td>
</tr>
<tr>
<td>- Is often forgetful in daily activities</td>
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</table>

Adapted from the Diagnostic and Statistical Manual of Mental Disorders, version IV (American Psychiatric Association, 1994)
Table 1.2  Criteria for the diagnosis of ADHD (hyperactive/impulsive type)

<table>
<thead>
<tr>
<th>HYPERACTIVITY</th>
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<tbody>
<tr>
<td><em>Six or more of the following symptoms for at least six months that is maladaptive and inconsistent with developmental level; fewer than six symptoms of inattention</em></td>
</tr>
<tr>
<td>• Often fidgets with hands or feet or squirms in seat</td>
</tr>
<tr>
<td>• Often leaves seat in classroom or in other situations where remaining seated is required</td>
</tr>
<tr>
<td>• Often runs or climbs excessively in situations where it is inappropriate</td>
</tr>
<tr>
<td>• Often has difficulty playing or engaging in leisure activities quietly</td>
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<tr>
<td>• Is often ‘on the go’</td>
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<tr>
<td>• Often talks excessively</td>
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<table>
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<tr>
<th>IMPULSIVITY</th>
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<tbody>
<tr>
<td>• Often blurts out answers before questions have been completed</td>
</tr>
<tr>
<td>• Often has difficulty awaiting turn</td>
</tr>
<tr>
<td>• Often interrupts or intrudes on others</td>
</tr>
</tbody>
</table>

Adapted from the Diagnostic and Statistical Manual of Mental Disorders, version IV (American Psychiatric Association, 1994)

Table 1.3  Criteria for the diagnosis of ADHD (combined type)

<table>
<thead>
<tr>
<th>ADHD COMBINED TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Six or more of symptoms of inattention and six or more of symptoms of hyperactivity-impulsivity have persisted for at least six months</em></td>
</tr>
</tbody>
</table>

Adapted from the Diagnostic and Statistical Manual of Mental Disorders, version IV (American Psychiatric Association, 1994)

**Co-morbid conditions**

In addition to the core symptoms, ADHD is frequently further complicated by a range of co-morbid conditions that may affect physical as well as mental and verbal behaviours. Barkley, (1990) described conduct disorder, oppositional defiant disorder, anxiety disorder and depression, learning disability, and speech and language disorders. Tannock (1998), after reviewing the literature, noted that it was not uncommon for
ADHD to be manifest together with more than one co-morbid disorder (Tannock, 1998). More recently, Thompson (2006) reviewed the association between ADHD and co-morbid disorders, and suggested that the presentation of symptoms in children with ADHD more likely resembles a cluster of conditions rather than a single clinical entity.

**Treatment of ADHD**

The treatment of ADHD is largely symptomatic. The Multimodal Treatment Study of Children with ADHD (MTA) concluded that medication therapy was the most effective form of treatment but there were significant caveats attached to this claim (The MTA Cooperative Group, 1999). These caveats highlighted the need for a multidisciplinary approach that incorporated drug therapy into a regime of supportive behavioural therapies. This approach recognised the complexity of ADHD. Furthermore, the suggested range of treatments, for example cognitive behaviour therapy, learning and literacy support, and speech and language therapy, made attempts to alleviate other areas of difficulty in addition to the symptoms reflected in behaviour.

**1.2.3. Issues in understanding the nature of ADHD**

There are several issues that remain unclear regarding the nature of ADHD. These include discussion about what kind of disorder it is; uncertainty about expected characteristics, and the status of co-morbid conditions.

**Category versus dimension**

There has been some debate over whether ADHD represents a category of disorder, or a dimension or degree of relative difficulty along the spectrum of normal behaviour (Barkley, 1996). The medical model tacitly supports the view of the categorical nature of the disorder, yet there is no clearly defined clinical picture of ADHD, nor is there
currently any objective test for its detection. However, the DSM checklists suggest that ADHD reflects the more extreme end of the continuum of variation in children’s behaviour, which is more of a dimensional view (Brown, 2002). The conceptualisation of ADHD as either a diagnostic category or as a disorder of a dimensional nature may significantly impact on the direction of research and intervention, and therefore is an important theoretical consideration.

**Heterogeneity**

The population of children with ADHD is known to be heterogeneous. The perception of variation in the presentation of symptoms among these children may also have been heightened by the changes, over time, of the diagnostic methods that have been used. Revisions of the diagnostic criteria that have described ADHD have attempted to accommodate research findings that have continuously revised the construct of the disorder (Tannock, 1998). The DSM scales, for example, have evolved in response to the rethinking of the relative significance of what have been considered the core difficulties of hyperactivity, impulsivity, and inattention (American Psychiatric Association, 1980, 1987, 1994; Barkley, 1996). Revisions of the DSM scales may well have been responsible for some of the differences in presentation of some populations of children with ADHD. As a further complication, the DSM scales do not specify or quantify degrees of difficulty, apart from the subjective recognition that the child’s development is ‘significantly’ impaired by the presence of the symptoms. Consequently, there is diversity in the description of the severity of symptoms. Elsewhere, it has been argued that the variations in some symptom behaviours suggest a malfunctioning of some regulatory process rather than a deficit (Sonuga-Barke, 1995, cited in Tannock,
One limitation of this view is that the criteria for delineating the parameters of ‘normal behaviour’ remain open to interpretation.

The diagnostic criteria of conditions that are commonly associated with ADHD have also been identified and diagnosed using a wide range of methods. For example, the assessment of speech and language abilities, and the assessment of reading disorders may be undertaken using a variety of tools. This means that not only the core behaviours but also the co-morbid conditions may be investigated differently. The reality of this diversity in description of the presenting symptoms creates what have been termed individual ‘phenotypes’ of ADHD (Redmond, 2004; Tannock, 1998). This presents challenges both in research and in clinical practice.

**Unitary models of ADHD**

Shaywitz, Fletcher, and Shaywitz (1994) identified the heterogeneity of both the core behaviours and the co-morbid conditions as presenting obstacles to the advancement of the understanding of both these conditions. They also identified an increasingly diversified classification of ADHD that they attributed to the referral patterns that were used in different studies. These patterns varied in terms of the ages and the sources of the children who participated in the studies. These authors advocated a conceptualisation of ADHD that provided “a panoramic view of the entire topography” of the disorder rather than a narrowing of the parameters of the investigations. They claimed that this approach would enhance the meaningfulness of the ADHD diagnosis yet still allow for the variations and subdivisions to remain apparent (Shaywitz, Fletcher, & Shaywitz, 1994, p22).
More recently, comprehensive and unified models of the disorder have appeared in the literature (Tannock, 1998). For example, Barkley (1997) observed that most studies concerning ADHD had been exploratory and descriptive, not theory driven, and could not account for the multiple difficulties that were associated with ADHD. Barkley proposed a model that suggested that difficulties with behavioural self-regulation underpinned disruptions to executive functions that were in turn responsible for the range of problematic behaviours that characterised ADHD. The executive functions that Barkley referred to were working memory, the regulation of motivation and arousal, the internalisation of speech, and the reconstitution of behaviour (that is, its analysis and then its synthesis as an act of behaviour). He claimed that these executive functions were responsible for the regulation of all complex behaviour, and that ADHD was, therefore, the result of impaired behavioural regulation due to impaired executive function.

Brown (2002, unpublished conference presentation) described executive function “as a wide range of central control processes … that connect, prioritize, and integrate cognitive functions moment by moment”. According to Brown, the theory of a deficit in executive function implies that for a person with a diagnosis of ADHD, all cognitive behaviours are at risk because all are influenced by executive function.

The multifaceted nature of executive function and of response inhibition indicates some of the difficulties associated with unitary models. However, such models provided possible explanations for the highly heterogeneous range of symptoms in children with ADHD because they attempted to explain complex behaviour as the outcome of orchestrated higher mental functions. These models were also able to accommodate observations from other work that described the difficulties associated
with ADHD as being strongly influenced by the context of the situation in which the behaviour occurred. (Barkley, 1997; Brown, 2002; Tannock & Schachar, 1996). For example, in a study by Lawrence, Houghton, Tannock, Douglas, Durkin, and Whiting (2002), children with ADHD displayed difficulties in real life situations that varied according to the activity in which they were engaged. This situational variability suggested that the occurrence or intensity some of the symptoms of ADHD may vary according to the context. The unitary models of ADHD suggested that the different contextual settings were somehow responsible for the stimulation of different responses which utilised different aspects of executive function, and resulted in varied behaviours.

Recently Damico, Muller, and Ball (2004) urged speech and language clinicians to expand their conceptualisation of ADHD to embrace social elements as well as biological and psychological ones. The authors proposed that ADHD be regarded as a social construct that exemplifies the socio-cultural complexity of human functioning. According to this model, human functioning is context-bound, and the way in which individuals interact with their environment is influenced by a wide range of factors, including social as well as biological ones. With regard to ADHD, the socio-cultural orientation acknowledges the reality of the contribution to external behaviour of a wide range of possible difficulties from among these factors. Damico et al. (2004) suggested that these factors need to be included in both the assessment and treatment regimes offered to children with ADHD.

Each of these unitary models of ADHD has particular implications for language and for conceptualisations of language disorder. The approaches of Barkley (1997) and also of Brown (2002) perceived language as a cognitive process that is mediated by executive function. In ADHD, impairments in executive function lead to verbal
disinhibition and poor verbal self-regulation, and language use may subsequently be problematic. Alternatively, approaches such as that of Damico et al. (2004) perceive language as socially as well as cognitively mediated. From this perspective, language use in individuals diagnosed with ADHD may be characterised by inefficiencies when using language to relate to their world, and it is the system of interaction at a complex level that displays difficulties.

**Subtypes of ADHD**

The DSM-IV (American Psychiatric Association, 1994) is slightly different to its predecessors in that it conflates hyperactivity and impulsivity as a single symptom of ADHD and differentiates it from the symptom of inattention. According to the DSM, the two ensuing clusters of symptoms are said to give rise to the three distinct subtypes that may be used to describe ADHD, namely the predominantly hyperactive/impulsive subtype, the predominantly inattentive subtype, or the subtype that displays a mixture of these symptoms, the mixed subtype. Prior to the 1994 revision of the DSM scales, hyperactivity was seen as the hallmark of the disorder with much less significance attributed to inattention. This more closely resembled the European diagnostic system for Hyperkinetic Disorder (World Health Organization, 1978, 1993). The difference between the diagnostic methods undoubtedly contributes to difficulties when comparing studies pre- and post-1994, and when comparing those conducted in North America with those conducted in Europe.

**The separateness of co-morbid conditions**

A diagnosis of ADHD in childhood is frequently accompanied by the diagnosis of one or more other disturbances. In addition to ADHD symptoms, speech and language disorder, difficulties with learning and reading, depression, anxiety, and compliance
problems are commonplace. The status of the range of these co-morbid conditions in relation to the core deficits of ADHD has been debated (reviewed in Tannock, 1998). It is not known if the conditions simply co-occur, or if they have a cumulative or amplifying effect, or if they interact in completely idiosyncratic ways.

The European diagnostic scales (World Health Organization, 1978, 1993) do not allow for a diagnosis of ADHD that is complicated by co-morbid conditions. This suggests that European practitioners view the core condition of ADHD and the co-morbid conditions as entirely separate entities, implying that if they do occur together then it is a different condition that is being examined. A diagnosis of ‘pure’ ADHD according to these criteria is relatively rare in Europe. This contrasts with the situation in those countries that use the North American diagnostic system (DSM scales) where co-morbid conditions are reported alongside ADHD, and the rates of co-morbidity are consistently reported as high (Tannock, 1998).

The unitary theories of ADHD, such as those of Barkley and Brown, highlighted the issues about the pathogenesis of these co-morbidities. Unitary models indicated a significant shift in the North American perspective, in that co-morbid behaviours were perceived as a part of the disorder of ADHD itself rather than as separate conditions that simply co-occur with ADHD (Barkley, 1996). This has led to the growing perception of ADHD as a singular disorder of behavioural inhibition that then disrupts the development of executive functions that mediate self-regulation and goal-directed behaviour. The disrupted regulatory processes result in the various problematic core behaviours as well as the co-morbid difficulties that are subsequently manifested.
Language difficulties are a common co-morbid behaviour associated with ADHD. The formal approaches to language view it as internal and rule governed, and language difficulties as faults within the internal language faculty that result in violations of the externally expressed rule system. By contrast, functional approaches cast language as rule governed but also as goal directed behaviour. Using this model, it is reasonable to expect, therefore, that language use in children who have been diagnosed with ADHD may be disturbed, since their goal directed behaviour is at risk.

1.2.4. Summary of ADHD

Children who have ADHD typically experience difficulty with inattention, hyperactivity, or impulsivity. The underlying nature and cause of these difficulties remain issues of debate. It is also common for children with ADHD to experience other co-morbid problems, one of which is language difficulty. It is unknown whether these associated difficulties are a part of the overall condition or additional to it.

More recent theories of ADHD emphasise the importance of contextual factors in understanding the nature of ADHD. Contextual factors are thought to contribute to the manifestation of symptoms. From this perspective, the contributions of elements in the surrounding environment are recognised as significant. This approach may also help to explain the known heterogeneity of the population of children with ADHD.

1.3. Exploring Language Associated With ADHD

1.3.1. Introduction

Assessments of language for the purposes of exploring its association with ADHD have often focused on language difficulties, and studies have been conducted using methods
that reflect different underlying approaches to the conceptualisation of language. These methods include the use of formal language testing instruments, and functional analyses. Other methods have attempted to utilise language analyses informed by pragmatic approaches to language function. Despite these different methods, the association between ADHD and language difficulties is most often demonstrated to be very strong.

Some studies have explored how language is typically used by children with ADHD without necessarily focussing on language difficulties. These studies have explored the possibility that children with ADHD may have idiosyncratic patterns of language use that, although they may be problematic, elude the usual connotations of language impairment.

It would be reasonable to expect that any differences in language use that might be detected will be of importance, given the difficulties that these children display in most areas of daily living. This is why investigating language from a more descriptive rather than a problem oriented perspective is valid.

1.3.2. **Definition of terms**

The investigation of language in children who have been diagnosed with ADHD has explored an area that is complex and multifaceted. Many of the terms used in discussion about language refer to obscure and unfamiliar concepts, while others have acquired a specific meaning. These include ‘language in use’, ‘discourse’, ‘text’, ‘grammar’, ‘pragmatics’, and ‘context’. Before considering the findings of previous literature, these terms require some clarification in their own right, and for the purposes of this thesis.
**Language in use**

The term ‘language in use’ refers to the dynamic nature of language as it is used in everyday situations. Halliday, a foremost proponent of Systemic Functional Linguistics (SFL) states that “all language is language-in-use” (Halliday, 1974, p34), and while this statement appears trite, the term ‘language in use’ assumes particular meaning when applied to the empirical study of language. For example, the Clinical Evaluation of Language Fundamentals (CELF; Semel, Wiig, & Secord, 1995) is one of many formal test instruments in use in clinical practice and it probes receptive and also expressive language through the use of a variety of subtest items. The Formulated Sentences subtest is one expressive language subtest that requires the child to create a sentence given a particular target word. Points are scored for the construction of a sentence using the target word correctly and appropriately. In this example, language use is tightly constrained. It refers to the particular response made by the child in the way the target word is used (or not used) to formulate a sentence in the testing situation. The quality of that response in terms of accuracy and appropriateness is judged and scored by the examiner according to pre-existing parameters that were set by the authors of the test. Inferences are drawn about the status of the child’s language abilities by matching the score achieved with scores achieved by same aged peers. In this way, formal test instruments best serve “the conceptualization of language as a set of rules” (Martin, Matthiessen, & Painter, 1997, p3). Language is being assessed in the formal testing situation but is concerned with what the speaker or writer is allowed do with regard to the implementation of those rules.

Halliday’s statement that “Language is as it is because of what it has to do” (Halliday, 1973, p. 34) encapsulates an alternative orientation to language in use that is
functional in approach, and is adopted in this thesis. For Halliday and SFL, this not only means that all language is functional but that it reflects systems of choices that have been made from among an array of possible linguistic options. Furthermore, each linguistic choice that is made has particular meaning, and the analysis of language in use describes these meanings, which are grounded in function and context. In this way, language is seen as a resource for making meaning (Martin et al., 1997). It is the tool that is being used to provide a way of expressing those meanings. Explanation of the particular resources that are being used to create these meanings reveals the purpose to which language is being put. This contrasts with language analyses that focus on linguistic form, and are based on idealised systems of linguistic rules.

**Discourse and text**

In everyday language, ‘discourse’ means the discussion, either by talk and conversation or in writing, of a particular subject. A text, on the other hand, as described by Halliday and Hasan, is “… any passage, spoken or written, of whatever length, that does form a unified whole.” (Halliday and Hasan, 1976, p.1). In some instances, the two descriptions may be conflated, as for example in, “Stop!” where the whole discourse is embodied in the one word text. More often, a text forms a part of a larger discourse, for example the chapters in a book, or the sentences in a paragraph. The notions of discourse and text are very closely related. Halliday writes that it is the function of discourse to create texts, and this function of discourse “… demands resources not only for attaching a sentence to what has preceded it but also for organizing the sentence in such a way that it is appropriate as information in the context.” (Halliday, 1968, p.210). As Halliday has put it, this is the process whereby language becomes actualized in text (Halliday, 1978,
cited in Stubbs, 1985, p10). Hence a window into language is provided by the analysis of texts.

In this study, the child’s total responses to the elicitation tasks were considered (the discourse or the whole text), as well as each component part, namely the individual clauses and clause complexes. When clauses and clause complexes were being analysed and discussed, they were also referred to as ‘texts’ since they had stand alone meaning. This was in addition to the meaning that was reflected by the wider ‘discourse’. This allowed for observation of the linguistic resources selected by the child at both of these levels to construct the texts and the discourse that expressed their desired meaning.

**Grammar**

Grammar is commonly understood as the system of rules that operate in language. Formal linguistics conceptualises language itself as a set of rules that are expressed in words and in grammar. The correct observation of these rules results in ‘correct’ language. The traditional conceptualisation of grammar is concerned with the process of applying labels to classes of words that compose sentences in speech or writing. Grammar is also discussed in functional linguistics, and it is referred to in this thesis from the functional perspective. Halliday describes grammar as “… the level of formal organisation in language” (Halliday, 1973, p.73), but his assertion is that this system of formal organisation has itself evolved from a functional basis. Grammar regulates language patterning since it is a “… system that allows principled choices to be made. What we say or write is always a matter of exercising these choices, designing our texts with some purpose in mind” (Candlin, 2000, p.iv). From the perspective of SFL, grammar is a patterning potential to be engaged with to achieve what is intended by the
communication. Functional linguistics enables the description of the functional grammar of texts, and the functional grammar reveals the use to which language is put.

**Pragmatics**

Pragmatic models have been broadly described as attempts “…to characterize communicative competence…” by considering the effect of the interrelationships of the formal, functional, contextual and social aspects of language on its everyday use (Gallagher, 1991, p2). In the study of language, the advent of language pragmatics was such a significant shift in emphasis that it was termed the “pragmatics revolution” (Duchan, 1984, cited in Gallagher, 1991, p2). Prior to this ‘revolution’, which occurred in the second half of the twentieth century, language was seen primarily as an abstract symbolic code and language use was seen as verbal behaviour that was governed by systems of rules.

Subsequent investigations of language that were mindful of the influence of pragmatic elements were markedly different from previous attempts in that they examined aspects of language beyond those of form and structure (for an overview, see Gallagher, 1996). This led to the development of an array of assessment tools including published formal tests, checklists, and profiles, as well as coding systems that were applied to naturally occurring language. These tools were designed to aid in eliciting, sampling and analysing children’s language from a pragmatically oriented perspective. For a review of these methods see Adams (2002).

Duchan noted that the “…pragmatics revolution broadened our view of communication (and therefore of disorders of communication) considerably” (Duchan, 2000, p190). According to the account given by Adams (2002), accounts of pragmatic
approaches initially concentrated on fairly abstract features such as speech acts (for example, analysing types of language according to whether they were questions, statements, commands etc.), and conversational analysis (for example, topic maintenance and turn taking ability). Grice’s “maxims”, (that communication be “truthful, accurate, relevant, and perspicuous”), then added the lens of social co-operation to the conceptualisation of language (Grice, 1975, cited in Adams, 2002, p974). Over time, further developments in the field of pragmatics have occurred. Duchan (2000) has explained that these more recent developments led to the extension of meaning to include the context of situations. This was in addition to pragmatic abstractions and in-text features, such as words and text constructions. Duchan gave the example, “What can I do for you?” which may be described pragmatically as a request (speech act), and an initiating move (conversational analysis). Including the situational context of the text extends these meanings. The request will mean something different when asked by a doctor, for instance, than by a sales assistant. The meaning is again different if the text is uttered rhetorically, for instance the exclamation of an exasperated parent, “What can I do for you!” Duchan points out that “… successful communicative ability requires knowledge of these differences.” (Duchan, 2000, p191). By this, she was referring to all the various elements that contribute towards the understanding of the notion of pragmatics, and how these comprise “successful communicative ability”.

There are at present numerous methods for describing the social and functional elements of language. Some researchers claim that these types of analyses should take precedence when language is investigated, and that the more familiar analyses of content and structure should be de-emphasised (Duchan, 2000). Conversely, Halliday has stated that there is no justification for treating any of these elements of language
independently from each other. He has said that “… a fair amount of harm has been done … by setting up pragmatics as a separate discipline” (private communication cited in Cattell, 2000, p132).

SFL became the approach associated with Halliday. As its name infers, this approach is systemic and functional, and claims to enable the full description of all these aspects of language in a unified way. SFL perceives social and functional variation as merely reflecting differences in context, which directly affect the way texts develop. SFL will be presented in more detail in Chapter 2.

**Context**

The word ‘context’ is derived from a Latin term meaning connection, and means “the circumstances or facts that surround a particular situation, event, etc.” (Moore, 1998, p145). In linguistic terms, the connection is between the language system and the total environment in which the language is embedded. Halliday (1985) defines context as that which is ‘with the text’ (Halliday, 1985, p.5) but beyond what is merely said or written. All language occurs within the context of culture, which in turn surrounds the context of situation (Butt, Fahey, Feez, Spinks, & Yallop, 2000). Eggins (1994) has explained that language and context are so thoroughly interrelated that context can be deduced from text, and conversely, language may be predicted from context.

The influence of context may often be deeply culturally embedded and subconscious, so much so that it does not appear to have great significance in many theories of child language development. Neither has it seemed to have received direct attention from most language assessment tools. Functional approaches may incorporate some reference to context, whereas formal measures more likely do not, apart from
retrospective suggestions to clinicians that contextual factors may contribute in some way to children’s scores on formal tests. Context is intrinsically included in the functional analysis of texts informed by SFL.

1.3.3. Variations in identified language difficulties

Difficulties with language have long been linked to the diagnosis of ADHD in children and considerable evidence has accrued as testimony to the prevalence of this association. The different aspects of language that have been reported as problematic are wide ranging. For example, some studies have focused on certain characteristics associated with verbal behaviour, such as talkativeness (Zentall, 1988) and disruptive speech (Ludlow, Rapoport, Bassich, & Mikkelsen, 1978). Some have concentrated on aspects of language ‘quality’, such as informativeness (Hamlett, Pellegrini, & Connors, 1987), cohesion (Tannock, Purvis, & Schachar, 1993), and the adaptation of language to suit set tasks (Landau & Milich, 1988; Whalen, Henker, Collins, McAuliffe, & Vaux, 1979; Zentall, 1988). A large number of studies have investigated expressive language, for example semantics and syntax. Many of these have used standardised tests to gauge language ability (Baker & Cantwell, 1992; Tannock & Schachar, 1996). Baker and Cantwell described children with ADHD who had language difficulties as “… a heterogeneous group linguistically” (Baker & Cantwell, 1992, p12), referring not only to the type and range of speech and language disorders they detected but also the severity of the impairment. Their review of the previous research indicated that in the majority of cases, speech and language difficulty associated with ADHD were in the mild to moderate range. Despite this abundance of information about the symptoms of language difficulty that have been associated with ADHD, the exact nature of the
problems with communication experienced by these children is not clear, and the way in which ADHD and linguistic ability interact is not understood.

After surveying the literature, Tannock and Schachar (1996) concluded that estimates of the prevalence of language difficulty in children with ADHD varied because different methodological approaches were often undertaken. These included different definitions of language impairment, and different ways of describing and assessing language. Various methods were also undertaken with regard to ADHD, with differences in the methods of diagnosis, and in the way that the sample populations were recruited. The authors concluded that despite these differences in methodology between the studies, the association between ADHD and language difficulty was still greater than could be expected to have occurred by chance alone.

That the prevalence of difficulty with language was still high may suggest that the reality of the language difficulty that occurs with ADHD may lie beyond the issues that these methodological variations exemplified. In other words, in previous studies the different ways that investigated language impairment and ADHD may not have adequately or sufficiently captured the essence of either.

1.3.4. Ways of evaluating language

The way that language is described and evaluated is directly informed by the theoretical approach adopted in understanding the nature of language, how it works, and how it develops in infancy and childhood. Theories regarding the nature of language reflect different fundamental orientations. These orientations are usually grouped into ‘schools of thought’ according to the different theoretical perspectives that underpin them. For example, language has been studied in ways that reflect purely mentalist, behaviourist,
psycholinguistic, and more recently, sociolinguistic approaches (see Cattell, 2000 for brief overview).

Some attempts to expound the nature of language have adopted philosophical approaches that have attempted to discuss how meaning comes to be meaningful, how the human capacity for thought operates, and what role language has in these capacities (Carruthers, 1996; Fauconnier, 1997). More recent debate, such as has been articulated by Hauser, Chomsky, and Fitch (2002), and Pinker and Jackendoff (2005), discuss language in both the broad and the narrow sense. However, these are beyond the scope of the present work, which focuses instead on the utility of language. Humans have the capacity for interpersonal communication because of the way in which the language system works to achieve human purposes. As suggested, it is possible that previous attempts to explore language in children who have ADHD, which commonly used either formalist, functional, or pragmatic approaches, may not have been able to fully capture this.

**Formalist approaches to language and its assessment**

The formalist approach has conceptualised language as an intrinsically human attribute that is organised and governed by formal systems of rules. The rule system is also innate but may be expanded through learning (Cattell, 2000; Martin *et al.*, 1997). Language behaviour is the individual’s attempt at approximating an ‘idealised’ language. However, the obvious variability in language has posed a challenge for this model. Bloomfield (1933) outlined two divergent responses to this problem, one describing variability as the “… interference of some non-physical factor … that is present in every human being” (Bloomfield, 1933, cited in Cattell, 2000, p35). This meant that not only was the language system thought to be innate, but any variation from the ideal or
difficulty with language was also seen as originating from somewhere within the individual. Bloomfield’s second response went on to say that these sources of difference were complex and may elude description, but in principle, were responsible for the predictability of behaviour.

Formalist approaches appear to be readily associated with the idea that language ability is located in areas within the brain. Chomsky, for example, stated that the brain is innately capable of language (Cattell, 2000). Also formalist in nature are those theories that suggest that it is not so much specific cortical areas that are responsible for language but neural networks between different parts of the brain. Damage to the brain or to cerebral networks may result in language problems that are perceived as deficits within either the individual’s underlying language capacities or their rule system for language. However, some individuals with brain damage retain the capacity for meaningful communication, whereas some significant communication disorders have not been clearly associated with any cerebral injury. Armstrong (2005) has briefly reviewed recent research that encourages “… re-examination of the deficit perspective…” (Armstrong, 2005, p144). In this way, she reflects the sentiments expressed by Halliday that the understanding of language is most challenged in the context of language disorder (Halliday, 2005).

Alternative behaviourist approaches, such as that proposed by Skinner, viewed language as an entirely learned verbal behaviour, and language development as subject to conditioning and reinforcement (Cattell, 2000). The whole notion of a physical basis for language was not of prime importance. Variability and errors in language were perceived as incomplete or erroneous learning patterns, and in this way these behaviourist approaches also demonstrate formalist thinking.
Standardised language assessment instruments reflect the formalist conceptualisation of language. These tools identify and describe language variation and problems by describing how closely samples of language approximate an accepted standard. These types of assessment tools have been used frequently in previous research to assess the language abilities of children with ADHD, and are often found in clinical speech pathology practice. They are frequently used to confirm and quantify overt manifestations of language impairment. The diagnosis of the child’s problem, their treatment plan, and frequently their access to the provision of further therapy or intervention services may often depend on the outcomes of assessments such as these.

**Language and executive function**

A study by Oram and colleagues investigated whether certain standardised language test items were more difficult than others for children with ADHD, regardless of any accompanying diagnosis of language difficulty (Oram, Fine, Okamoto, & Tannock, 1999). The authors hypothesised that particular test items that made demands on faculties other than formal language skills, such as executive function, would be more difficult for children with ADHD compared to those with language impairment (LI) and normal controls. The study compared the performances of three groups of children (ADHD, ADHD+LI, non-ADHD) and used items from three formal language tests; the Test of Word Finding (German, 1986), Rosner’s Auditory Analysis Test (Rosner, 1971), and the Clinical Evaluation of Language Fundamentals Revised version (CELF-R; Semel et al., 1995). The test items they selected combined probes for linguistic abilities and specific cognitive abilities (sustained attention, inhibition, planning, and organization) that had been suggested as deficient in ADHD. For most items, they found that the scores of the two groups of children without LI did not differ, and both
performed significantly better than the ADHD+LI group. However, on the Formulated Sentences subtest of the CELF-R they found that both groups of children with ADHD (ADHD, ADHD+LI) performed significantly lower than their non-ADHD peers, with the ADHD+LI group achieving the lowest scores. In their discussion, the authors proposed that the children with ADHD may have failed to appropriately evaluate the context of the task, and that this led to their low scores for the sentences they had formulated. The authors speculated that contextual adaptation involves the executive control system and that this system is involved in language pragmatics.

This study illustrated a more finely-grained approach to the investigation of language than those that had used whole standardised test batteries. It was one of the first to sample differentiated groups of children with ADHD, LI, and typically developing children, and to discuss the significance of context in the language difficulties of children with ADHD regardless of LI. In addition, the investigators raised concerns about the validity of the formal language test results when the child’s attention, motivation, and cooperation were obviously compromised by their ADHD condition, or when the child was medicated in an effort to help alleviate their problems. In doing so, they focused attention on methodological problems concerning the use of formal tests for assessing children with ADHD.

Functional approaches to language and its assessment

Functional approaches to the investigation of language represent a departure from the formalist tradition of concentrating on categories or classes of words and linguistic structures, and instead examine language as it is used in communicative situations. Damico (1985) has described the development of clinical discourse analysis as a hallmark tool of the functional approach. Clinical discourse analysis may take many
forms and has been widely applied, as, for example, when describing the language of narrative and of conversation (Stubbs, 1985). It describes naturally occurring discourse. This contrasts with the formalist approach, which usually examines responses to standardised assessment tasks, and sometimes to simulated language situations that are often minimally related to social reality (Stubbs, 1985). Discourse analysis usually investigates units of meaning, or texts, in relation to the surrounding material in which they occur. This enables spoken texts to be examined above the level of the clause, and written texts above the level of the sentence. Discourse analysis has been used equally to examine non-disordered language as well as problematic language. Some particular forms of discourse analysis have evolved in an effort to apply the approach to disordered language, and these have largely focused on the identification of errors (Simon, 1979). However, the identification of errors reflects reference to and comparison with an idealised prescriptive form of language. Therefore, these applications of discourse analysis, in spite of adopting a functional approach to analysis and assessment, appear to have reverted to the formalist and prescriptive conceptualisation of language.

In what they described as “a novel linguistic approach,” Tannock, Fine, Heintz, & Schachar (1995, p177) explored the conversational skills of two boys with ADHD, using a particular form of discourse analysis. The authors wished to investigate everyday language use since they believed that it was in everyday social and academic contexts that the hallmark behavioural symptoms associated with ADHD, including language problems, were manifested. The authors were concerned that verbal symptoms of hyperactivity, impulsivity and inattention, when displayed in the everyday language use of children with ADHD, could have potentially significant and detrimental
consequences (Tannock et al., 1995). For example, they were aware that blurtng out inappropriate speech, excessive talkativeness, and poor topic maintenance usually resulted in social isolation and academic problems. The boys in the study had not been identified as language impaired, and the aim of the study was to assess the effect of psycho-stimulant medication on their everyday language use. The approach adopted for their study was based on systemic functional theory, and investigated speech function (initiating and responding in conversation) and cohesion (the links of reference in conversation that help with meaning), as well as measures of productivity (the number of utterances, number of turns, turn density). When measures were compared, the children displayed differences in their verbal behaviour that were attributed to the effect of the medication. The study demonstrated a practical application of systemic functional theory, and illustrated an approach based on the exploration of language use rather than the identification of errors, or analysis of language impairment.

**Pragmatic approaches to language and its assessment**

Functional conceptualisations of language have led to numerous investigations of aspects of language pragmatics. Tannock and Schachar (1996) proposed that ADHD and problematic language use were interrelated in a highly complex fashion. They suggested that the expressive language deficit associated with ADHD was often of the pragmatic type, meaning that children with ADHD often showed difficulties “…using language appropriately within a social, situational, and communicative context” (Tannock & Schachar, 1996, p138). They noted that these difficulties were often identifiable in children who were able to demonstrate adequate formal language skills (phonology, syntax, and semantics). Furthermore, they observed that pragmatic
disorders were more specifically linked to ADHD, whereas deficits in formal language skills were more closely associated with reading disorder (RD).

Westby suggested that the DSM-IV criteria used to diagnose ADHD were strongly suggestive of difficulties with pragmatic and metacognitive abilities. She explained metacognitive deficits as difficulties in the planning, organising, monitoring, and evaluation of behaviour, and added that “pragmatic and metacognitive behaviours are language-based, rule-governed behaviours” (Westby & Cutler, 1994, p60). She cautioned that standardised tests were “likely to miss pragmatic language problems and problems related to difficulties processing and producing extended texts and using language for metacognitive (planning, monitoring, and evaluating) purposes” (Westby & Cutler, 1994, p61).

Camarata and Gibson (1999) reviewed the outcomes of previous studies from the perspective of pragmatic abilities and concluded that not only were children with ADHD vulnerable to pragmatic language difficulties regardless of the subtype of their ADHD, but the presence of these vulnerabilities inhibited them from further effective language learning. This meant that pragmatic difficulties were not only problematic in themselves, leading to behavioural and social difficulties, but their presence impeded further age appropriate language development.

Several studies have been undertaken that specifically explored pragmatic ability in children with ADHD, but the conceptualisation of pragmatic ability and the methods used to evaluate it have varied. Humphries, Koltun, Malone and Roberts (1994), for example, asked teachers to identify language difficulties such as children’s ability to appropriately introduce and maintain a topic, and to take turns in conversation. Geurts
(Geurts et al., 2004), on the other hand, used the Children’s Communication Checklist (Bishop, 1998) to examine the language of children with ADHD. This checklist evaluated speech output, syntax, inappropriate initiation, coherence, stereotyped conversation, use of conversational context, conversational rapport, social relationships, and personal interests.

Adams (2002) reviewed and critiqued a range of methods for assessing pragmatic ability. The list included formal tests, such as The Test of Pragmatic Language (TOPL, Phelps-Terasaki & Phelps-Gunn, 1992), and checklists, such as The Children’s Communication Checklist (Bishop, 1998) and the Pragmatic Protocol (Prutting & Kirchner, 1987). Also included were methods of naturalistic assessment, for example the coding of speech acts (requests, commands, requests etc.), and examining turn-taking and repair strategies. Although most of these assessment tools focused on expressive language, the comprehension of language pragmatics was also included with, for example, the understanding ambiguous sentences subtest of the Test of Language Competence (Wiig & Secord, 1989).

The outcomes of the varying types of pragmatic assessments may be unhelpful by themselves because of their inherent limitations, in that they may only be interpreted as applicable to a specific context. This resembles the difficulty posed by the constructed environment in which standardised tests are usually conducted. Adams described pragmatics as context-dependent by nature, and she proposed that it is precisely this characteristic that makes the assessment task difficult. She remarked that the assessment of pragmatic abilities “… has remained problematic due to the complex interaction of social, linguistic, cognitive and cultural influences on pragmatics” (Adams, 2002, p973).
Cohen, Vallance, et al. (2000) combined the use of formal and functional assessment techniques. Their research examined structural language skills as measured by a battery of standardised tests, as well as functional language that was measured by the Pragmatic Checklist (Prutting & Kirchner, 1987) and the analysis of story construction (Hammill, 1991). The study compared four groups of language-impaired and language-normal children with behaviour disturbances including ADHD (ADHD+LI; ADHD alone; other psychiatric disturbance +LI; other psychiatric disturbance alone). Their results from both the formal and the functional assessments of language demonstrated that irrespective of their psychiatric diagnosis, the children with LI were the most disadvantaged. The results also showed that some aspects of executive function, such as working memory, were more problematic for children with LI than for children with ADHD and the authors warned of the dangers of “attributing to children with ADHD what might be a reflection of problems for children with language impairment generally” (Cohen et al., 2000, p353). There was no typically developing control group used in this study, and so the conclusions can only be evaluated for children with significant behavioural disturbance.

1.3.5. Limitations of previous work

In previous studies that have investigated language in children with ADHD, some methods used brought with them restrictions that limited the usefulness of findings, while others reflected conceptualisations of either language or ADHD that appeared to be incomplete.

Language assessment limitations

Formal test instruments are associated with identifying particular features of language, measuring the child’s performance for that feature, and then comparing the child’s
outcome with that of a same-aged reference group that has already been identified as competent. Many formal tests are found in speech pathology clinics, and were most often developed to assist the clinician to diagnosis and plan interventions for children already identified as showing serious communication difficulties. As discussed, formal test instruments may be used to assess many aspects of language, including pragmatic elements. Children with ADHD are a highly heterogeneous group, and it is reasonable to expect that the usefulness of an approach based on formal testing may be limited, since potential difficulties may not necessarily be identified by the particular formal test selected. This limitation may also apply to those functional and pragmatic assessment instruments that predetermine the features of language that are to be evaluated.

Approaches based on this type of assessment reflect a ‘deficit’, or errors based perception of problematic language, and often regard language problems as synonymous with poor performance on test instruments. In addition, standardised formal tests evaluate language competence on the basis of the attainment of minimum standard scores under test conditions. Therefore, they can only provide partial evidence about the extent and nature of possible communication difficulties in the individual children being assessed. In other words, approaches that have utilised these types of assessment instruments have, by necessity, largely ignored the importance of context because of methodological restrictions placed on the sampling, the elicitation, the analysis, and the interpretation of the data obtained. This limits their usefulness when evaluating the language of children with ADHD because context has been identified as an important factor in the evolution of problematic symptoms in these children. In addition, these types of assessments are not capable of dealing with those features of language use that are non-standard yet meaningful.
In a study by Oram, Fine, Okamoto and Tannock (1999), the outcomes for the Formulated Sentences subtest of the CELF-R revealed problems that could also have been described as difficulties with language use. Results for several other formal test instruments that were used in this study did not show differences between children with ADHD and typically developing children. The authors proposed that impulsive responding may have been able to explain the difficulties that were shown for the Formulated Sentences subtest. An alternative view is that this subtest posed difficulties related to language use in that particular context. It is reasonable to speculate that research focused on the analysis of language use may be well suited to the investigation of the language abilities of children with ADHD.

**Methods for diagnosing ADHD**

Many of the North American studies conducted have used the DSM scales to diagnose ADHD (American Psychiatric Association, 1980, 1987, 1994). In Europe, the diagnostic scales developed by the World Health Organization (1978, 1993) are more commonly used. Differences between the North American and European approaches include the emphasis placed on the core deficits (inattention, impulsivity, and hyperactivity), the pervasiveness of the symptoms, and the significance of other co-occurring problems (Tannock, 1998).

At the time this study was conducted, the DSM-IV was the clinical tool of choice for describing ADHD (Barkley, 1997). A more recent revision, DSM-IV TR, is currently available (DSM-IV-TR workgroup, 2006), and uses very similar diagnostic criteria. The DSM-IV (see Tables 1.1-1.3) has been in widespread use since 1994, and before that earlier versions of the DSM scales were used. Barkley (1996) stated that the revision leading to the DSM-IV ushered in significant change, in that problems with
inattention were identified as one of two possible clusters of symptoms, the other being hyperactivity/impulsivity. Prior to DSM-IV, inattention was said to have not featured prominently in the conceptualisation of ADHD, with emphasis being on hyperactivity and impulsivity (Barkley, 1996).

In addition to the DSM scales, previous studies have used a variety of other assessment tools to make the diagnosis. These include the Connors Teacher Rating Scale (Humphries et al., 1994; Landau & Milich, 1988; Ludlow et al., 1978), the Connors Abbreviated Teacher Rating Scale (Zentall, 1988), the Swanson, Nolan, and Pelham Rating Scale (Humphries et al., 1994), the Parent Interview for Child Symptoms-Revised, and the Teacher Telephone Interview (Purvis & Tannock, 1997; Schachar et al., 2004), the Attention-Deficit Hyperactivity Disorder Test (Kim & Kaiser, 2000), and the Child Behaviour Checklist (Redmond, 2004). These may be administered by medical practitioners, parents, teachers, or other professionals such as psychologists. Therefore, the methods for diagnosing ADHD have varied in terms of the target behaviours, the setting, the technique used for assessment, (for example, interview, or observation), and the qualifications of the person conducting the assessment. The range of symptoms described by these methods would be likely to differ, even though they provide similar general criteria for diagnosing ADHD.

**Recruitment of participants**

Recruitment methods have great potential to affect the significance of the outcomes of the research studies because findings demonstrated for a particular diagnostic group and sample population may not be able to be generalised to others. Samples of children diagnosed with ADHD have been recruited for studies from a variety of sources. The caseloads of medical practitioners, especially psychiatrists and paediatricians, have
frequently been used (Barkley, Anastopoulos, Guevremont, & Fletcher, 1991; Clark, Cheyne, Cunningham, & Siegal, 1988; Cohen et al., 2000; Cunningham & Siegal, 1987; Francis, Fine, & Tannock, 2001; Lawrence et al., 2002; Lorch et al., 1999; Love & Thompson, 1988; Oram et al., 1999; Purvis & Tannock, 1997; Redmond, 2005; Renz et al., 2003; Resta & Eliot, 1994; Sandler et al., 1993). Javorsky studied adolescents with ADHD who were hospitalised at an acute care psychiatric facility (Javorsky, 1996). Recruitment from caseloads in learning disorders clinics (Berry, Shaywitz, & Shaywitz, 1985; Humphries et al., 1994), and speech pathology clinics have also been used (Baker & Cantwell, 1992). Several studies have recruited children through regular schools and school districts (De La Paz, 2001; Landau & Milich, 1988; Tirosh & Cohen, 1998; Zentall, 1988), and for others, community based recruitment methods have been used (McInnes, Humphries, Hogg-Johnson, & Tannock, 2003; Williams, Stott, Goodyer, & Sahakian, 2000). The demographics and clinical characteristics of each group are likely to differ significantly.

**Approaches to co-morbid language difficulty**

Investigations into co-morbid conditions associated with ADHD have suggested that these co-occurring difficulties may not necessarily influence each other (Shaywitz et al., 1995) even if they do have a common antecedent, as unitary models of the disorder speculate (Barkley, 1997; Beitchman, Cohen, Konstantareas, & Tannock, 1996; Purvis & Tannock, 2000; Tannock, 1998; Tirosh & Cohen, 1998). For example, from their review of the literature concerning language problems, Tannock and Schachar (1996) observed that the majority of children with ADHD displayed expressive language difficulties that were of the pragmatic type. This was often without any associated disorder of the fundamentals of language (semantics, syntax, phonology). This
suggested that in children with ADHD, a language disorder of the pragmatic type may exist independently from what may be considered a more formally described disorder of language. The authors also observed that problems with these fundamentals of language were more closely linked with reading disability (RD) than with ADHD. They surmised that, in children with ADHD, the underlying difficulty with executive function proposed by Barkley affected one part of the language system but not another. In other words, they proposed that there may be differences in the causal pathways of the difficulties associated with these aspects of language and literacy.

The study by Cohen et al. (2000) attempted to investigate the boundaries between ADHD and co-morbid LI. The study used separate groups of children: ADHD + LI; ADHD alone; other psychiatric diagnosis + LI; other psychiatric diagnosis alone. They found that ADHD and LI both affected measures of language (including language use), academic achievement, and cognitive processing, but that LI contributed more to poor performance. They were unable to demonstrate a unique profile for children with ADHD + LI. However, their findings suggested that ADHD and LI could be described separately, and that the presence of LI was likely to influence the achievements of children with ADHD.

Similarly, Tirosh and Cohen (1998) wrote that, “Children with attention-deficit and language problems appear to have a different neurocognitive pattern underlying their problems as compared with peers with ADHD only” (Tirosh & Cohen, 1998, p493). They used formal test instruments to evaluate most aspects of language with the notable exception of the pragmatic elements of language, which appeared to receive only subjective and generalised judgements of correctness.
The uncertainties about the way co-morbid conditions present and possibly interact create challenges for experimental design. Outcomes and observations from studies may potentially be confounded by an unknown mix of variables. For example, from the reports of the previous literature it would appear that children with ADHD should be assessed for separate SLI, since clinical SLI conceptualises a specific impairment in syntax and semantics. The literature suggests that other communication difficulties, for example organisational difficulties, may still exist even if SLI is excluded. The presence of SLI would need to be eliminated before any investigation of these other particular communication difficulties could proceed.

The use of normal controls

Tannock has observed that the “… full methodological design (i.e. four groups – co-morbid condition, the two component conditions in isolation of one another, and a normal comparison group …)” may be needed to determine the effect of co-morbid conditions on ADHD (Tannock, 1998, p68). Few previous investigations of language in children with ADHD have included a comparison with typically developing children in their design. This study attempted to exclude SLI, and the children did not have any other co-morbid difficulties. Therefore, the groups that were investigated were ‘pure’ ADHD, or ADHD alone, and they were compared with typically developing children, who acted as controls. The time and resources available to this study did not permit the recruitment and involvement of a further two groups of children, such as ADHD+LI, and LI alone, although such information may have been advantageous.

1.3.6. Issues in language development and assessment

There are several additional important issues that suggest that the further exploration of language in children with ADHD is warranted.
Chronological age and the perception of disorder

Language difficulties in the early school years often result in referrals for assessment. There is awareness of the importance of the early detection of these problems because of the relationship between language abilities and emergence of other areas of learning and literacy. This heightened awareness does not necessarily continue into later childhood and adolescence. Tannock and Schachar (1996) have observed that whereas speech disorders may decline with increasing age in children, it is not necessarily the case with regard to language disorders. Hence, for many older children tenuous language ability in earlier years, as is commonplace in children with ADHD, may be allowed to escalate unchecked into significant language disability. This is often because this developmental period is a time when the child’s social and academic environments, together with the language associated with them, are likely to become more complex, therefore placing increased demands on the child’s language capacity (Montgomery, 1992). Children with ADHD are known to perform poorly socially and academically in the years of older childhood, and may be more likely to be represented in this older group with undetected language difficulties. For children with SLI, as well as those with other less obvious difficulties such as problems with higher order language skills, a “…negative spiral of social-communication failure” may result (Rice, 1991, cited in Reed, Bradfield, & McAllister, 1998, p206).

Risk of undetected language disorder

Research has suggested that language difficulties in children with behaviour problems may easily be overlooked, and undiagnosed language difficulties have been identified as prevalent in referrals to child psychiatric clinics. The work of Cohen, Davine, Horodezky, Lipsett, and Isaacson (1993) exemplified this particular risk of failure to
detect language difficulty in children with ADHD. The researchers observed that a substantial number (34%) of a cohort of clinically referred children with behaviour problems also had undetected LI. This was in addition to the 28% of the children who had previously been diagnosed with LI. The authors suggested that the communication problem for the previously undiagnosed LI children may have been more subtle, and may have been overshadowed by the children’s serious externalising symptoms and disruptive behaviour, and therefore overlooked. Another factor may be that the type of language difficulty may be mild and subtle. Baker and Cantwell (1992) noted in their review of the research that nearly half the children in studies were classified as having a mild difficulty, and a further 32% were classified as having moderate difficulty.

Since many cases of ADHD have been diagnosed in early childhood, the potential may exist for this diagnostic ‘label’ to mask awareness of insidious language difficulties that may emerge as the child matures. This poses a considerable additional risk to the well being of older children since these types of more subtle difficulties with language are not benign. Benasich, Curtiss, & Tallal (1993) provided a longitudinal account of greater than usual development of behaviour and emotional problems in children with language disorders (McGee, Partridge, Williams, & Silva, 1991). Westby and Cutler (1994) also added that problems with language posed a considerable risk to the effectiveness of treatment, since cognitive and language based intervention programmes have often been designed to assist children overcome the difficulties associated with ADHD. A lack of knowledge about the language status of children with ADHD may complicate the vulnerabilities that they experience, and jeopardise their opportunities for improvement.
Clinical practice guidelines and the scope of language difficulties

Despite more recent increased focus on the importance of language development in the later years of childhood (Cohen et al., 2000; Ylvisaker & DeBonis, 2000), and the frequent call for a multidisciplinary approach to the assessment of children with ADHD (Maag & Reid, 1996; Shelton & Barkley, 1994; Tannock & Schachar, 1996), there have been relatively few clinical guidelines developed.

The work of Damico and also of Duchan (Damico, Damico, & Armstrong, 1999; Duchan, 2000) referred to the gradual widening of the concept of language disorder and its implications. Damico observed that language difficulties were often intricately associated with a range of other learning difficulties such as poor reading and spelling, and that this awareness had a significant impact on service delivery and intervention (Damico et al., 1999). Duchan chronologically summarised various language assessment methods and listed several approaches available to the current day clinician that were not in regular use in the past. These included the assessment of literacy abilities, language development, social interaction skills, participation in events, communicative intents, narrative abilities, vocabulary, and language comprehension (Duchan, 2000). While acknowledging that “… different assessment questions lead logically to different assessment approaches” (Duchan, 2000, p189), Duchan advocated that specific assessment plans be constructed that reflected the purpose of the investigation of the person’s abilities. The pervasive nature of the communication difficulties that have been associated with ADHD suggests that for children with ADHD, the assessment plan would need to be very widely cast indeed.

Similarly, Damico et al. (2004) have proposed that a socio-cultural perspective, that is, one that incorporates the contextual dimensions of human functioning, more
accurately and authentically describes ADHD and the behaviours bound up with it. They suggested that all service delivery “… must be more reflective of the underlying complexity of ADHD” (Damico et al., 2004, p282). This has wide ranging implications with regard to the conceptualisation and consequently to the management of aspects of behaviour that involve language use.

1.4. Summary

ADHD is a complex condition, the symptoms of which elude straightforward description. In addition, the mechanisms of the maladaptations that the condition may represent are not well understood. In recent times, the importance of the pervasive role of context in the conceptualisation and presentation of ADHD and of the co-morbid conditions that are associated with it has become more apparent. The investigation of language ability in children with ADHD may benefit from this recognition of the importance of contextual factors to behaviour.

In the past, there have been a variety of approaches to the investigation of language that in turn have depended on different conceptualisations of language and also of language impairment. It appears that formalist approaches have influenced the description of the language difficulties that frequently occur in children with ADHD. These approaches may be well suited to the exploration of specific language impairment (SLI), but are unlikely to be able to capture the complexities of the other language problems that may occur. Such difficulties have been recognised as prevalent, significant, and multifaceted. Functional methods and the development of pragmatic models of language have contributed to a richer understanding and more extensive analyses of language than previously. However, the same kinds of limitations that
impede more formal investigations of language may also restrict functional approaches. Sociolinguistics, with its focus on the interrelationship of language and context, appears to offer an alternative framework for the exploration of language in children who have ADHD.
2.1. Introduction

The previous chapter provided an overview of thinking that has recently emerged with respect to the symptoms and language difficulties associated with ADHD. The commonality between these two separate aspects of behaviour lies in their descriptions as reflecting processes of adaptation to the external environment. The symptoms of ADHD represent the attempts of the individual to engage with his or her world. However, for reasons yet to be determined, these attempts lack the usual boundaries and socially motivated modifications that characterise the engagement of individuals who do not have ADHD. Similarly, language difficulties, particularly those outside the realm of specific language impairment, may represent linguistic choices that are less than optimal, as the individual attempts to use verbal means to initiate or to respond communicatively.

This chapter has two main aims. The first is to present details about aspects of the language use of children with ADHD that have been identified as significant in the previous literature. The second aim is to explain the suitability of the socially oriented
perspective in the work of further exploration of these and other aspects of language use. Systemic Functional Linguistics (SFL), which was introduced in Chapter 1, is further discussed as a useful and appropriate theoretical model that may enrich endeavours in this field. The framework inspired by SFL incorporates the importance of context, which is described in the previous chapter as the overall environment in which language is embedded. Since context has been identified as a major contributory influence both for the symptoms of ADHD as well as commonly reported associated language problems, such an approach provides a suitably holistic foundation for investigations in this field of study.

2.2. Notions about language in children with ADHD

A review of some of the studies that have investigated the language ability of children who have a diagnosis of ADHD was presented in Chapter 1. As discussed, these studies targeted a range of sample populations and employed a wide variety of methodologies. For example, Love and Thompson’s influential work reported that “nearly two-thirds of a group of preschool children referred for psychiatric outpatient services were found to have language disorders when assessed by standardised procedures” (Love & Thompson, 1988, p69). This excerpt from the abstract to Love and Thompson’s work specifies age group (preschool), method of attainment (psychiatric outpatient clients), and method of detection (standardised tests). Although such specifications are appropriate to scientific method, they present limitations that make it difficult to generalise the findings. Children with ADHD present as a heterogeneous group. Consequently, facts about the language ability of children with ADHD are difficult to clearly discern.
2.2.1. Information from previous research

It has often been reported that a stronger association exists between ADHD and language deficits than between ADHD and speech disorders (Damico, Damico, & Armstrong, 1999; Tannock & Schachar, 1996). In addition to this focus on language rather than speech, there are some recurring issues in aspects of language that have been investigated previously and found to be significant. Compared to peers without ADHD, children with ADHD have been observed to have greater difficulty with the organisation of discourse, usually produce texts of significantly different length, have more difficulty managing complexity, less semantic ability, more negative behaviour associated with language, and more difficulties with the use of written conventions.

Organisation of discourse

Difficulties with the organisation of discourse have been observed in previous work that has used the analysis of discourse. In some instances, the discourse concerned was conversation (Tannock, Fine, Heintz, & Schachar, 1995) while in others it concerned the retelling of a stimulus story (Purvis & Tannock, 1997; Tannock, Purvis, & Schachar, 1993). The measures that were used included indicators of speech function (whether the children used questions, statements, commands), and cohesion (cohesive reference devices, ellipsis, lexical repetition and cohesion, conjunction) (Kim & Kaiser, 2000; Purvis & Tannock, 1997; Tannock et al., 1995; Tannock et al., 1993). Renz (2003) examined story grammar using the model suggested by Stein & Glenn (1979). This particular study evaluated how children with ADHD used goal-oriented behaviour, which was measured by their use of a planning strategy in the creation of stories. The accuracy and appropriateness of adjustments for errors in the stories that were produced were also examined (Renz et al., 2003).


Quantity

Anecdotally, children with ADHD have been said to show differences in the quantity of their verbal output, and have been described as both overly talkative as well as verbally inhibited. The DSM-IV criteria include references to the quantity of output. The Hyperactivity scale, for example, includes “Often talks excessively” (Barkley, 1996, p5; Camarata & Gibson, 1999). Methods used for measuring quantity of verbal output have varied. Ludlow and colleagues examined the overall length of texts and found that the hyperactive children that they studied produced shorter stories (Ludlow, Rapoport, Bassich, & Mikkelson, 1978). Other studies have investigated component parts of texts such as the mean length of utterances in morphemes (Redmond, 2004), the total number of words (Resta & Eliot, 1994; Zentall, 1988), and the total number of utterances (Barkley, Cunningham, & Karlsson, 1983; Berry, Shaywitz, & Shaywitz, 1985; Purvis & Tannock, 2000; Whalen, Henker, Collins, McAuliffe, & Vaux, 1979; Zentall, 1988). The criteria for determining what constitutes an utterance have also varied, and have included definition by speech prosody markers (Barkley et al., 1983), and by the expression of one whole idea, (Renz et al., 2003).

Researchers have also discussed ‘quality versus quantity’ and have noted that the quality and effectiveness of verbal behaviour and overall communication is of at least as much importance as the quantity (Barkley, 1990; Tannock & Schachar, 1996; Whalen et al., 1979). The work by Ludlow et al. (1978), for example, was one of the first that attempted to address both these issues empirically. In that particular study, not only the number of utterances but also the percentage of grammatically correct utterances and the percentage of complex sentences were computed, the latter based on the incidence of embedded utterances (Ludlow et al., 1978).
**Complexity**

In addition to the measures of output, various measures of the complexity of children’s expressive language have often been used. As mentioned, in the study conducted by Ludlow and colleagues, the percentage of embedded utterances was computed as a measure of complexity, which was also measured by noting the longest complete and grammatical phrase in an utterance (Ludlow *et al.*, 1978). These measures showed no differences between boys who were described as normal compared to hyperactive boys. Barkley, Cunningham, and Karlsson (1983) found no difference in complexity that was rated by the mean number of syllables in the five longest utterances in their data. Several studies examined the number of different words (NDW) in narratives as a measure of lexical diversity (Redmond, 2004; Zentall, 1988), and noted differences in the outcomes for children with ADHD, SLI, and typically developing children. Measures of lexical diversity may be sensitive to complexity in language because lexical diversity indicates an attempt by the speaker or writer to vary the overall wordings that are used within the text. Redmond (2004) also used mazing (instance of repetitions, revisions, restarts, the use of fillers, and the like) as an indicator of utterance formulation difficulties, and included mazes in his array of measures of language impairment. He noted that increased mazing differentiated the children with ADHD from the SLI and typically developing children.

**Semantics**

Semantic difficulties are often cited, along with syntactic and pragmatic problems, as the basis of specific language impairment. Studies that have used assessment instruments that target specific language impairment have been somewhat inconclusive concerning the semantic abilities of children with ADHD. For example, Oram, Fine, Okamoto and Tannock (1999) used the CELF-R (Semel, Wiig, & Secord, 1987), and
noted that the children with ADHD experienced particular difficulties with the Formulated Sentences subtest, but proposed that because this item was problematic in isolation, it could not be taken as evidence of impaired semantic ability. Similarly, Kim and Kaiser (2000) investigated semantic, syntactic, and pragmatic abilities using formal language test instruments but did not find any evidence of semantic disability in the children with ADHD when they were compared to typically developing children. Javorsky (1996) suggested that oral language semantic ability as detected by elicited sentences and expressive figurative language, did not differentiate between children with ADHD, children with language learning disability, and typically developing children. Purvis and Tannock (1997) detected deficits in receptive as well as expressive semantic abilities using story retelling as well as standard test instruments. The cohort in that study also had co-morbid reading disabilities.

Semantic ability, when not assessed by formal testing, was often assessed as story comprehension. In terms of expressive ability, oral production was assessed in terms of story reconstruction and the repair of errors, including errors of reference (Purvis & Tannock, 1997; Renz et al., 2003), and the children with ADHD were shown to have difficulties in these areas. Language formulation, although a broad term, involves semantic ability, and the finding of Redmond that mazes differentiated between children with ADHD and SLI may reflect some underlying expressive semantic difficulty (Redmond, 2004).

**Behaviour**

Difficult verbal behaviours displayed by children with ADHD are said to be associated with attempts to investigate their language. Ludlow (1978) described “hyperactive children” as often having difficulty regulating “their speech and language output”
(Ludlow et al., 1978, p185), and this difficulty included more off-task speech, more non-compliance with the experimental tasks, and more disruptive and recalcitrant behaviour than their peers. Javorsky (1996) noted that they also made more requests for clarification of verbal material.

The DSM-IV itself includes reference to verbal behaviours that, together with other significant criteria, would have initially motivated the child’s diagnosis of ADHD. The impulsivity scale, for example, specifies “Often blurts out answers…” (Barkley, 1996, p5). Camarata perceived the DSM-IV as a tool that generally described pragmatic language impairment, where pragmatic ability referred to “social language skills” (Camarata & Gibson, 1999, p208). This difficulty was displayed in disruptions to topic introduction, maintenance and change, turn-taking difficulties and interruptions, overly-long pause time, and difficulties with repair strategies. Kim and Kaiser (2000) observed problematic behaviours that were associated with communication, including interrupting, and overlapping speech. They further noted that the participants in their study achieved acceptable levels on formal pragmatic assessment, and suggested that the difficulties displayed by the children with ADHD were evidence of pragmatic performance rather than pragmatic knowledge deficits (Kim & Kaiser, 2000). This finding reflected earlier observations that children with ADHD often attained adequate overall linguistic abilities but failed to demonstrate that they could demonstrate these skills appropriately in context (Barkley, 1990; Tannock & Schachar, 1996; Whalen et al., 1979). Children with ADHD also showed difficulty in modifying their language to reflect changes that met the specific demands of different tasks (Baker & Cantwell, 1992; Landau & Milich, 1988; Zentall, 1988). These observations were consistent with the view that stressed the importance of considering context in the assessment of the behaviour and language ability of children with ADHD.
**Conventions**

Since difficulty with rule-governed behaviour is a hallmark of ADHD, then it could be anticipated that following the conventions, or rules, of spoken as well as written language would be problematic for these children. Some studies, such as that by Ludlow *et al.*, examined overall grammatical correctness in the language of children with ADHD and found no differences between the children with ADHD and the normal control children on formal assessment measures (Ludlow *et al.*, 1978). Alternatively, Purvis and Tannock (1997) used the recall of spoken stories to assess semantic and organisational skills. The convention of relating story elements in a sequential fashion was expected but not met. Redmond (2005) found that sentence recall appeared to be sensitive in differentiating typically developing children from children with ADHD, and proposed that heightened impulsivity to respond on the part of the children with ADHD may have had an adverse affect on their performances. Although not designed as a measure of compliance with conventions, it is feasible that the observed impulsivity on the part of the children with ADHD demonstrated less regard for the observance of the conventions of the recall task.

Regarding the use of written conventions by children with ADHD, Javorsky (1996) observed errors made by children with ADHD in their spelling, punctuation, and capitalisation. Resta and Eliot (1994) also reported poorer written language skills in boys with ADHD, based on problems with the mechanics of writing and copying, and the quality of written discourse.

Language is multifaceted, and the characteristics exemplified by the aspects of verbal behaviour described above are not intended to be exhaustive nor are they to be understood as being totally independent entities. However, questions concerning the
impact of ADHD on language use may begin to be explored by using the information gained from this previous work as an empirical basis.

2.2.2. The place of Specific Language Impairment

The presence of SLI or a significant developmental delay in language would impede a child’s capacity to function at a level comparable to that of his or her same-age peers. Frequently, standardised test instruments that relate to formal language abilities have been used to detect and describe SLI.

The present study perceived language difficulties, as are frequently experienced by children with ADHD, as context related and not readily detected by typically-used formal language tests. This thesis assumes the position discussed earlier that ADHD and SLI are often separate conditions that may occur together, but that some problematic differences in language may exist in children with ADHD independently of SLI, and can be demonstrated by examining language in use. Alternative methods, such as discourse analysis and SFL, take context into consideration, and may therefore be more appropriate tools for capturing these differences. SFL has unique advantages for describing language use because it analyses language from a functional perspective, allowing for rich description at the level of words, phrases, clauses, and whole texts, while at the same time offering potential explanations for the pattern of use of linguistic elements (Thomson, 2003).

In this study, two standardised tests, the Clinical Evaluation of Language Fundamentals, 3rd Edition (CELF-3; Semel, Wiig, & Secord, 1995) and the Test of Pragmatic Language (TOPL; Phelps-Terasaki & Phelps-Gunn, 1992) were used to ensure that SLI was eliminated from the sample population. SLI was an important
criterion for exclusion from this study because it may interfere with other variations in language use that children with ADHD may experience, and which are the focus of the present investigation.

The way language is used is known to vary widely in everyday communication even when there is no question of language difficulty. In addition to supplying information about potential SLI, the standardised language test instruments selected for this study provided the means of objectively measuring and demonstrating a baseline level of general language development of each participating child in relation to his or her chronological age. Some detail regarding these two assessment instruments and the manner in which they describe language abilities follows.

Clinical Evaluation of Language Fundamentals, Version 3 (CELF-3)
The CELF is frequently used in clinical speech pathology practice to detect and quantify language impairment in relation to age. The CELF states that its purpose is “for the identification … of language skill deficits … in the areas of morphology, syntax, semantics, and memory…” (Semel et al., 1995, pp1-2). An earlier version, the CELF-R, was used in previous research to examine the language of children with and without a diagnosis of ADHD (Oram et al., 1999). In the present research, the CELF-3 was used to ensure that each child could demonstrate at least average overall language development as it is described by this test.

Test of Pragmatic Language (TOPL)
It has been suggested that the diagnosis of ADHD reflects pragmatic language impairment (Camarata & Gibson, 1999). The authors of the Test of Pragmatic Language (TOPL) defined pragmatics as describing “language in context” (Phelps-Terasaki &
Phelps-Gunn, 1992, p1). They stated “the pragmatic purpose of language is the most important feature, with all other skills superimposed on the pragmatic base.” (Phelps-Terasaki & Phelps-Gunn, 1992, pp1-2). They discussed the difference between communicative competence and linguistic competence, and the competing nature of different factors of language in communication. The authors claimed that the TOPL was a formal norm-referenced instrument which targeted language on demand, as opposed to spontaneous language. The TOPL has been used previously in research to examine the pragmatic ability of children with and without a diagnosis of ADHD (Kim & Kaiser, 2000). Kim and Kaiser (2000) found no differences between children with ADHD and typically developing peers as assessed by the TOPL. However, results from the Pragmatic Protocol (Prutting & Kirchner, 1987) which Kim and Kaiser’s study also used, showed that the children with ADHD demonstrated less appropriate pragmatic behaviours during conversations with adult partners. These different findings may reflect the distinction between linguistic competence (pragmatic knowledge), and communicative competence (pragmatic performance) that had been raised previously by the authors of the TOPL.

In the present research it was decided that a standardised measure of pragmatic ability would assist in building a profile of the linguistic abilities of the participating children, based on formal test outcomes. It was anticipated that each child would demonstrate at least average pragmatic development or knowledge as described by the TOPL.

**The place of formal tests**

As discussed in Chapter 1, when formal test instruments have been used previously in research with the ADHD population, it has been generally in the more narrow sense of
establishing a diagnosis of language impairment (Cohen et al., 2000; Kim & Kaiser, 2000; Oram et al., 1999; Pecora, 1996; Redmond, 2004; Tirosh & Cohen, 1998). Whole test batteries have been used in order to describe a form of language impairment based on the variables targeted by the particular test. Studies have also suggested that children with ADHD characteristically perform poorly on sections of formal tests, for example the formulated sentences subtest of the CELF-3 (Oram et al., 1999). However, the literature suggests that standardised test measures alone are unsuitable for describing the kinds of difficulties that children with ADHD may experience with their language. This may be true not only of linguistic form but also when the social purposes of language are being considered. Adams, for example asserts that “the nature of pragmatics as a set of context-dependent behaviours casts doubt upon the capability of formal testing procedures to reproduce these behaviours reliably” (Adams, 2002, p976).

This study aimed to increase knowledge about the language of children with ADHD by providing information gained from the standardised testing and considering it alongside the information gained from discourse analysis and the analysis of language use. It attempted to examine the language use of children who were as alike as possible in all aspects except for a diagnosis of ADHD. They were all ostensibly ‘normal’ children in terms of language development, general behaviour, academic ability, physical characteristics, and socio-economic status. The process of attainment and the selection of suitable participants will be more fully discussed in Chapter 3, ‘Methods’.

2.2.3. A theoretical basis for exploring language use

Once SLI was excluded, the appropriate selection of an empirical framework that could be used to examine language use in children with ADHD was required. The framework
needed to encompass a theoretical understanding of language that was pertinent to the understanding of ADHD.

As introduced in Chapter 1, unified models have been proposed that have attempted to explain the problem behaviours of ADHD, including language and verbal behaviours (Barkley, 1997; Brown, 2002). Barkley included language among the behaviours influenced by executive function, stating that executive function encompasses working memory, the self-regulation of motivation/arousal, the internalisation of speech, and the reconstitution of responses. He suggested that response reconstitution would be reflected in the information-giving function of language, and in goal directed discourse, and he presented evidence from the literature that gave some support to this (Barkley, 1997).

Damico et al. described linguistic ability as a “functional representational (semiotic) capacity” (1999, p40). A semiotic capacity refers to one in which a choice between available options is to be made. In the case of linguistic choices, this refers to the real life that the linguistic options represent. Therefore it seems that language function may be involved in the deeper level cognitive mechanism of response inhibition, which in turn was involved in the regulation of behaviour. So language may have a role in regulating behaviour, and in turn, behaviour that may be influenced by self-regulation, might affect language. This explanation articulated by Damico et al. highlighted the close inter-relationship between ADHD and linguistic function, and echoed the ideas published over forty years earlier in Luria’s “The Role of Speech in the Regulation of Behaviour” (Luria, 1961).
An approach such as that proffered by Damico *et al.* challenged speech and language clinicians to approach their work in ways that reflected the ‘context-sensitive’ approaches of ADHD investigators such as Tannock (Tannock *et al.*, 1995; Tannock *et al.*, 1993). Although the literature has reported investigations of language that have embraced this approach to a certain extent (Armstrong, 2005; Fine, 1985; Labov, 1971; Lawrence *et al.*, 2002; Westby & Cutler, 1994; Whalen *et al.*, 1979), the model suggested by Damico *et al.* exemplified a systematic approach to language use that applied specifically to children with ADHD.

**Systems Theory**

Damico *et al.* recommended that service delivery for children with ADHD needed to embrace “… a systems-theory approach and a functional orientation” (Damico *et al.*, 1999, pp42-43). In their terms, systems theory is an approach developed within the social sciences which recognised that such a complex notion as behaviour must be the product of the dynamic, transactional interplay between intra and extra-personal variables. Their study cited Weaver who applied systems theory to the understanding of ADHD:

> ADHD should be understood, then, not simply as a neurologic condition, but as a social construct. In effect ADHD is not so much a disorder (located within the individual) as a set of dysfunctional relationships between an individual with certain predispositions and an environment that generates certain expectations, demands, and reactions. (Weaver, 1993, cited in Damico *et al.*, 1999, p43)

This conceptualisation of ADHD incorporates social context as an important factor in the pathogenesis of ADHD. In Chapter 1, this issue regarding the way individuals with ADHD may use language to relate to the world was raised. Damico *et al.* suggested further that “… all materials and activities should be meaning-based,
contextually embedded, and temporally constrained to real-time experiences” (Damico et al., 1999, p51). SFL theory motivates the use of “…meaning-based, contextually embedded … real-time experiences” that become the basis of a functional approach to the analysis and description of language in use. In this respect, SFL and traditional approaches to language based on syntax, semantics, and structural grammar that are investigated under strictly controlled conditions may be seen as opposing ends of the spectrum of linguistic exploration.

SFL has not been previously used as a tool for investigating the language of children with ADHD. In fact, the origins of SFL are to be found in theoretical linguistics, and not in the applied areas of children’s language development or language pathology at all. Early practical applications occurred in the fields of political discourse, classroom discourse, and in the teaching methods of second language acquisition. More recently, it has been applied in other areas of clinical research, especially in the exploration of acquired language disorders following brain injury, such as aphasia, and in dementia. The value of the SFL framework in describing non-standard communication patterns as exemplified in these disorders quickly became apparent (summarised in Armstrong, 2005). SFL describes the language in context, and conflates the description of selected structural characteristics of language with information about their functions. Such a perspective may provide fresh insights into how language is described. It also may help to identify language variation and to distinguish it from language disturbance, as well as indicate possible clinical pathways for managing problematic language use.

The particular approach advocated by Damico et al. (1999) highlighted the importance of contextual factors, and the interaction of the individual with the
environment as crucial to the understanding of the behaviour that is associated with ADHD, particularly with regard to language behaviour. They also advocated the use of broad-based descriptive and multidimensional assessment tools that could not only capture the complexity of the behaviours concerned but could also incorporate the role of contextual elements. They contrasted this approach with, for example, the medical model of the disorder, which describes the symptoms of ADHD as well as its associated problems as particular deficits or failures that exist solely within the individual.

2.3. Describing language use

For this study, there were two main sources of information that informed the design and the initial selection of dependent variables. Firstly and as previously mentioned, information was gained from previous studies into language in children with ADHD. The second major influence was the potential of the SFL framework itself. SFL provides a means of systematically describing the experimental tasks as well as the children’s responses. It does this by examining language as well as context. SFL theory also gives possible explanations for the ways language has been used in discourse, which is particularly helpful for problematic language. Because of the high profile of SFL in this thesis, and because of the unfamiliarity of some of its principles, a detailed explanation follows shortly.

As the study progressed through early planning phases, additional variables were suggested. For instance, the software that was chosen to manage and help analyse the linguistic data that was later generated in the study, (the “Systematic Analysis of Language Transcripts” or “SALT” programme, Miller, 2004), provided numerous potential variables that were based on the model of child language development.
proposed by SALT authors. In addition, the texts themselves often contained examples of linguistic forms that were simply described and tallied. The potential of these descriptive means was suggested by earlier analyses of data collected in the pilot phases of the research (Mathers, 2001, 2005, 2006).

2.3.1. Systemic Functional Linguistics

Some basic assumptions

As its name suggests, Systemic Functional Linguistics provides a framework for a systemic and functional analysis of language. Several core assumptions underlie the approach. These assumptions are that the SFL perspective is functional, that the function of language is to create meanings, that these meanings incorporate the context in which language occurs, and that language is a semiotic process. A semiotic process is one that requires a choice to be made between alternative options (of signs, symbols, words grammar etc.; Eggins, 1994).

Halliday explains that the ‘systemic’ part of SFL refers to the fundamental concept of a system, that is, “a limited … set of terms in a choice relation”, where “terms” are the set of possibilities for a given structure in a language (Halliday, 1963, cited in deJoia & Stenton, 1980, p107). This enables the perception of language as a process rather than as a product (Halliday, 1994). This process of making choices in meaning is nonetheless ordered and predictable.

The functional part of the SFL title indicates “the model’s orientation to language in use” (Thomson, 2003, p45). This means that real life purposes are investigated, which contrasts with the hypothetical situations, or laboratory-controlled conditions that are associated with investigations of formal grammar, or behaviourist
theory. So a systemic functional approach to the analysis of language seeks to
demonstrate the way individuals select from the resources of language in systematic
ways to achieve particular purposes. SFL therefore conceptualises language as a
resource for creating meaning that is expressed as a network of relationships that exists
between the elements that have been selected to encode the desired meanings. This
systemic and functional orientation contrasts markedly with more formalist approaches
that perceive language as behaviour that must follow a predetermined set of rules that
are expressed in linguistic structures, usually sentences (Martin, Matthiessen, & Painter,
1997).

Language as a semiotic system

The ways that individuals use language, the functions that they want it to serve, or the
different types of meanings they wish to create may appear to be infinite. Halliday has
argued that there are but three overarching functions of language, called linguistic
metafunctions. These are: the ideational metafunction, whereby language is used to
encode experience or thought, the interpersonal metafunction whereby language is used
to encode interaction or personal positioning, and the textual metafunction that
organises experiential and interpersonal meanings into a coherent whole. Halliday and
Hasan (1985) provided examples of each of the three linguistic metafunctions and how
they function in one text. One example is of a legal document concerning transfer of
ownership. It is instantly recognisable as legal document because of the properties of
field (what it is about, which is expressed in formal legal jargon), and tenor (formal and
impersonal). The mode was described as, “written to be filed” (Halliday and Hasan,
1985, p13).
Every instance of language encodes options for each of these three metafunctions simultaneously (Butt, Fahey, Feez, Spinks, & Yallop, 2000). This makes complexity and flexibility possible, “… because language is a semiotic system: a conventionalised coding system, organised as a set of choices. The distinctive feature of semiotic systems is that each choice … acquires its meaning against the background of the other choices that could have been made” (Eggins, 1994, p3). Figure 2.1 illustrates the notion of semiotic systems, using traffic lights as an example. Figure 2.2 applies the concept to language.

**Figure 2.1.** Content and expression in examples of semiotic systems (Eggins, 1994, p18). Reproduced by kind permission of Continuum International Publishers.

<table>
<thead>
<tr>
<th>TRAFFIC LIGHTS</th>
<th>LANGUAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONTENT</td>
<td>meaning</td>
</tr>
<tr>
<td></td>
<td>words</td>
</tr>
<tr>
<td>EXPRESSION</td>
<td>lighting</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FOLK NAMES</th>
<th>TECHNICAL TERMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONTENT</td>
<td>meanings</td>
</tr>
<tr>
<td></td>
<td>wordings</td>
</tr>
<tr>
<td></td>
<td>(words &amp; structures)</td>
</tr>
<tr>
<td>EXPRESSION</td>
<td>sounds/letters</td>
</tr>
</tbody>
</table>

**Figure 2.2.** Levels or strata of language (Eggins, 1994, p21). Reproduced by kind permission of Continuum International Publishers.
As explained by Thomson, “…the network of choices which language users have available to them … allows the dynamic (and nondeterministic) nature of discourse.” (Thomson, 2003, p45). Speakers and writers are able to access these choices within the framework of the linguistic metafunctions. The range of options of possible linguistic resources includes options for grammatical as well as lexical selection, for the arrangement of given and new information, and for how all these linguistic resources inter-relate (discourse semantics). The analysis of language in use describes the options that have been made, and the texts that are examined are everyday texts. Because each linguistic choice has meaning, these meanings can be explained and the use to which language has been put can be revealed.

**The description and explanation of texts**

The SFL approach to the analysis of texts makes meaning of what is actually there in the text without references to what is not or perhaps ‘should’ be there. This is particularly appealing since it examines language objectively without the distractions of a prescriptive or deficit-oriented schema. This is one reason why discourse analysis that is informed by SFL holds such potential with regard to the exploration of the language of children who have ADHD. It is commonplace texts that are described and analysed, rather than data being scrutinised for the presence of predetermined linguistic targets, or evaluated according to criteria set by the researcher. In the latter cases, much data would possibly have been discarded because of its failure to demonstrate the predetermined linguistic targets that were the focus of particular investigations.

SFL analysis and description may be exhaustively comprehensive, or may select a more narrow focus for analysis. For example, analysis informed by SFL might concentrate on the resources of discourse semantics, which is how the meanings
expressed in the text as a whole hold together. This might focus on descriptions of reference, lexical relations, cohesion, or, if the text was conversation, exchange structure. Alternatively, analysis might concentrate on the lexico-grammar. Butt et al. have explained lexico-grammar as referring to “words and the way they are arranged” (2000, p6). Lexico-grammatical options include grammatical intricacy, which refers to the way clauses are combined into clause complexes to express increased complexity of meaning, and theme, which has to do with options regarding the organisation of the constituents of texts to create the speaker’s intended meanings. For each of these levels of analysis, (discourse semantics and lexico-grammar), meanings reflecting the three linguistic metafunctions may be encoded (i.e. ideational, interpersonal, and textual meanings; Butt et al., 2000). Following the ‘dissection’ that characterises analysis, the meanings are again ‘reconstructed’ with regard to context and to these linguistic metafunctions.

Description within the SFL framework shows how the relationships between linguistic resources interact. Meaning is derived from understanding these inter-relationships, and the meaning indicates the particular use to which language has been put (Martin et al., 1997). This contrasts with the formalist view whereby assessment detects which sentences may be judged as ‘correct’ according to the linguistic rule system and the constraints that were inherent in the task.

It has been claimed that SFL is not only foremost in its capacity to describe language, but also that through the theoretical framework of SFL, “Halliday has provided a real opportunity for the consideration of textual variation when analysing and interpreting linguistic data” (Damico, 2003, p59). It is in this capacity that it was employed in this study to explore the language use of children with ADHD. The aim of
the study was to explore the texts provided by the participating children, to describe them according to the principals of SFL, and to consider the significance of observed variations between the children with ADHD and the control children.

**Language variation**

Language variation is common and expected between individuals. Analyses based on SFL are able to describe variations and preserve as data those variations which in other approaches may be dismissed. This study aimed to describe and explain any language variation between children with ADHD and control children that exceeded what could reasonably be expected to have occurred either by chance or by natural variation. To do this, the study compared a group of children with ADHD with a matched control group, where the matching process included pairing the children for their levels of developmental language ability, all of which were within the normal range. This matching, in SFL terms, attempted to control aspects of the context that may have impacted on the language of the participating children, thereby limiting one potential source of language variation between the children.

**The Social Perspective: Culture and Context**

Martin *et al.* (1997) described SFL as an approach to the analysis of discourse that enables any text to be related to the context in which it is used. Damico has also claimed that SFL can “assimilate contextual issues … in a manner that is lacking in virtually any other framework” (Damico, 2003, p59). Context can be deduced from language, and similarly language can be predicted from context. The frequent difficulty experienced in comprehending language when context of use is not taken into account illustrates this reciprocal relationship (Eggins, 1994). Context is of considerable importance to this
research since it has been identified as a significant factor associated with language
difficulties in children who have ADHD.

Context encompasses both the wider culture and the situation, and all language
occurs within both of these. Furthermore, “The combination of context of culture and
context of situation results in the differences and similarities between one piece of
language and another” (Butt et al., 2000, p3). In SFL, the term ‘context of situation’
entails descriptions of what the language is about (the field or area of experience), the
roles and relationships integral to the text (the ‘tenor’), and the role played by language
itself (the mode; Halliday and Hasan, 1985, p12; Butt et al., 2000). As Halliday and
Hasan state, “The more specifically we can characterise the context of situation, the
more specifically we can predict the properties of a text within a situation” (Halliday &
on SFL would include a description of the context of the situation of the text. For
example, a formal language testing session would be described as a one-to-one, spoken
question-and-answer format, with strictly controlled test administration, and within a set
period of time. It would also include a description of what the text was about (field), the
relationship between the participants in the communication (tenor), and the mode or
channel in which the communication was to take place. As a further example using the
sentence formulation subtest of the CELF-3, the field is the child’s responses to the task
of sentence-making with a given target word. The tenor is the relationship between the
child who is being assessed and who takes the role of a respondent, and an adult, either
a teacher or therapist whose role it is to administer the test items. The mode of the
communication for this subtest is the channel of spoken language. All of this
information is important and adds to the meaning of what it is that the child is
attempting to communicate. It therefore forms an integral part of the child’s
communicative ability. However, typically, in the clinical setting the value of this information is lost.

SFL considers context in a fairly rigorous and systematic way compared to other methods. For example, the assessment of pragmatic abilities is another approach that considers the role of context in language. However, most assessments of pragmatic abilities treat the impact of context as a separate dimension of language, and fail to integrate it into the creation of meaning overall. For example, it would not be unexpected to hear clinical reports on children’s language ability detail information about semantic, syntactic, and pragmatic ability as isolated entities. SFL on the other hand sees context as the essential connection that relates the form of language to those non-language factors that create the meaning, and therefore presents a more comprehensive picture of the resources of language that are being used. (deJoia & Stenton, 1980).

2.3.2. The SFL perspective on language issues in ADHD

As noted previously, recurring outcomes have emerged from previous research into language use in children who have ADHD. These are concerned with the organisation of discourse (Tannock et al., 1993), the quality (complexity) of discourse (Ludlow et al., 1978), semantics and language formulation (Purvis & Tannock, 1997; Redmond, 2004), behaviour (Baker & Cantwell, 1992; Camarata & Gibson, 1999), and written conventions (Elbert, 1993; Resta & Eliot, 1994).

Several parameters that constitute part of the SFL model for describing language offer alternative ways for systematically exploring these issues further. For example, the organisation of discourse, in SFL, is realised by the textual metafunction, and this may
be explored by investigating cohesion, theme and clause structure (Halliday and Hasan, 1976, p 324-326). Cohesion is often created by the use of ellipsis, lexico-grammar, and discourse semantics. Theme and clause structure also provide insights into complexity and semantics (Butt et al., 2000). Organisation and complexity can be investigated in the same way for spoken and written language because in SFL the mode of expression, or the channel of language selected, is specified as an aspect of context; the others being field (what the communication is about), and tenor (the interpersonal relationship in which the communication is embedded).

The framework for examining language use in this study was informed by SFL. Mindful of the information provided by the previous literature, and guided by the tenets of SFL, this study undertook to describe the discourse of children with ADHD with regard to cohesion, theme, clause structure, mood, and lexico-grammar.

**Cohesion**

The notions of the metafunctions of language (experiential, interpersonal, and textual) were introduced in part 2.3.1 of this chapter. As described there, the ideational metafunction is used to encode experience or thought, the interpersonal metafunction is used to encode interaction or personal positioning, and the textual metafunction organises experiential and interpersonal meanings into a coherent whole. The textual function relates to the use of language itself, whereas the other two metafunctions express meanings related to events and ideas (experiential), and about social relationships (interpersonal; Mathiessen, 1995). The textual metafunction is what it is that makes a text into a text (Halliday and Hasan, 1985, p23). It does this in part through cohesion, which works to establish connections between meanings in texts. Halliday has described cohesion as a semantic concept, not a structural one. He claims that is
expressed “partly through the grammar and partly through the vocabulary” (Halliday and Hasan, 1976, p5), and accounts for the meaning relationships in discourse.

The ability to organise extended discourse that is coherent is considered a major factor of the language development of children beyond the preschool years (Karmiloff-Smith, 1987). Researchers in the area of child language have investigated cohesion as an isolated entity in children with language disorders, and in children with ADHD (Caplan, Guthrie, Tang, Nuechterlein, & Asarnow, 2001; Fine, 1994; Liles, 1985; Tannock et al., 1995). Within the SFL framework, the investigation of cohesion as a textual resource links it as a linguistic resource to the other strands of meaning that are simultaneously expressed in texts, namely the experiential meanings and the interpersonal meanings. The discourse is understood by considering these strands of meaning together as a unified text. Linguistic resources that help to create cohesion include lexical devices such as lexical repetition, and grammatical devices such as ellipsis and thematic progression (Butt et al., 2000). In this study, lexical diversity, ellipsis, and theme in the elicited texts were examined.

**Theme**

The system of theme describes “the structural configurations by which the clause is organised as a message” (Eggins, 1994, p271). It is because the theme system organises the text that it is described as also conveying the textual strand of meaning. Textual meanings prioritise and connect the other elements of the text (the experiential and interpersonal meanings), so that all three are simultaneously expressed in the way the speaker or writer wishes, and form a coherent and linear whole. “It is because it plays this essential semantic support role that Halliday refers to the textual metafunction as the enabling function of language.” (Eggins, 1994, p299).
Halliday has defined theme as “the starting-point for the message” (Halliday, 1994, p38). It is identified in English (but not in all languages) by its position at the beginning of the clause. In addition, it includes the whole of the first item of experiential meaning. The remainder of the clause is called ‘rheme’. Rheme was not investigated in this study. Martin (1995) has distinguished between theme and topic by pointing out that information is presented in the first (thematic) position in ways that are significant for the text as a whole. The information conveyed by the theme of a clause, because theme is a textual resource, “mirrors the tri-partite semantic structure of language” (Eggins, 1994, p271). The topic of the clause can usually only describe experiential meaning. Theme, on the other hand, can also realise experiential, interpersonal, and textual meanings, with different degrees of importance. So theme is important to the coherence and cohesion of texts because its significance goes beyond the level of the individual clause where it was first identified.

Butt et al. (2000, p133-150) provide an excellent introduction to an operational understanding of theme and provide a good example that illustrates theme (p136). In this example, shown in Table 2.1, the experiential meanings are the same (that is, the texts are about the same thing).

<table>
<thead>
<tr>
<th>Theme</th>
<th>Rheme</th>
</tr>
</thead>
<tbody>
<tr>
<td>The lion</td>
<td>beat the unicorn all around the town</td>
</tr>
<tr>
<td>All round the town</td>
<td>the lion beat the unicorn</td>
</tr>
<tr>
<td>By the lion</td>
<td>the unicorn was beaten all around the town</td>
</tr>
<tr>
<td>The unicorn</td>
<td>was beaten all round the town by the lion</td>
</tr>
</tbody>
</table>
There are several types of theme that are largely distinguished by the meanings they create. For example, if a theme expresses only an experiential (known as ‘topical’) information, it is known as simple topical theme. Interpersonal and textual information are not expressed. When theme expresses additional meanings, such as interpersonal and textual meanings, it must always also include a topical element. The term ‘multiple theme’ refers to these combinations of thematic elements.

Each of the types of theme is further described as either marked or unmarked. When theme is conflated with the grammatical subject, it is known as unmarked theme. On occasion, an atypical element other than the grammatical subject draws attention to itself as the theme and this is known as marked theme. Any type of theme (simple or multiple; textual, interpersonal or topical) may function as marked. Another thematic pattern that often characterises clause complexes is known as predicated theme. This is where a second clause, for example a dependent clause, becomes the theme of the first. The type of theme is closely linked to other aspects of the text, one being the mode of expression, (spoken or written), and the other being mood. This study investigated the types of theme used in the elicited texts for both modes of expression. Figure 2.3 summarises the system of theme.
Clauses have been identified as, “… the fundamental meaning structure in …linguistic communication” (Butt et al., 2000, pp33-36). Halliday observes that it is in appreciating this function of the clause that the fundamental shift is made from understanding
grammar as a system to considering it as a means of creating meaning (Halliday, 2004, p10). Traditional grammar states that every clause must at least have a verb. In SFL, the verb is termed the process, which carries this obligatory information (Butt et al., 2000).

Clause types include major (sometimes also termed “independent stand alone”), independent, dependent, minor, and embedded clauses. Examples of clauses include, “Mary had a little lamb”, which is a major (independent stand alone) clause; “whose fleece was white as snow”, which is a dependent clause; and “Come”, which is a minor clause.

The use of clause complexes illustrates one of the linguistic resources used by speaker or writer’s to elaborate or extend information expressed in a clause. Other means may include, for instance, adding new lexical items, or modifying the process or the circumstance. In this thesis, clause complexes referred to the combination of two or more separate clauses. This is slightly different to the definition of the clause complex as consisting of, “one or more clauses” (Butt et al., 2000, p29). This latter definition is drawn from Halliday’s functional grammar system that uses the notion of the rank scale (Halliday, 1994), and clause complexes are ranked as the “…patterns of language at the level above the clause” (Butt et al., 2000, p29). For the purposes of the linguistic analyses used in this thesis, the term clause complex “…refers to the association of clauses in a sequence, in either written text (in which case clause complex boundaries are indicated by full stops), or in spoken text (in which case clause complex boundaries are indicated by a combination of rhythm, intonation and pauses)” (Eggsins, 1994, p129). The sequencing of the clauses follows “some kind of logical relationship” (Butt et al., 2000, p30) that is meaningful.
Mood

The choice of theme in English clauses “depends on the choice of mood.” (Halliday, 1994, p42). The mood is indicative of the kind of exchange that transpires through communication. “Mood represents the organisation of participants in speech situations, providing options in speaker roles” (Halliday, 1967, p199). This means that clauses (and sentences in written texts) may be recognised either as making a statement (known as the declarative mood), asking a question (interrogative mood) or giving an order (imperative mood). Every independent clause selects for mood. Mood carries interpersonal information in that it indicates the roles adopted by the speaker as well as those imposed on the listener. For example, a clause in the declarative mood will be giving information from the speaker or writer, and whereas the interrogative will be asking a question in order to engage the listener or reader, the imperative will be giving a command or an instruction that the listener or reader is expected to respond to.

Sometimes, a speaker or writer can manipulate the mood to achieve a particular effect. For example, if politeness is considered absolutely necessary, then a speaker might use the interrogative, “would you like to sit?”, rather than the imperative, “sit down”.

It was anticipated that the declarative mood would predominate in this study. This was because two of the three elicitation tasks required the children to provide firstly, a story retell, and then a recount. The decision was made to examine the third text type, the procedural texts, for evidence of the use of the imperative mood, since it is in this particular text type that the use of the imperative could usually be expected to occur.
**Lexico-grammar**

The term, lexico-grammar, has been defined as meaning words (lexis), and the way they are arranged in texts (grammar; Butt *et al.*, 2000). The lexico-grammar encodes the meanings of the text in wordings. These may be morphemes, words, phrases, or clauses, along with the ways they are organised within whole texts and within contexts (Butt *et al.*, 2000). In SFL, lexico-grammar maintains a distinction between the idealised form and the meaning that is realised within the context of the discourse. This differs from the more commonly held understanding that words have particular meanings, and grammar follows particular rules in order for language to be understood. SFL suggests that meaning is created by considering language within its social context rather than this exclusive reliance on the forms of language (Armstrong, 2005). The lexico-grammar allows the speaker or writer certain linguistic options, which may be thought of as related to vocabulary and grammar. Halliday explains that “…the more general meanings are expressed through the grammar, and the more specific meanings through the vocabulary” (Halliday and Hasan, 1976, p5). The meaning of the options that are expressed in the text are fully realised only within the context in which the communication occurs. In the current study, lexical diversity and grammatical intricacy were examined in the elicited texts.

**2.3.3. The SALT programme**

The Systematic Analysis of Language Transcripts (SALT; Miller, 2004) was selected as a tool for managing the data that emerged from the children’s texts. The SALT computer programme was developed as a means of analysing children’s free speech samples (Miller & Chapman, 1982, 1983, 1984, 1985, 1986, & 1987). Miller (1991), one of the authors who developed SALT, reviewed research into language disorders and
concluded that most previous research had approached language from a developmental perspective. He proposed that the investigation of language disorders should include the broad description of language performance, in addition to consideration of developmentally appropriate linguistic skills and abilities. To this end, he developed a means for recording and quantifying language performance (Miller, 1991). Features that could be identified in children’s language production would then serve as the basis for later investigations. He categorised the main characteristics of language that were described. These categories were sentence formulation (for example, sentence completion and word order), word finding, speech rate, discourse and pragmatics, semantics, and syntax. Later, measures of the number of different words and the total number of words in children’s narratives were added as indicators of language development.

Redmond (2004) used SALT to explore group differences in the conversational abilities of children with ADHD, children with SLI, and typically developing children. It was used to tally and analyse the number of words, the speaking rate, mean length of utterance, the number of mazes, lexical diversity (NDW), morphosyntactic development, and tense markers. Mazes refer to those interruptions to the flow of language, such as revisions, restarts, and filled pauses that often occur in spoken language (Miller, 2004). Redmond found that measures related to utterance formulation (specifically to mazes) differentiated the ADHD group from the SLI and control groups, while measures related to lexical diversity, average sentence length and tense marking differentiated the SLI group from the ADHD and control groups.

The research version of SALT, version 8, was selected for use in this study. Several of its suggested target items were added to the analyses of the texts as
dependent variables. These were abandoned utterances, utterances with pauses, utterances with mazes, lexical diversity (as measured by the type token ratio), number of words, and number of utterances.

2.3.4. **Descriptions of the texts**

Miller criticised the inadequacy of research methods that had usually been used in child language disorders, and described them as having focused on “parsimonious characterisations of disordered performance” (Miller, 1991, p5). He advocated a descriptive approach using multidimensional models for the investigation of language. Similarly, Damico *et al.* (1999) described models of service delivery for speech pathologists who worked with individuals who have ADHD and suggested they “…be descriptive and flexible enough to richly describe the student’s behaviours and the contexts within which the behaviours occur. Further, the analysis must be detailed enough to identify the actual contextual variables that exacerbate the student’s ‘predispositions’” (Damico *et al.*, 1999, p44). Anecdotal evidence has suggested that children with ADHD tend to avoid directed verbal engagement, construct written texts poorly, stray off the topic, interrupt other speakers, and fail to follow verbal directions. For these reasons, in this study it was decided to include as wide a range of descriptions of features of the sample texts as possible. This meant that on occasion data was recorded and examined often without any theoretically-driven basis, but was usually influenced by the findings of previous research (for example, opening and concluding remarks in texts were assumed to represent some attempt at organisation). On occasion, options of interest that were used repeatedly by children in the study were included (for example, the tendency to write procedures in numbered or point form). These items of interest were termed “descriptive variables” in this thesis. These variables were
avoidance behaviour, unrelated information, requesting clarification, interrupting and overlapping utterances, opening and concluding remarks, and using numbered or point form in written texts.

2.4. Summary

Context is thought to play a significant role in the symptoms that are manifest in the behaviour of children with ADHD, including problematic language. To date, the usual methods for detecting and describing language difficulty have largely overlooked the importance of context. The framework of SFL, which systematically incorporates issues of context, offers potential as an appropriate method for investigating language use in children with ADHD. The application of SFL means that the creation of texts can be understood in terms of linguistic choices that were made in view of the overall meanings that were expressed, and related to the purpose to which the language of the text was put. That is, using such a framework, variation in language use may be described and understood. This orientation reflects the sociolinguistic approach to language, and it is this that guided the analysis of various text types, both spoken and written, in this research.

The literature has suggested that specific language impairment may be a completely separate condition that often co-occurs with ADHD. This research attempted to investigate language use independently from language impairment, and so any children whose formal test outcomes suggested SLI were excluded from the study.

Under these conditions, this research explored whether there were differences in the language use of children with ADHD compared to the language use of children
without ADHD. In particular, the textual resources used by the two groups of children were compared, since these have been identified by previous research as areas of difficulty. The organisation of discourse, text length, complexity, discourse semantics, and behaviour were investigated. The application of SFL meant that these previous observations were to be investigated in terms of cohesion, theme, clause structure, lexico-grammar, and mood.
CHAPTER 3
METHODS

3.1. Introduction

For this thesis, the research question asked whether important differences could be detected when the patterns of language use of children with a diagnosis of ADHD and their non-ADHD peers were compared. In Chapter 2 it was argued that a sociolinguistic orientation presented an appropriate option for exploring the language use of children diagnosed with ADHD. This is because a sociolinguistic approach recognised the importance of context as a factor that is critical in dealing with language use, particularly in children affected by ADHD, and incorporated it in its methods. This study adopted this particular approach, and used discourse analysis together with analyses that were inspired by SFL to examine children’s elicited texts.

The hypotheses of this study were that differences in language use could be detected and described between the two groups of children and that the differences could be predicted and accounted for by the mode of expression and the text type. Therefore, the analyses also took into account the mode of expression and the text type when other aspects of context, namely the experience being communicated and the relationship between the speaker/writer and the listener/reader, were held as constant as
could be expected. In addition, attempts were made to eliminate language difficulties as well as other potentially confounding conditions from the cohort of children.
Community based recruitment and specific exclusion criteria were used. This chapter describes the procedures and methods that were chosen to examine the research questions.

3.2. Ethics

The study that was conducted for this research was approved by the Human Research Ethics Committee of the University of Newcastle, and complied with all its stipulations regarding research using human subjects (HREC Approval No. H 760 1099). Each of the children, including those who were eventually excluded, provided written consent to participate in the study, as did their parents or guardians.

3.3. Subjects

Study participants were recruited from the community rather than through clinic populations. Many of those who volunteered to participate were ineligible to do so because of the selection criteria established for the study. The final sample size was twenty-two children, with eleven children with ADHD, and eleven control children. Nine males and two females made up each group. This sample size, although small, minimally satisfied the requirements of the statistical procedures that were later to be undertaken in the study.
3.3.1. Recruitment

Three separate recruitment methods were employed. In the first instance, parents were invited to have their child participate by way of invitations issued through the network of ADHD support groups in the Newcastle and Hunter area. Secondly, media exposure concerning the project also attempted to attract participants. The third recruitment method involved an approach to the principals of a small number of independent schools in the lower Hunter region for permission to inform their parent organisations about the study, and to invite participation through school newsletters. Control children were recruited exclusively using this latter method, since the support groups and the media exposure attracted only potential participants with ADHD. The recruitment through the independent schools network was made largely out of expediency, since an approach to government schools involved a separate ethics approval process and considerable additional time. In the final sample, only two pairs of children could not be matched for type of schooling (see Table 3.1). Attempts were made to closely match the children for other socioeconomic indicators, and it was anticipated that these would help offset the potential discrepancy suggested by the differences in schools. The demographics of the sample will be presented in the following section.
Table 3.1  Background information for paired children with ADHD and control children

<table>
<thead>
<tr>
<th>ADHD</th>
<th>CONTROL</th>
<th>ADHD</th>
<th>CONTROL</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>SEX</td>
<td>AGE</td>
<td>CELF</td>
</tr>
<tr>
<td>S09</td>
<td>F</td>
<td>10.3</td>
<td>101</td>
</tr>
<tr>
<td>S29</td>
<td>F</td>
<td>12.1</td>
<td>116</td>
</tr>
<tr>
<td>S23</td>
<td>M</td>
<td>12.6</td>
<td>109</td>
</tr>
<tr>
<td>S03</td>
<td>M</td>
<td>10.5</td>
<td>128</td>
</tr>
<tr>
<td>S15</td>
<td>M</td>
<td>9.6</td>
<td>112</td>
</tr>
<tr>
<td>S31</td>
<td>M</td>
<td>9.2</td>
<td>93</td>
</tr>
<tr>
<td>S13</td>
<td>M</td>
<td>11.9</td>
<td>102</td>
</tr>
<tr>
<td>S04</td>
<td>M</td>
<td>10.2</td>
<td>106</td>
</tr>
<tr>
<td>S33</td>
<td>M</td>
<td>12.5</td>
<td>88</td>
</tr>
<tr>
<td>S34</td>
<td>M</td>
<td>12.3</td>
<td>96</td>
</tr>
<tr>
<td>S11</td>
<td>M</td>
<td>11.0</td>
<td>114</td>
</tr>
</tbody>
</table>

Note:
Age = years (one decimal place)
CELF & TOPL reported as standard scores
Ed 1 = Education factor 1, refers to type of school (ng = non-government; g = government)
Ed 2 = Education factor 2, refers to general school progress and level of schooling
(+, above average; =, average; -, below average; year 3 to year 7).

3.3.2.  Selection criteria

Attempts were made to control for several factors in the study, including age, gender, language ability, academic ability, level of schooling, and socio-economic status. These demographic and developmental factors are widely considered to have some influence on children’s language. In this study, it was considered important to establish some degree of equivalence among the participating children for these factors. The selection criteria were established in order to attempt this. The parents of all potential
participants, children with ADHD as well as controls, completed a written questionnaire that was designed to ascertain demographic details, and obtain information about each child’s developmental status and history. The parents of children with ADHD were also asked to complete an additional set of questions about their child’s diagnosis and treatment. The questionnaire and the extra set of questions are presented in Appendix A. In addition, the questionnaire asked about the behaviour and academic progress of each student, in particular their literacy skills and written expression, and their communication skills. For students recruited through the schools, informal contact was made with the children’s teachers to discuss their academic progress. It was felt that there were no serious discrepancies between the parent and the teacher comments. The method of parent reporting was used in an effort to be consistent with the functional approach to the detection of the children’s difficulties; if the parents and the teachers had not identified any serious academic, language, or behavioural difficulty (other than ADHD) then, in functional terms, no difficulty existed. In addition, there were very limited additional project resources available to enable, for example, a thorough evaluation of the intellectual and cognitive abilities of the children. Although the selected method lacked the scientific rigor found in many other research projects, it was decided to proceed with it in the interests of expediency. Normal language ability, as assessed by standardised test instruments, was the exception because of the importance of this to the outcomes of this study.

**General criteria**

The only general criteria stipulated were age and normal language ability. The age range was between eight and twelve years of age. This corresponds to the primary years of schooling, which in New South Wales are termed year three through to year six.
inclusively. One child with ADHD was in year seven at school, but was aged twelve years six months and so met the criterion. All were required to have English as their first language.

**Exclusion criteria**

Exclusion criteria included English as a second language, sensory impairment (for example hearing or vision problems), motor problems, or significant behaviour problems other than ADHD. Children were expected not to be actively involved in speech or language treatment programs or to be receiving any additional educational support. This information was obtained from the parent questionnaire. All potential participants were assessed using two standardised language tests, the Clinical Evaluation of Language Fundamentals version 3 (Semel, Wiig, & Secord, 1995) and the Test of Pragmatic Language (Phelps-Terasaki & Phelps-Gunn, 1992). They were excluded if the result on either test was more than one standard deviation below the mean. The remaining sample therefore attempted to only include children with normally developing language. Children with ADHD were excluded if a pre-existing diagnosis of ADHD had not been made by an independent medical specialist (Paediatrician or Psychiatrist), or, for those taking methylphenidate, if they were unable to comply with the washout requirement, which is detailed below.

There was a high rate of exclusion following initial recruitment efforts, mostly because of the inability of the children with ADHD to attain at least average scores on the standardised language tests. Eight out of an initial group of twenty five children with ADHD, (approximately 32%), were unable to continue to participate in the study for this reason. This reflected a level of diagnosed SLI in the children with ADHD that fell well within the range that has been cited in the previous literature (Love & Thompson,
Some children were also excluded for other reasons. Details of the attrition process are listed in Appendix B. A considerable amount of time was invested in the recruitment of children, and for the early stages of the study (which included formal language testing). For this reason, the decision was made to cease the recruitment process once the lowest acceptable number of participants was reached that would minimally satisfy the statistical methods.

**Children with ADHD**

The parents of children with ADHD were asked in the questionnaire to provide background information about their child’s condition. This included the age of diagnosis by an independent medical specialist (Paediatrician or Psychiatrist), the type of ADHD, if known, and suggested and current treatments, if any. In Australia, the diagnostic tool of preference is commonly the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 1994). Therefore, it was decided that the stipulated criterion for a prior diagnosis by a medical specialist would suffice. Many parents were unaware of any particular subtype made at their child’s diagnosis, and so for the purposes of this research, the term ADHD was used in the general sense to include all three subtypes of the disorder, namely inattentive, hyperactive/impulsive, and combined.

Those children who were receiving drug treatment using methylphenidate were asked to cease taking it for a washout period of at least fifteen hours prior to data collection sessions. This was because previous studies involving that particular drug have suggested that it affects language performance (Francis, Fine, & Tannock, 2001; Tannock, Fine, Heintz, & Schachar, 1995; Thomas, 1999; Whalen, Henker, Collins,
McAuliffe, & Vaux, 1979). All the children with ADHD who participated in the study complied with this request.

### 3.3.3. Sample

Two groups of eleven children eventually comprised the sample that participated in the study. Attempts were made to pair each child with ADHD with a control child for age, gender, language ability, type and stage of schooling, and socioeconomic background. The matching process attempted to make the groups as homogeneous as possible, apart from the diagnosis of ADHD. Table 3.1 (above) presents characteristics of the resulting sample group that participated in the study. There were nine boys and two girls in each group. This proportion of boys to girls resembled the often reported gender imbalance among children who have a diagnosis of ADHD.

**Age**

The pair matching was somewhat approximate because of the small sample size, and some criteria were more closely paired than others. Pairing the children for age was the major consideration after gender and took precedence over the remaining criteria. Age pairing followed the age ranges used for determining the standard scores in the Clinical Evaluation of Language Fundamentals test (i.e. to within plus or minus 12 months of chronological age). The children with ADHD ranged in age from 9.17 years to 12.58 years. Children without ADHD (hereafter termed the controls) ranged in age from 8.83 years to 12.42 years. The median ages for these groups were 11.00 years for the children with ADHD, and 11.33 years for the control children. Statistical analysis of the difference between the median ages using the non-parametric Mann Whitney test for two independent samples revealed no significant difference between the groups for age,
with p > 0.05 for a 2-tailed t-test. Appendix C details the comparisons between the two groups for age.

**Formal test scores**

Clinical Evaluation of Language Fundamentals version 3 (Semel et al., 1995) and the Test of Pragmatic Language (Phelps-Terasaki & Phelps-Gunn, 1992) were selected because they targeted language ability from two differing perspectives; the CELF from a traditionally psycholinguistic viewpoint, and the TOPL from a pragmatic or functional perspective. They were also appropriate to the ages of the children involved and at the time of the study, were in widespread use in Speech Pathology practice in Australia for assessing language function. An outcome greater than one standard deviation below the mean for either of the tests was taken as suggesting language impairment (LI), and these children were excluded from the sample. This procedure provided the basis for the description of remaining children in the sample group as “language normal”.

The standard scores obtained by the children with ADHD for the CELF ranged from 88 to 128. Scores for the control children ranged from 98 to 131. The median scores for these groups were 106 for the children with ADHD and 119 for the control children. For the TOPL, scores obtained by the children with ADHD ranged from 85 to 120. Scores for the control children ranged from 94 to 113. The median scores for these groups were 105 for the children with ADHD and 106 for the control children. Statistical analysis of the difference between the median scores using the non-parametric Mann Whitney test for two independent samples revealed no significant difference between the groups for either test, with p > 0.05 for a 2-tailed test. Appendix C details the comparisons between the two groups for formal test outcomes.
Socioeconomic status
Attempts were made to control for socioeconomic status. All the children were resident in and attended school in the Hunter region of New South Wales, Australia. This region is considered to be relatively socioeconomically homogeneous. The area was rated as ‘average’ according to two indices of socioeconomic status. These were the index of relative social disadvantage, and the index of education and occupation (NSW Department of Health, 2002). These are detailed in Appendix D.

3.4. Experimental procedure

3.4.1. Setting
Each child who volunteered was seen individually by the researcher at either the child’s family home, the child’s school, or at the Speech Pathology Clinic at the University of Newcastle. The venue was nominated by the parents and at each venue a quiet, separate room was used. The formal language testing took place first, followed by the text elicitation procedures. Questionnaire forms concerning the required background information were either handed to or mailed to the child’s parents for completion. The data collected from each child was then included in the study, provided that the child’s results on the formal assessment tasks passed the set criteria, and following receipt of written consent and agreement, and the completed questionnaires from the parents.

3.4.2. Data collection
The elicitation procedure was designed to obtain language samples that were typical of school aged children’s everyday language use. In addition, changes to aspects of context were incorporated into the experimental design. This was done by introducing three
different language sampling tasks, and for each of these, two different types of responses, namely spoken and written, were required. The three different types of texts were a story retell text, a recount, and a procedural text. Story narratives have been used in previous research as a means of investigating children’s discourse (Francis et al., 2001; Hayes, Norris, & Flatyz, 1998; Liles, 1985a; Tannock, Purvis, & Schachar, 1993). In this study, additional tasks were added that required sequencing of factual information (recount), and a specific organisational structure (procedure). As noted in Chapter 2, these two competencies have been identified as particularly problematic for children with ADHD.

Recasting the procedures in SFL

In SFL terms, variations in mode of expression and text type mean that the context of language was changed in terms of its textual aspects. The effect of context on language was investigated in this study because context has been shown to be of importance in the understanding of ADHD. It is also a crucial feature of the SFL conceptualisation of language.

In SFL, aspects of context are realised by the field, the tenor, and the mode of communication. Field is what the communication is about, tenor is the social circumstance in which the communication occurs, and mode is the role that the communication itself takes in the creation of meaning. These aspects of context are in turn realised by the metafunctions of language, that is, the experiential, the interpersonal, and the textual metafunctions. In this study, attempts were made to maintain some control over the field and the tenor. Field was concerned with the computer game, and the elicitation tasks. Tenor remained constant and was between the researcher and the child as communication partners. However, the mode of communication was
manipulated throughout the elicitation phase. The mode of communication is realised by the options for the channels of communication and the text types used. These describe the textual metafunction of the language. In this study, both spoken and written channels of communication, as well as three different text types were used (story retelling, recount, and procedure). Therefore, this study attempted to describe the linguistic resources used by the children to encode the textual metafunction in response to the elicitation tasks that were used.

**Motivation**

Children with ADHD are typically difficult to engage. They often demonstrate poor compliance and application to tasks, particularly those tasks that are academically oriented or challenging, or require sustained attention, or are not intrinsically of interest to the child. It is common practice to examine language in settings that are highly artificial and possibly lacking a sense of everyday functional meaningfulness for the children concerned. Consequently, with children who have ADHD, the research method itself may well present particular obstacles to validity. The research that is described for this thesis attempted to be mindful of these issues, and efforts were made when designing the elicitation tasks to strongly appeal to the interests of the children and to maximise their enjoyment and positive engagement. In addition, it was necessary to design elicitation tasks that imitated a meaningful context that was relevant and could naturally occur in the everyday life of a primary school-aged child. Popular cartoons are a large part of the social culture of children’s lives, and opportunities to play computer games are usually highly attractive to this particular age group. Story narrations and situational recounts, both oral and written, have been used in previous studies to investigate language in children with ADHD, language impaired children, and typically
developing children (Bliss, McCabe, & Miranda, 1998; Francis et al., 2001; Hadley, 1998; Liles, 1985b; Renz et al., 2003; Tannock et al., 1993; Ulatowska, Macaluso-Haynes, & North, 1980). Narrative and recounts, along with procedural texts, would be familiar to primary school aged children in this sample since they are taught as part of the school curriculum for this stage of education (Board of Studies, 2006).

Elicitation
Following the formal language testing, the children proceeded to the next stage of the study. The same elicitation procedure was used for all the children and involved three distinct steps that were undertaken sequentially within one session. The first part involved role play and creating a cartoon. The activities in this part of the elicitation process created the setting in which the children’s narrative texts were elicited and recorded. The remaining steps of the procedure involved the child recalling details of the session to date (a recount text), while the third part involved giving directions about using the software to an imaginary subsequent child (a procedural text).

Creating a cartoon
Firstly, each child was seated in front of a computer. “The Simpson’s Cartoon Studio” is an interactive software program for creating short animated cartoons based on the popular television series, “The Simpsons” (Fox Interactive, 1996). The programme shows a brief demonstration cartoon (approximately 30 seconds) and then allows for the user to create a cartoon using the software tool. For each child, the same demonstration cartoon was screened and used to show some of the software’s capabilities. Each child was then guided through the software’s on-screen tutorial which taught the necessary steps in cartoon making. The child was allowed unlimited time to gain confidence and
expertise in using the software. All the children took under thirty minutes to master the use of the software.

**Role play**

At this stage, role play was introduced. The researcher took on the identity of a television network executive. The child’s role was as animator/scriptwriter for the cartoon production studio. It was suggested to the child that the network was in desperate need of a cartoon to be screened that evening. The child’s task was to create that episode on the computer and to notify the ‘executive’ when it was completed. No time limit was externally imposed but was implied by the description of the executive’s request as urgent. Without exception, each child, both the children with ADHD and the control children, appeared to enjoy this stage of the procedure. All were co-operative and produced a completed cartoon within a reasonable time frame (about thirty minutes).

**Story retelling task**

When ready, the child, in role, presented his or her cartoon to the researcher, who was role playing the TV executive. In role, the researcher asked, “Tell me all about your cartoon. Give me all the details. I want to hear about everything you’ve got. Tell me the story of the cartoon; tell me all about it.” This was an attempt at standardising the task instructions which were repeated in the same way to each participating child. If the child did not respond or requested clarification, then these same lines were repeated either in part or in full. The researcher sat out of the child’s sight for this role play so that the child would be encouraged in the role to communicate in a way that resembled a telephone conversation as closely as possible. In addition, this negated the effect of a common tendency among some of the children to point to the computer screen while
narrating their stories as a visual aid for their communication. Continuing in role play, the researcher then asked, “Fax the script of your cartoon to the studio”. The researcher explained to the child that this meant writing down what they had narrated earlier about the cartoon. This became the script of the cartoon, and provided the content of the imaginary fax.

**Recount task**

The second step in the elicitation procedure involved the establishment of a hypothetical scenario that was conveyed as real to the child. Each child was asked by the researcher to orally recount all the events that he or she had experienced as part of his or her involvement in the study so far. This was promoted as being of special help to subsequent participants. The researcher said, “Children often describe things better to other children than adults do. I’m hoping you can help me find the best way to tell other kids what to expect when they come here. Can you say what happened in this session in your own words in the best way that other kids will understand? What is the best way to tell them all about what happened here, what you did and all that?” The child was asked to provide a written version of this recount so that it could be included in an instruction manual about the research activity for subsequent participants.

**Procedural task**

For the third and final task in the elicitation procedure, each child was asked by the researcher how, in words, they would explain the use of the software to some unseen subsequent participants. The child was also asked to provide a written version of these instructions for inclusion in the manual that had been referred to earlier.
**Time taken**

The sessions with the children were not timed. No child required more than three hours to complete the required tasks. About half of this time was spent conducting the formal assessments. In addition to elicitation tasks, the remainder of the time included food, refreshment, and rest breaks, which were taken as required. All the children remained compliant throughout, although some of the children with ADHD favoured the sessions with the computer, and some needed to be encouraged to undertake the written tasks. There were no length prescriptions for any of the texts, neither were time limits placed on the children during the elicitation tasks. The children were asked to complete each text to their own level of satisfaction. For the written texts this involved each child’s own process of revision and editing so that the final texts were considered by themselves to be their best efforts.

**Recording**

The sessions were all recorded on video as well as on audiotape. The video camera stood on a tripod in the corner of the room while the cassette recorder was positioned near the children on a separate table. The children’s written responses were hand written by them using pen and paper. They were read aloud by the researcher in the presence of the child prior to the end of the child’s session. The child verified the accuracy of the researcher’s comprehension of the text and made clarification where necessary.

**Transcription**

The video recordings of the children’s spoken responses to the elicitation tasks were transcribed manually by the researcher. This was done as closely as practicable to the day of the session with each child. A speech pathology student assisted in the transcription of approximately twenty percent of the data. The transcription was a time
intensive process, and since the study was conducted with no financial allowances, it was impractical to arrange for other individuals to assist with the transcription. Attempts were made to ensure that the transcripts accurately represented the spoken texts, and often repeated listening was required. Each word and phrase was transcribed exactly as it was heard. For example, “yep” was transcribed rather than “yes”, “gunna” was transcribed instead of “going to”, and the like. Parts that were unintelligible were designated on the transcripts as being unintelligible, and not considered for further analysis. Basic intonation patterns were noted (rising, falling, continuing), because a change in intonation often denotes the end of an utterance, and so may assist with the division of utterances in spoken texts. The texts were then typed as ‘Word’ documents. Written texts were also transcribed, and preserved the original spelling and punctuation. Examples from the data of transcripts of spoken and written texts for each of the three text types are presented in Appendix E, together with a depiction of the intonation symbols that were used during the transcription.

3.5. Data

The elicitation process resulted in each child producing six texts, three spoken and three written, with one text for each genre or text type. In this thesis, the term ‘text type’ was used rather than genre, which is often found particularly in educational literature to discuss different functions of texts. The text types used in the thesis were examples of story retelling (narrative), recount, and procedure. Incomplete or unintelligible utterances could not be analysed and so were not included with the data. The transcribed texts were then entered into a software programme, which was the research version of the Systematic Analysis of Language Transcripts Research (SALT RV8; Miller, 2004).
This particular computer software has been specially developed for analysing discourse. “The SALT program provides clinicians and researchers with the means to transcribe language samples into a common format and to compute a series of general analyses of lexical, syntactic, semantic, pragmatic, rate, fluency, and error categories” (Overview in SALT electronic guide; Miller, 2004).

The utterances were divided into individual clauses. This way of dividing the texts reflects Halliday’s notion that the clause expresses the smallest unit of meaning in a text. This compares, but also contrasts with other methods of discourse analysis, for example, the T-unit proposed by Hunt (1965). In this thesis, clause division uses a very different linguistic methodology (SFL) based on the procedure suggested by Martin, Matthiessen, and Painter (1997; see also Butt, Fahey, Feez, Spinks, & Yallop, 2000, p294; Eggins, 1994, p334). The method contrasts with others that have been used in the analysis of children’s discourse, and includes consideration of minor as well as major clauses. Non-finite clauses may be considered as either major or minor depending on the semantic load. In other words, T-unit analysis provides a structural description of the text, whereas SFL analyses provide a semantic description of the grammar.

In this thesis, this method of clause division is applied to spoken as well as written language. The process of clause division organised the data in preparation for analysis. Appendix F presents examples drawn from the data that illustrate clause division.
3.6. Data analysis

Each separate text provided by the children was analysed, which meant that for each child, six different texts were usually elicited. As described in Chapter 2, the choice of variables of interest for describing language use that were investigated in this study was motivated by several sources, which included information from previous studies, the SFL orientation, the linguistic approach underlying the SALT programme, and variables generated through observation. An identifying code was assigned to each variable. A notation for the code was marked onto the text for every time the use of a particular variable was identified. Some codes were attached to words, some to clauses, some to clause complexes or sentences, and some were appended to the whole text. The approach taken to coding followed the functional approach in that codes were assigned in relation to the function and the meaning that was being expressed. This meant that some words and utterances may have had several codes attached, indicating the particular language functions that were being served. In SFL, language function may be variably achieved through the use of different grammatical forms. This type of overlap of language functions should be borne in mind when considering the categories of variables shown in Table 3.2.

The SALT software program that was used during the study was specially designed to help with this type of discourse analysis. It was used to tally the counts for each code and to organise the data. The tallies ultimately became the bases for later comparisons between the two groups of children, between spoken and written texts, and between the three different types of texts. The outcomes of these comparisons in turn became the bases for the statistical analysis as well as the descriptive analyses.
Each of the six texts that were created by each child was examined for the occurrence of a total of thirty dependent variables. These outcomes, in addition to those from the two formal language tests, were compared. For easier management and clarity of presentation, the variables were grouped into eight overarching categories. The categories were called ‘Clause structure’, ‘Thematic structure’, ‘Lexico-grammar’, ‘Conventions of written language’, ‘Behaviours of spoken language’, ‘Length of texts’, ‘Associated behaviours’, and ‘Macro textual organisation’. The variables were organised in this way in an effort to depict them as relevant to language in use, rather than as separate and isolated entities. Table 3.2 lists the categories along with the variables in each.
Table 3.2  Variables within overarching categories

<table>
<thead>
<tr>
<th>CLAUSE STRUCTURE</th>
<th>SPOKEN BEHAVIOURS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Embedded clauses</td>
<td>Abandoned utterances</td>
</tr>
<tr>
<td>Dependent clauses</td>
<td>Utterances with a maze</td>
</tr>
<tr>
<td>Independent clauses</td>
<td>% maze words</td>
</tr>
<tr>
<td>Major clauses</td>
<td>Number of mazes</td>
</tr>
<tr>
<td>Minor clauses</td>
<td>Utterances with a pause</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>THEMATIC STRUCTURE</th>
<th>WRITTEN CONVENTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ellipted subject</td>
<td>Spelling errors</td>
</tr>
<tr>
<td>Multiple theme</td>
<td>Punctuation errors*</td>
</tr>
<tr>
<td>Marked theme</td>
<td></td>
</tr>
<tr>
<td>Simple theme</td>
<td></td>
</tr>
</tbody>
</table>

| IMPERATIVE MOOD                      |                                    |
|--------------------------------------|                                    |

| QUANTITY & LEXICO GRAMMAR            |                                    |
|--------------------------------------|                                    |
| Total number of utterances           |                                    |
| Number of utterances in analysis set |                                    |
| Number of words                      |                                    |
| Type/token ratio                     |                                    |
| Grammatical intricacy                |                                    |
|                                    |                                    |

3.6.1.  Clause structure

Clauses and clause complexes

Each text was recast into a succession of single clauses. Clauses were identified by the presence of a process, or in SFL terminology, a verbal group. As suggested by Martin, Matthiessen, and Painter (1997, p28), “These are the elements expressing processes of doing, saying, perceiving, thinking, feeling, being, or having.” Codes were attached to
the types of clauses that were identified. Clauses were coded for one type only. Clause
types included major (sometimes also termed “independent stand alone”), independent,
dependent, minor, and embedded clauses. Codes were also attached to clause complexes
and to their component clauses in order to tally the number of clause complexes as well
as the number of separate clauses within each clause complex. An example, drawn from
the data, of clauses and clause combining to form a clause complex is given in Figure
3.1.

<table>
<thead>
<tr>
<th>Clause complex 1:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clause 1</td>
</tr>
<tr>
<td>Clause 2</td>
</tr>
<tr>
<td>Clause 3</td>
</tr>
<tr>
<td>Clause 4</td>
</tr>
<tr>
<td>Clause 5</td>
</tr>
</tbody>
</table>

Figure 3.1   Control child’s (C17) use of clauses and a clause complex (shown bracketed) for spoken story retell

3.6.2.   Thematic structure

Theme was identified in the texts and coded for the type of theme (simple topical, or
multiple) and the markedness (marked, unmarked). The component parts of multiple
theme were not specified (interpersonal and/or textual, plus topical), as it was felt that
the counts for the difference combinations of multiple theme would be low. Theme
relates to the textual function of language (Halliday and Hasan, 1985, p23), and has
been discussed in Chapter 2. In this thesis, other devices used that related to the textual function were also included as variables in this category. These were ellipsis of the subject, which contributes to textual cohesion, and macro textual organisation (opening and concluding strategies).

Tables 3.3 to 3.8 present some examples drawn from this study of theme in both spoken and written texts. Written texts have been reproduced with their original spelling, grammar and punctuation. Words in parentheses alongside misspelt words stand for the child’s target word. In Table 3.3 the simple topical theme tells what the clauses are about, namely “it”, “we”, “you’, “Maggie”, and “A loud red flashing sigren”.

Table 3.3 Examples of simple topical theme in spoken and written texts of controls

<table>
<thead>
<tr>
<th>SIMPLE TOPICAL THEME</th>
<th>RHEME</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SPOKEN</strong></td>
<td></td>
</tr>
<tr>
<td>(C03: 1)</td>
<td>it</td>
</tr>
<tr>
<td>(C16: 2)</td>
<td>we</td>
</tr>
<tr>
<td>(C24: 3)</td>
<td>you</td>
</tr>
<tr>
<td><strong>WRITTEN</strong></td>
<td></td>
</tr>
<tr>
<td>(C03: 1)</td>
<td>Maggie</td>
</tr>
<tr>
<td>(C04: 1)</td>
<td>A loud red flashing sigren(siren)</td>
</tr>
</tbody>
</table>

Note:
C = control, followed by 2 digit identification number
1 = story retell
2 = recount
3 = procedure
In Table 3.4 the textual element, “and”, links the clause to the one preceding it. The topical theme then follows immediately.

Table 3.4 Examples of multiple theme (textual and topical) in spoken and written texts of controls

<table>
<thead>
<tr>
<th>TEXTUAL THEME</th>
<th>TOPICAL THEME</th>
<th>RHEME</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPOKEN</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(C03: 1) and</td>
<td>Bart</td>
<td>'s trying to show off</td>
</tr>
<tr>
<td>(C09: 2) and</td>
<td>it</td>
<td>was the first one I ever did</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WRITTEN</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(C13: 1) but</td>
<td>homer</td>
<td>gets them</td>
</tr>
<tr>
<td>(C18: 1) and</td>
<td>his assistant Lisa</td>
<td>gets scared</td>
</tr>
</tbody>
</table>

Note:
C = control, followed by 2 digit identification number
1 = story retell
2 = recount

In Table 3.5 the interpersonal elements, “well”, and “OK” begin the clause by introducing some slight deference. “For sure”, on the other hand, could be being used in the sense of expressing attitude. The topical element then follows. Table 3.6 illustrates the three strands of the multiple theme, namely textual, interpersonal, and topical. In this example, the textual elements "and" and "but" link the clauses to the ones that preceded it. The use of "and" signifies the addition of information, while "but" suggests some condition or circumstance that modifies what has come before. The interpersonal element, "well", tempers the assertiveness of the statement somewhat, while "best of all" gives the speaker's personal opinion. The topical theme in both examples clearly denotes what the messages are about. In the first instance this is "sometimes", meaning
from time to time during the task. In the second example, the topical theme is the character, "Skinner".

Table 3.5  Examples of multiple theme (interpersonal and topical) in spoken and written texts

<table>
<thead>
<tr>
<th>INTERPERSONAL THEME</th>
<th>TOPICAL THEME</th>
<th>RHEME</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPOKEN</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(C05: 1) well</td>
<td>the alien</td>
<td>has come to take over the planet Springfield</td>
</tr>
<tr>
<td>(S13: 3) okay</td>
<td>you</td>
<td>click on the different buttons for the different things</td>
</tr>
</tbody>
</table>

| WRITTEN              |               |       |
| (S13: 2) For sure    | it            | 's not boring |

Note:
S = ADHD, followed by 2 digit identification number
C = control, followed by 2 digit identification number
1 = story retell
2 = recount
3 = procedure

Table 3.6  An example of multiple theme (textual, interpersonal, and topical) in spoken and written texts of children with ADHD

<table>
<thead>
<tr>
<th>TEXTUAL</th>
<th>INTERPERSONAL</th>
<th>TOPICAL</th>
<th>RHEME</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPOKEN</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(S31: 2) and</td>
<td>well</td>
<td>sometimes</td>
<td>you can do two or three sessions</td>
</tr>
</tbody>
</table>

| WRITTEN              |         |         |
| (S29: 1) But        | best of all | skinner | was there making a fool of himself |

Note:
S = ADHD, followed by 2 digit identification number
1 = story retell
2 = recount
In Table 3.7, the marked themes illustrates that it was not the grammatical subject that held the position of theme. This is one of the functions of theme markedness, namely to draw attention to the theme of the utterance for some particular reason.

**Table 3.7** Examples of marked theme in spoken and written texts

<table>
<thead>
<tr>
<th>MARKED THEME</th>
<th>RHEME</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SPOKEN</strong></td>
<td></td>
</tr>
<tr>
<td>(C18: 1) so then</td>
<td>Bart was going to run off</td>
</tr>
<tr>
<td>(S33: 2) and now</td>
<td>we get to be filmed by a video camera</td>
</tr>
<tr>
<td>(C05: 1) and Bart</td>
<td>he saves them from the alien with this ray gun</td>
</tr>
<tr>
<td>(C24: 1) in the end</td>
<td>Bart gets bored of it</td>
</tr>
<tr>
<td>(S34: 3) but the other ones</td>
<td>you shouldn’t really worry about</td>
</tr>
<tr>
<td><strong>WRITTEN</strong></td>
<td></td>
</tr>
<tr>
<td>(S11: 1) The 1st day</td>
<td>we did boring stuff</td>
</tr>
<tr>
<td>(C16: 1) Just at that moment</td>
<td>Marge walked in</td>
</tr>
<tr>
<td>(C18: 1) Before their eyes</td>
<td>a great big blob of green goo leaks out of the blender</td>
</tr>
<tr>
<td>(C13: 1) Then at the end</td>
<td>Bart says cool</td>
</tr>
</tbody>
</table>

Note:  
S = ADHD, followed by 2 digit identification number  
C = control, followed by 2 digit identification number  
1 = story retell  
2 = recount  
3 = procedure

In Table 3.8, the example illustrate that the whole first clause functions as the theme of the clause complex. In other words, “what happens in cartoons” functions as the point of departure for the meaning of the clause complex, or, in this case because it is written text, the sentence. It orients the reader to the information that follows, “isn’t real”.
Table 3.8 An example of predicated theme in a written text

<table>
<thead>
<tr>
<th>PREDICATED THEME</th>
<th>RHEME</th>
</tr>
</thead>
<tbody>
<tr>
<td>(C26: 1) what happens</td>
<td>isnt real</td>
</tr>
<tr>
<td>in cartoons</td>
<td></td>
</tr>
</tbody>
</table>

Note:
C = control, followed by 2 digit identification number
1 = story retell

3.6.3. Imperative mood

Codes were attached to instances of the imperative mood. As explained in Chapter 2, the imperative mood was the only element of the mood structure that was examined in this study. This was because it was expected that the declarative would be the predominant mood choice for all but the procedural texts. The main function of procedural texts is to give instructions or commands, whereas the main function of narrative and recount texts is to give information. Both spoken and written procedural texts were therefore investigated for the use of the imperative mood, since it was considered a reasonable expectation that the procedural texts might yield instances of the use of imperative mood. This was because for these tasks the children were asked to provide instructions about the operation of the computer and the software for an identified, hypothetical subsequent participant.

There were occasions in the texts when the declarative was used to express the instructions required for the procedure. The decision was made not to code these as imperative, recognising that some issues related to the interpersonal metafunction might be involved in these examples (e.g. differing expressions of politeness).
Tables 3.9 and 3.10 list some examples of the use of the imperative mood drawn from the texts that were examined in this study. The spelling, punctuation, and grammar in the written examples are reproduced exactly as they appeared.

**Table 3.9**  Examples of imperative mood in spoken procedural texts

<table>
<thead>
<tr>
<th>Reference</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>(S04)</td>
<td>rewind it</td>
</tr>
<tr>
<td>(S23)</td>
<td>push the little one at the top in the yellow</td>
</tr>
<tr>
<td>(C06)</td>
<td>and click it on the same thing as close as you can</td>
</tr>
<tr>
<td>(C06)</td>
<td>and put your sound in</td>
</tr>
</tbody>
</table>

Note:
S = ADHD, followed by 2 digit identification number
C = control, followed by 2 digit identification number

**Table 3.10**  Examples of imperative mood in written procedural texts

<table>
<thead>
<tr>
<th>Reference</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>(C18)</td>
<td>1. use the mouse</td>
</tr>
<tr>
<td>(C18)</td>
<td>click OK</td>
</tr>
<tr>
<td>(C24)</td>
<td>Step2 enter newfile</td>
</tr>
<tr>
<td>(S23)</td>
<td>Rewind</td>
</tr>
<tr>
<td>(S09)</td>
<td>do not press on save</td>
</tr>
</tbody>
</table>

Note:
S = ADHD, followed by 2 digit identification number
C = control, followed by 2 digit identification number
3.6.4. **Quantity and lexico-grammar**

Quantity and lexico-grammar were measured by the three different variables for length (two for the number of utterances, and one for the number of words), the type/token ratio, and grammatical intricacy.

**Text length**

Discourse may be described in terms of its length as well as its lexico-grammar. In this study, text length was determined by the number of utterances as well as the number of words. The SALT software tallied these for each transcript for both the total transcript as well as the analysis set. In this study, utterances were individual clauses. The total transcript contained all utterances, while a subset of the total transcript that included only complete and intelligible utterances became the analysis set. In this study, the total transcript and the analysis set contained very similar numbers of utterances. With respect to words, the software was preset to identify only complete and intelligible words. The SALT software tallied the number of words and the number of utterances for both the total transcripts as well as the analysis set because different features of language use were computed using these different base counts. For example, the number of words in the total transcript count was used to calculate the percentage of words that were in mazes, whereas the number of words in the analysis set was used to calculate the type/token ratio.

**Type/token ratio (TTR)**

Type/token ratio (TTR) is a measure of lexical diversity. It differs from the number of different words (NDW) in that NDW necessitates samples of equal size in order for comparisons to be made between groups. In this study, the samples were not controlled for length, and so the TTR was a more appropriate choice.
Tokens may be thought of as content carrying words and differ from those words that carry grammatical meaning, such as “the”, “a”, and ‘wh’ words (Eggins, 1994, p60). Content carrying words are often repeated in texts, and this constitutes a repetition of the same type of token. The term “type” in type/token ratio refers to the different types of tokens in a text. The TTR, therefore, is the proportion of different content carrying words with respect to total number of content carrying words, or tokens, that were counted. In this study, the TTR was calculated for each text by the SALT programme. SALT calculated the TTR for each text as the ratio of different words to the total number of words. This method enabled the comparison across samples regardless of the number of utterances, which varied from text to text (SALT electronic guide, Miller 2004). However, the sampling was controlled for aspects of context, namely the elicitation conditions and the desired text types, and so the variation between the children for the length of the texts was not thought to be problematic. Furthermore, the length of the texts was to become one of the dependent variables that were examined and compared between the groups.

In the following examples, which are drawn from the data, the calculations for the TTR are shown. The particular examples chosen are from the same child using the same mode of expression, but differ in text type.

<table>
<thead>
<tr>
<th>Clause 1</th>
<th>on the planet Namek 2 aliens appear from nowhere</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clause 2</td>
<td>and then Bart zaps them into another dimension</td>
</tr>
</tbody>
</table>

No. Different Word Roots = 17  
Total Main Body Words = 17  
TTR = 1.00

**Figure 3.2** Example of TTR as calculated by SALT RV8 from written story retell text of child with ADHD (S11).
Clause 1 up the top of The screen click on NEW
Clause 2 Then click on the sun set photo for a background
Clause 3 After you choose your back ground
Clause 4 you click on the couch for The props .
Clause 5 Then you click on the ear for the sound.
Clause 6 Then you click on a charachter.
Clause 7 Then you click on the mushroom bomb photo for FX and The Words that say THE END.

No. Different Word Roots = 34         0
# Total Main Body Words = 65
TTR = 0.52

Figure 3.3 Example of TTR as calculated by SALT RV8 from written procedural text of child with ADHD (S11).

**Grammatical intricacy**

Grammatical Intricacy (GI) indicates the proportion of total clauses of a text that are in clause complexes. Halliday has described grammatical intricacy as one of the “ways of constructing complex meanings” (Halliday, 1994, p349). Combinations of clauses into clause complexes enable the meaning expressed in each main clause to be expanded or elaborated by the information that is expressed in each of the associated clauses. For each text, the number of clauses was tallied, and the number of clauses that were in clause complexes was also tallied. GI was then calculated manually. This is illustrated in Figures 3.4 and 3.5, which show examples of different values for grammatical intricacy that were drawn from the texts created by a child with ADHD and a control child. The examples also show different modes of expression and different text types.
Figure 3.4  Example of the calculation of grammatical intricacy in the spoken story retell text of control child (C09).

Figure 3.5  Example of the calculation of grammatical intricacy in the written procedural text of child with ADHD (S03).
3.6.5. Spoken language

Mazes

In this study, attempts were made to richly describe behaviours that were associated with language use, and this included observations of other features of the discourse in addition to those traditionally investigated, such as semantics and syntax. Among these features were several observations about mazes. Mazes are one way of quantifying the degree of verbal fluency of spoken language. The term has been attributed to Loban (1976), and collectively refers to those verbal behaviours that disrupt the fluency of spoken texts. Examples include repetitions, revisions, restarts, and filled pauses. The SALT programme includes mazes in its standard analyses, and texts may be coded for the number of mazes they contain. SALT may also calculate the number of words that constitute a maze, and the percentage of overall words that were in mazes.

In this study, the focus was on mazes as they occurred in utterances. The dependent variables related to mazes were the likelihood of mazing occurring within any utterance, and the overall number of mazes within texts. In addition, the percentage of overall words that were in mazes was measured, since this measure was previously shown to differentiate between children with ADHD, typically developing children and children with Specific Language Impairment (SLI; Redmond, 2004). In Redmond’s study, children with ADHD showed a higher percentage of words mazed and a greater average number of words per maze than both of the other groups of children.

Appendix G provides examples drawn from the data that illustrate the children’s use of mazing.
Other observations

In addition to mazes, codes were attached to spoken utterances that were abandoned, contained interrupting and overlapping speech, provided evidence of task avoidance, contained unrelated information, requests for clarification, or pauses. SALT was used to tally all the utterances codes within the texts.

3.6.6. Conventions of written language

Codes were attached to words that showed errors in spelling or punctuation, and SALT was used to tally the word codes. Examples of spelling and punctuation errors are listed in Appendix H.

3.6.7. Description

In Chapter 2 (part 2.3.4, “Description of the Texts”), it was explained that some variables were included in the analyses because they showed potential as features of interest. Codes were attached to evidence of avoidance behaviour, unrelated information, requests for clarification, interrupting and overlapping utterances, opening and concluding remarks, and the use of written numbering or point form. SALT was used to tally these utterance codes.

3.7. Statistical methods

A range of statistical procedures was required because of the variety of the types of variables that were examined in the data. For example, some of the variables were numerical in nature (that is, responses were counted); while others were categorical (that is, responses may or may not have fallen into a particular category). Furthermore, the study attempted to investigate the effect of the mode of expression and the text type
on language. Outcomes were examined for interactions between the children’s diagnostic status, (ADHD or control), the mode of expression, (spoken and written), and the three text types, (story retell, recount, and procedure). This required the use of specific statistical tools.

3.7.1. Quantitative analyses

Logistic regression techniques were used to examine eighteen out of a total of thirty variables used in this study. This was because these variables were categorical in nature. Four numerical variables were examined using other non-parametric quantitative analyses. A further eight variables were treated descriptively.

Independent logistic regression

Logistic regression was selected as the appropriate statistical method for modelling the likelihood of a relationship between a response, or dependent variable, and one or more explanatory, or independent variables. In other words, it was selected because of its capability for determining significant main effects as well as interactions. Logistic regression uses the principal of parsimony in model building, in that it determines the simplest model that will explain the significant features of the data. It was selected to deal with three characteristics of the data from this study that in varying degrees would have presented problems for other statistical approaches, for example the Analysis of Variance (ANOVA). These characteristics were the varying sample size for each subject leading to varying standard error per subject, failure of the homogeneity of variance assumption, and lack of normality.

A categorical variable is one where the response reflected a judgement that was made about the presence or absence of a particular quality or characteristic (Maxwell &
Sataki, 1997). For example, a ‘minor clause’ was a categorical variable. It was described this way because each clause in each transcript, if it was complete and intelligible, was either a minor clause or some other sort of clause, and clause division was the smallest unit of division of each transcript. Logistic regression is the statistical tool of choice when the response variables are categorical.

Logistic regression uses odds ratios (ORs) to infer, in broad terms, the likelihood of the occurrence of a particular event. ORs relate to a reference group that is assigned a likelihood of 1.00. The OR expresses the likelihood of an event occurring for the non-reference group compared to the likelihood of that event occurring for the reference group (in this study, the control group). An OR of 1.00 indicates that there was no association between the variables. Main effect differences indicate that the simplest model for explaining differences in the data associates only one independent variable with one dependent variable. For example, it may explain that one group of participating children in this study was more likely to use a particular linguistic resource compared to the other.

For interactions, the ORs indicate a different pattern of use of the dependent variable, given the combination of a number of independent variables, in this case two independent variables for two way interactions, or three independent variables for three way interactions. ORs are again interpreted by assigning one of each of the independent variables as the reference group. In this study, the control group, the spoken mode of expression, and the story retell text type were the reference groups, and each of these was assigned a likelihood of 1.00.
**p-values**

Differences between outcomes that were observed in this study were judged to be significant at the 0.05 (5%) level of significance. It was difficult to calculate confidence intervals for interactions, and so in an effort to remain consistent throughout the thesis, they are not used. However, where observed differences in the results of this study reached statistical significance, the exact p-values are cited.

**Poisson regression**

The number of mazes in utterances presented a different circumstance regarding statistical analysis because the variable type was numerical and therefore required the use of a model for counted data. The overall number of mazes was included as a variable in an effort to compare the findings from this study with that of Redmond, who recently found that mazes differentiated children with ADHD from SLI and control children (Redmond, 2004). An independent Poisson regression model was run to determine this comparison, as logistic regression is suitable only for categorical data. The number of mazes was one of three different measures calculated regarding the use of mazes. The remaining measures were the number of utterances containing at least one maze, and the percentage of words that were mazed.

**Potential systematic error**

The within-subject nature of this procedure presented problems with regard to systematic error. Each child had at least three repeated measures for most responses, and many responses had six repeated measures. All the initial logistic regression modelling work did not consider the within-subject aspect of the study design by using independent logistic regression. In the logistic regression framework a matched logistic regression approach or Generalised Linear Mixed Model (GLMM) approach is
appropriate (Agresti, 2002). Cross validation of the outcomes of independent logistic regression was conducted using the GLMM approach, and there were no differences in the p-values obtained (see Appendix I). Because of this, and because of the considerable additional extra time that would have been required to carry out the complex GLMM procedures to obtain odds ratios, the use of the independent logistic regression procedure was let stand.

*t-tests*

The differences between the children with ADHD and the control children for outcomes describing the number of utterances and the number of words in the texts were compared, as were the formal test results. The data in these instances were numerical, and the two groups (ADHD and control children) were independent of each other. Differences between the control and children with ADHD were examined by comparing the median scores for each of the variables in question. Observed differences were then tested for significance using the non-parametric version of the independent t-test, the Mann Whitney test. The non-parametric tools were used because of the small sample size and the unknown nature of the distribution of the variables.

**3.7.2. Descriptive outcomes**

The outcomes for eight variables were managed descriptively. The data were the tallies of observations of the variables. The variables were included because they had been identified as important by previous research, but occurred in this study in numbers too low to enable quantitative analysis. Furthermore, their inclusion was felt to be consistent with the intention of the study to describe in detail the resources of language use employed by the children involved.
In addition, the subtest scores for the CELF-3 were considered of interest, and have been reported descriptively. The small sample size of eleven children in each group of participants was considered too small to enable statistical analysis of comparative scores from these separate subtests.

3.7.3. Reliability

Validity and reliability checks were integrated at various points of the study. As noted in part 3.3.3, attempts were made to reduce potential confounding effects by matching the participating children for age, gender, socioeconomic status, stage of schooling, school progress, and language development history. Therefore, the remaining difference between the children was whether or not they had been diagnosed with ADHD. It could be reasonably assumed then that differences in the outcomes for the variables that had been selected as measures of language use might be associated with ADHD. The measures used to explore language use were thought to be valid because they had been suggested by previous research, and were also consistent with the guiding principles of SFL theory for the analysis of texts.

Potential threats to reliability existed, since the study was the work of a single researcher, was exploratory in nature, and examined a considerable amount of data. The formal test instruments were administered and scored by the researcher. The use of a software programme to score the CELF-3 and manage the results greatly assisted this process (Semel, Wiig, & Secord, 1998). Regarding transcription of the texts, the researcher and a senior speech pathology student at the University of Newcastle transcribed all spoken and written material and conferred to reach agreement. Spoken texts were videotaped which allowed for them to be viewed and reviewed as often as was necessary in order to accurately transcribe the spoken material. When any
A discrepancy in transcription occurred; this reviewing process meant that agreement could eventually be reached in all cases.

In a separate exercise, a portion of the data was examined regarding clause division. Two senior staff members of the discipline of Speech Pathology at the University of Newcastle were recruited and a point-to-point comparison of 10% of the sample texts was undertaken. Texts were randomly selected from both the subject and the control groups reflecting an even representation of the three text types and the two modes of expression that comprised the data set. The judges were asked to divide the texts into separate clauses and also to identify the type of clause. For one judge, point-to-point inter-judge agreement with the researcher was 87% and for the second judge, agreement was 96%.

The coding of specific items within the texts was done by the researcher using guidelines from the publications of Butt et al. (2000), Eggins (1994), Halliday, (1994), and Martin, Matthiessen, and Painter (1997). However, in SFL there are no absolute judgements of correctness for particular items since they are identified by listeners’ perceptions of the functional role taken within the text by the item that is under consideration. More important was that the identification of items remained consistent for the entire set of data. To assist with achieving this, frequent consultation to discuss coding and to reach agreement in decision-making about particular examples occurred between the researcher and three senior staff members of the discipline of Speech Pathology at the University of Newcastle who were familiar with discourse analysis and systemic functional grammar. In addition, the researcher conferred periodically with researchers from other universities within state of New South Wales who were familiar with SFL. Inter-observer reliability coefficients were not calculated for this process.
However, at least one tenth of the texts were discussed in this way and the observers reached agreement in judgements for all texts

3.8. Summary

This study explored potential differences in the language use of children with a diagnosis of ADHD when compared to their non-ADHD peers. This chapter presented details of the research method that was adopted to explore the main research question and its corollary, which explored the effect of mode of expression and text type on observed differences.

The sample group of children was recruited from the community and was carefully considered so as to exclude children with other co-morbid conditions, especially language impairment, as much as possible. The study used discourse analysis and analyses of the texts that were drawn from SFL, and was guided by the outcomes of previous research. Thirty different variables were examined, and these were grouped under the headings of clause structure, thematic structure, imperative mood, quantity and lexico-grammar, spoken behaviours, written conventions, and text descriptions. Results of two formal language assessment tools, the CELF-3 and the TOPL, which had been used to screen eligible participating children, were also evaluated. Depending on the nature of the data, different methods of analyses of the results, statistical as well as descriptive, were undertaken.
4.1. Introduction

In this chapter, the results of the different analyses of the data are presented. The results form the responses to the two parts of the research question that were posed. These were, firstly, ‘Are there differences between children with ADHD and control children in their use of linguistic resources?’, and secondly, ‘If differences in language use between the children with ADHD and the control children are observed, how might the mode of expression and the text type be associated with these differences?’

The data analyses that were undertaken were the quantitative procedures of logistic regression, as well as non-parametric statistical analyses. Descriptive treatments of some of the data were also undertaken. The variables that were evaluated descriptively were treated this way because for these observations, either the tallies of the data were very low, or the numbers of sample texts that were examined were low. The rationale behind the choice of the methods of data analysis is discussed in Chapter 3, ‘Methods’.

The results are presented in several parts in order to simplify their presentation. First, results for those variables that showed overall differences between the children
with ADHD and the control children are presented. These formed a response to the first research question. Also presented in this section are the children’s scores for the formal language tests that were undertaken. Although not strictly speaking a response to the research question, this information is included because it provides an indication of the level of the language abilities of the participating children. Details about the overall differences derived from the descriptive, non-parametric, and logistic regression procedures are next. Lastly, the results that showed interactions between observed group differences, the mode of expression, and the text type are then presented. This latter information formed the response to the second part of the research question.

The details of the results are sequenced this way in an attempt to retain clarity throughout the presentation of a substantial amount of information from different sources. The logistic regression statistical procedure yielded the most complex outcomes. These are explained in the text, and are also summarised in Table 4.12, which appears towards the end of the chapter.

4.2. Differences between ADHD and control children

An overall picture of the results of the study is presented in Tables 4.1 and 4.2. These summarise all the outcomes for each of the variables that were investigated. Information in the white columns in the tables provides a clear depiction of the group differences (G), and the interactions where appropriate (e.g. G*M, meaning group and mode interaction). When differences were observed, they are indicated by the black circle. Some cells in the table remain blank. This means either that no differences between the
two groups were observed, as in the case of some descriptive outcomes, or observed differences were not statistically significant.

Table 4.1 also presents results for observations that were not central to understanding the group effect. These included main effect differences for mode, M, or text type, T, and interactions that did not involve group interactions (an interaction between mode and text type, for example). These are indicated in Table 4.1 in the cells that are shaded grey. Although of interest, this information did not assist in forming a direct response to the research questions, and is not presented in any detail.

Table 4.2 shows the variables that were investigated for group effects only.
Table 4.1  Observed differences between ADHD and control groups in use of language features (‘●’ indicates observed difference)

<table>
<thead>
<tr>
<th>LANGUAGE FEATURE &amp; VARIABLE</th>
<th>MAIN EFFECTS</th>
<th>INTERACTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>G</td>
<td>M</td>
</tr>
<tr>
<td><strong>CLAUSE STRUCTURE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>embedded clauses</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>dependent clauses</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>independent clauses</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>major clauses</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>minor clauses</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td><strong>THEMATIC STRUCTURE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>imperative mood</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>ellipted subject</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>multiple theme</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>marked theme</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>simple theme</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td><strong>LEXICO-GRAMMAR</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>grammatical intricacy</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>type/token ratio</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td><strong>WRITTEN CONVENTIONS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>spelling errors</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>punctuation errors</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td><strong>BEHAVIOURS IN SPOKEN</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>abandoned utterances</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>utterances with a maze</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>% maze words</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>utterances with a pause</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>number of mazes</td>
<td>●</td>
<td></td>
</tr>
</tbody>
</table>

Note:  
G = group (ADHD or control)  
M = mode of expression (spoken or written)  
T = text type (story retell, recount, procedure)
Table 4.2  Observed differences between ADHD and control groups in use of language features ('●' indicates observed difference); group effects only.

<table>
<thead>
<tr>
<th>LANGUAGE FEATURE &amp; VARIABLE</th>
<th>GROUP EFFECTS ONLY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Text length</td>
<td></td>
</tr>
<tr>
<td>utterances (a)</td>
<td></td>
</tr>
<tr>
<td>utterances (t)</td>
<td></td>
</tr>
<tr>
<td>words</td>
<td></td>
</tr>
<tr>
<td>Associated behaviours</td>
<td></td>
</tr>
<tr>
<td>avoidance</td>
<td>●</td>
</tr>
<tr>
<td>unrelated</td>
<td>●</td>
</tr>
<tr>
<td>clarification</td>
<td>●</td>
</tr>
<tr>
<td>interrupting</td>
<td>●</td>
</tr>
<tr>
<td>overlapping</td>
<td>●</td>
</tr>
<tr>
<td>Macro text</td>
<td></td>
</tr>
<tr>
<td>title/overview</td>
<td>●</td>
</tr>
<tr>
<td>ending/conclusion</td>
<td>●</td>
</tr>
<tr>
<td>point form</td>
<td>●</td>
</tr>
<tr>
<td>CELF-3</td>
<td>TLS</td>
</tr>
<tr>
<td>TOPL</td>
<td>TLS</td>
</tr>
</tbody>
</table>

Note:
Utterances (a) = number of utterances in the analysis set
Utterances (t) = number of utterances in the total transcript

4.2.1. Comparisons of formal language assessments

The Clinical Evaluation of Language Fundamentals Version 3 (CELF-3; Semel, Wiig, & Secord, 1995) and the Test of Pragmatic Language (TOPL; Phelps-Terasaki & Phelps-Gunn, 1992) provided standardised measures of the developmental level of language of each participating child. Normal language development as measured by these tests was an important criterion for admission to this study. The comparison of the formal test scores was then undertaken in order to compare the performance of the two groups of children on these tests.
Scores for both tests for each child fell within the range that would suggest normal functioning, that is, above one standard deviation below the mean (see Appendix J). The non-parametric Mann-Whitney test (2-tailed) was used to test the statistical significance of the difference between the median scores for the CELF-3 and the TOPL. It showed that overall, there were no significant differences between the median scores attained by the children with a diagnosis of ADHD and their typically developing non-ADHD peers for Total Language Scores (TLSs) on both CELF-3 and TOPL. Reference to the calculated p-value for the CELF (p= 0.08) suggests that this outcome be interpreted with caution.

**Table 4.3** Comparisons of CELF total, receptive, and expressive language, and TOPL median scores for children with ADHD and control children

<table>
<thead>
<tr>
<th>TEST</th>
<th>MEDIAN SCORE</th>
<th>P-VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>CELF-3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>119</td>
<td>106</td>
</tr>
<tr>
<td>RECEPTIVE</td>
<td>120</td>
<td>106</td>
</tr>
<tr>
<td>EXPRESSIVE</td>
<td>112</td>
<td>106</td>
</tr>
<tr>
<td>TOPL</td>
<td>106</td>
<td>105</td>
</tr>
</tbody>
</table>

**CELF-3**

Visual inspection of the graphically depicted data (Figures 4.1 - 4.4), shows some variation between the groups. In addition, the calculated p-value of 0.08 suggests some ambiguity in the result rather than clear evidence that the null hypothesis may be accepted. For the CELF-3 total language scores, box plots (Figure 4.1) depict the children with ADHD as generally performing lower than the control children, but the
shape and overall spread of the scores appears similar for both groups of children, and the differences were shown to not reach statistical significance. Similarly, the scores of the children with ADHD generally appear to be lower for receptive (Figure 4.2) and expressive language scores (Figure 4.3), and individual subtest scores (Figure 4.4). Differences between the groups for receptive and expressive scores, and the separate subtest were not analysed statistically because of the small sample size.

It appears possible that the two groups of children might not demonstrate exact equivalence in terms of those language abilities targeted by the CELF-3, and this is suggested by the graphically depicted information. However, being able to achieve scores within the range that would indicate a normal level of language functioning was a specified criterion for inclusion in the study. The consideration of the results of the dependent variables in the light of formal test outcomes that suggest normal language ability is an important consideration and is discussed in Chapter 5.
Figure 4.1   Comparison of CELF-3 total language standard scores for children with ADHD and control children.

Figure 4.2   Comparison of CELF-3 receptive language standard scores
Figure 4.3  Comparison of CELF-3 expressive language standard scores

Figure 4.4  Comparison of CELF-3 subtest standard scores

Note:
Receptive scores:  Expressive scores:
CD (concepts & directions)  FS (formulated sentences),
WC (word classes)  RS (recalled sentences),
SR (semantic relations)  SA (sentence assembly)
TOPL

Visual inspection of box plots derived from the TOPL quotients for both groups of children show that the medians for the groups were very similar (see Figure 4.5). The scores of the middle 50% of the children with ADHD (about 5 children) were more widely spread than the scores of the middle 50% of the control children. This might be interpreted to mean that the children with ADHD used those language features that were targeted by this test in a different way to the control children.

![Box plot comparison of TOPL language quotients for control and ADHD groups](image)

**Figure 4.5** Comparisons of TOPL language quotients
4.2.2  **Summary of formal test information**

The results of standardised language testing demonstrated that all the participating children achieved scores that would indicate normal language skills, as was expected by the selection criteria that were established for the study. Closer inspection of the scores provided some additional information about the language abilities of the sample of children in the ADHD group, when compared with their peers who did not have a diagnosis of ADHD. This information contributed a response to the main research question which was concerned with detecting potential differences in the language use of these children. There were no statistically significant differences between the children with ADHD and the control children for median scores on the standardised tests (CELF-3, TOPL). However, overall trends in the data may indicate that the children in the ADHD group attained relatively lower scores than their non-ADHD counterparts.

4.2.3  **Overall comparisons of elicited texts**

Overall differences refer to those comparisons that were made between the groups of children for the use of linguistic resources without any reference to the mode of expression or the text type. As depicted in Tables 4.1 and 4.2, overall differences between the ADHD and the control children were observed for variables within the language feature categories of ‘Clause structure’, ‘Thematic structure’, ‘Lexico-grammar’, ‘Written conventions’, ‘Behaviours in spoken texts’, ‘Text length’, ‘Associated behaviours’, and ‘Macro textual organisation’.
ADHD, associated behaviours and macro textual organisation

The categories of ‘Associated Behaviour’ and ‘Macro Text’ contain variables that were reported using descriptions of the raw scores. For ‘Associated Behaviour’, most of the counts for the children with ADHD were higher than the counts for the control children. For ‘Macro Text’, the counts for the children with ADHD were lower. This information, which was drawn directly from the raw data, is summarised in Table 4.4.

Table 4.4  Comparison between children with ADHD and control children for descriptive variables

<table>
<thead>
<tr>
<th>LANGUAGE FEATURE &amp; VARIABLE</th>
<th>OUTCOME</th>
</tr>
</thead>
<tbody>
<tr>
<td>BEHAVIOUR</td>
<td></td>
</tr>
<tr>
<td>Avoidance</td>
<td>ADHD = C</td>
</tr>
<tr>
<td>Unrelated</td>
<td>ADHD &gt; C</td>
</tr>
<tr>
<td>Clarification</td>
<td>ADHD &gt; C</td>
</tr>
<tr>
<td>Interrupting</td>
<td>ADHD &gt; C</td>
</tr>
<tr>
<td>Overlapping</td>
<td>ADHD &gt; C</td>
</tr>
<tr>
<td>MACRO TEXT</td>
<td></td>
</tr>
<tr>
<td>Title or text overview</td>
<td>ADHD &lt; C</td>
</tr>
<tr>
<td>Ending or concluding remark</td>
<td>ADHD &lt; C</td>
</tr>
<tr>
<td>Written point form for procedure</td>
<td>ADHD &lt; C</td>
</tr>
</tbody>
</table>

For each of these variables, the size of the difference in the tallies between the children with ADHD and the control children was small. The raw data tallies are listed in Appendix K.

ADHD and length of texts

As explained in Chapter 3, ‘Methods’, the various quantitative techniques that were used helped gauge the significance of the observed differences for the remaining data.
Comparisons of the medians were made for four variables that were numerical in nature. These included three different measures of the length of the texts, and a tally of the total number of mazes. The non-parametric Mann-Whitney t-test (2-tailed) showed that none of the observed differences between the medians were significant (see Table 4.5).

Table 4.5  Overall comparisons between children with ADHD and control children for measures of quantity

<table>
<thead>
<tr>
<th>MEASURE OF QUANTITY</th>
<th>MEDIAN</th>
<th>P-VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ADHD</td>
<td>CONTROL</td>
</tr>
<tr>
<td>Total number of utterances</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Analysis set)</td>
<td>12</td>
<td>14</td>
</tr>
<tr>
<td>Total number of utterances</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Total transcript)</td>
<td>13</td>
<td>14</td>
</tr>
<tr>
<td>Total number of words</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Analysis set)</td>
<td>65</td>
<td>78</td>
</tr>
</tbody>
</table>

Figures 4.6 and 4.7 illustrate comparisons between the ADHD and the control children for the number of utterances in the analysis set, and the total number of words in the texts. There was negligible difference between the number of utterances in the analysis set and the number of utterances in the total transcript, and so only the box plots for the analysis set are presented.
Figure 4.6  Comparison between children with ADHD and control children for the total number of utterances/ clauses in the analysis set

Figure 4.7  Comparison between children with ADHD and control children for the total number of words in the analysis set
A result for the analysis of the number of mazes is presented in section 4.2.4 rather than in this section because it involved an interaction and not a main effect, or overall difference, between the groups of children.

*Logistic regression*

The remainder of this chapter presents the results of the independent logistic regression. Only the significant results have been presented in the text. All the outcomes are summarised and presented in Table 4.12, which is found towards the end of this chapter. In addition, all the relevant statistical information (degrees of freedom, variance, and exact p-values) is presented in Appendix L. This was done in an attempt to keep the amount of information manageable, and to highlight the results of importance.

*Main effects and odds ratios*

In logistic regression, main effects give information about overall differences in the likelihood of occurrence of the dependent variables that may be associated with one of the independent variables. In this case, the independent variables were the diagnostic status of the children (ADHD or control), the mode of expression (spoken or written), and the text type (story retell, recount, procedure). Therefore, a main effect for group means that any differences that were observed were associated only with the diagnostic status of the children, irrespective of the mode of expression or the text type. For the purposes of this thesis, these results have also been termed overall differences in keeping with the nomenclature used in this chapter.

For a particular variable (linguistic resource) the odds ratio (OR) is the ratio of the likelihood of the use of that resource by an ADHD child compared to the likelihood of its use by a similar child in the reference group, in this case a control child. For
example, an OR of 1.00 (OR = 1.00), indicates that the likelihood of use of the variable in question for an ADHD child was estimated to be 1.00, which is the same as the likelihood of its use by a control child, i.e. there is no difference for this variable. Variations in the ORs that were less than 1.00 mean that the children in the ADHD group were less likely to have used the particular variable compared to the children in the control group. Similarly, ORs that were greater than 1.00 mean that the children in the ADHD group were more likely to have used it. When differences in the odds ratios have been observed, the significance of the difference is indicated by the p-value. In this thesis, all results were judged to be significant at or below the 5% level of significance (p ≤ 0.05).

**The effect of ADHD on clause structure, thematic structure, and lexico-grammar**

Table 4.6 summarises the outcomes for the variables that were examined using logistic regression, and showed overall (main effect) differences for group. The variables concerned were dependent clauses, ellipted subject, and type/token ratio. Dependent clauses were included in the language feature termed, ‘Clause structure’, ellipted subject was included in ‘Thematic structure’, and type/token ratio, in ‘Lexico-grammar’. The ORs that described each result are given in the table.
### Table 4.6  Odds ratios for observed group main effect differences

<table>
<thead>
<tr>
<th>LANGUAGE FEATURE</th>
<th>VARIABLE</th>
<th>ODDS RATIOS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clause Structure</td>
<td>embedded clauses</td>
<td>1.00</td>
</tr>
<tr>
<td></td>
<td>dependent clauses</td>
<td>0.65</td>
</tr>
<tr>
<td>Thematic Structure</td>
<td>imperative mood</td>
<td>1.00</td>
</tr>
<tr>
<td></td>
<td>ellipted subject</td>
<td>0.58</td>
</tr>
<tr>
<td>Lexico-Grammar</td>
<td>type/token ratio</td>
<td>1.16</td>
</tr>
</tbody>
</table>

Using the result for dependent clauses as an example, the OR for these effects may be interpreted as follows. A child in the ADHD group was estimated to be 0.65 times as likely to use dependent clauses as a similar child in the control group, irrespective of mode of expression and text type. This was a highly significant result ($D(1) = 14.53, p \leq 0.001$; where “$D$” denotes the deviance. Also see Appendix L).

Similarly, a child in the ADHD group was estimated to be 0.58 times as likely to ellipt the grammatical subject as a similar child in the control group ($p \leq 0.01$).

The result for type/token ratio is expressed a little differently because TTR is a ratio. The texts of a child in the ADHD group were estimated to show 1.16 times the TTR of those of a similar child in the control group, irrespective of mode of expression and text type. This was a strongly significant result for this particular sample despite the appearance of a low OR; $D(1) = 27.86, p \leq 0.001$). This means that the probability of the difference in TTR was highly unlikely to have occurred by chance.
There were no differences between the groups for the likelihood of use of embedded clauses or the imperative mood.

The effect of ADHD on written conventions and behaviours in spoken texts

It was appropriate to investigate several of the variables in one mode of expression only because of the nature of the variables themselves. For example, spelling and punctuation errors could only be evaluated in written texts, whereas pauses could only be evaluated in spoken.

Spelling errors, abandoned utterances, utterances with a maze, the percentage of maze words, and utterances with a pause had significant main effects for group only. Spelling errors were included in the category that was termed, ‘Written conventions’, while the remaining variables were in ‘Behaviours in spoken text’. The results are summarised in Table 4.7.

Table 4.7  Odds ratios for observed group main effect differences in spoken only and written only

<table>
<thead>
<tr>
<th>LANGUAGE FEATURE</th>
<th>VARIABLE</th>
<th>ODDS RATIOS</th>
</tr>
</thead>
<tbody>
<tr>
<td>WRITTEN CONVENTIONS</td>
<td>Spelling errors</td>
<td>1.72</td>
</tr>
<tr>
<td></td>
<td>Abandoned utterances</td>
<td>1.90</td>
</tr>
<tr>
<td></td>
<td>Utterances with a maze</td>
<td>0.74</td>
</tr>
<tr>
<td>BEHAVIOUERS IN SPOKEN</td>
<td>% mazed words</td>
<td>1.26</td>
</tr>
<tr>
<td></td>
<td>Utterances with a pause</td>
<td>0.74</td>
</tr>
</tbody>
</table>
4.2.4 The effect of mode of expression and text type

In an interaction, the influence of each of the independent variables contributes to the significant effect. The two way interactions of particular interest in this study were those involving group (group and mode; group and text type). Interactions between mode and text type were also observed, but these are not considered further. Three way interactions meant that the effect of all three independent variables of group, mode, and text type combined to influence the likelihood of occurrence of the linguistic resources.

Odds ratios and interactions

For interactions, the ORs are again interpreted by assigning one of each of the independent variables as the reference group. In this case, the control group, the spoken mode of expression, and the story retell text type were the reference groups, and each of these was assigned a likelihood of 1.00.

The effect of ADHD and mode of expression on clause structure and lexico-grammar

There were significant two way interactions between group and mode of expression for independent and major clauses, and grammatical intricacy. The result for major clauses was strongly significant. Independent and major clauses were included in ‘Clause structure’, while grammatical intricacy was in ‘Lexico-grammar’.

Using independent clauses as an example, the OR for this effect is interpreted as follows. In spoken texts a child in the ADHD group was estimated to be 0.76 times as likely to use independent clauses as a similar child from the control group, irrespective of the text type. In written texts a child in the ADHD group was estimated to be 0.50
times as likely to use independent clauses as a similar child from the control group, irrespective of text type. Table 4.8 summarises these results.

Table 4.8 Odds ratios for interactions between group and mode of expression

<table>
<thead>
<tr>
<th>LANGUAGE FEATURE</th>
<th>VARIABLE</th>
<th>ODDS RATIOS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>SPOKEN</td>
</tr>
<tr>
<td>Clause structure</td>
<td>independent clauses</td>
<td>0.76</td>
</tr>
<tr>
<td></td>
<td>major clauses</td>
<td>1.02</td>
</tr>
<tr>
<td>Lexico-grammar</td>
<td>grammatical intricacy</td>
<td>0.66</td>
</tr>
</tbody>
</table>

The effect of ADHD and text type on thematic structure

There was a significant two way interaction between group and text type for multiple theme. There was also a significant two way interaction between group and text type for minor clauses, and also for punctuation errors. In these latter cases, the effect of mode of expression, though of importance, may not be considered an interaction because the variables were not investigated in both modes of expression. All these results for the interaction between group and text type are presented in Table 4.9.
Table 4.9  Odds ratios for interactions between group and text type

<table>
<thead>
<tr>
<th>LANGUAGE FEATURE &amp; VARIABLE</th>
<th>SPOKEN</th>
<th>WRITTEN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RETELL</td>
<td>RECOUNT</td>
</tr>
<tr>
<td>CLAUSE STRUCTURE:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MINOR CLAUSES</td>
<td>0.66</td>
<td>2.34</td>
</tr>
<tr>
<td>THEMATIC STRUCTURE:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MULTIPLE THEME</td>
<td>1.54</td>
<td>0.80</td>
</tr>
<tr>
<td>WRITTEN CONVENTIONS:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PUNCTUATION ERRORS</td>
<td>n/a for spoken</td>
<td>4.67</td>
</tr>
</tbody>
</table>

The OR for this effect is interpreted as follows. In story retell texts, a child in the ADHD group was estimated to be 1.54 times as likely to use multiple theme as a similar child from the control group, irrespective of the mode of expression. In recount texts, a child in the ADHD group was estimated to be 0.80 times as likely to use multiple theme as a similar child from the control group, irrespective of the mode of expression. In procedural texts, a child in the ADHD group was estimated to be 0.76 times as likely to use multiple theme as a similar child from the control group, irrespective of the mode of expression. Multiple theme was included in the category of variables that was termed ‘Thematic structure’.

**The effect of ADHD and text type on the number of mazes**

An independent Poisson regression model was run to determine the group comparison for the number of mazes. This was because this particular data set was numerical in nature (also see Appendix I). The result of this procedure is the ratio of the predicted rate of incidence of mazes of the ADHD compared to the control group. The best fitting model showed a significant two way interaction between group and text type. The exact
p-values were not calculated. Mazing is only evident in spoken language, and so this variable was only examined in the spoken mode. The results for the number of mazes are presented in Table 4.10.

Table 4.10  Odds ratios for the interaction between group and text type for number of mazes

<table>
<thead>
<tr>
<th>LANGUAGE FEATURE &amp; VARIABLE</th>
<th>SPOKEN</th>
<th>WRITTEN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RETELL</td>
<td>RECOUNT</td>
</tr>
<tr>
<td>BEHAVIOUR IN SPOKEN:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NUMBER OF MAZES</td>
<td>1.37</td>
<td>0.68</td>
</tr>
</tbody>
</table>

The relative rate for this effect is interpreted as follows. A child in the ADHD group was estimated to have 1.37 times the rate of mazes in their story retell texts compared to a similar child in the control group. The relative rate for the recount texts was 0.68, while for the procedural texts it was 0.78. Mazing was listed among ‘Behaviours of Spoken Language’.

The combined effect of ADHD, mode of expression, and text type on thematic structure

There was a significant three way interaction between group, mode, and text type for simple theme and also for marked theme. These are both related to ‘Thematic Structure’. The results are presented in Table 4.11.
Table 4.11  Odds ratios for interactions between group, mode, and text type

<table>
<thead>
<tr>
<th>LANGUAGE FEATURE &amp; VARIABLE</th>
<th>SPOKEN</th>
<th>WRITTEN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RETELL RECOUNT PROCEDURE</td>
<td>RETELL RECOUNT PROCEDURE</td>
</tr>
<tr>
<td>THEMATIC STRUCTURE:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MARKED THEME</td>
<td>2.25 1.12 0.71</td>
<td>0.97 1.02 2.40</td>
</tr>
<tr>
<td>SIMPLE THEME</td>
<td>2.85 0.66 1.36</td>
<td>0.99 1.17 1.12</td>
</tr>
</tbody>
</table>

Using marked theme as an example, the OR for this effect is interpreted as follows. A child in the ADHD group was estimated to be 2.25 times as likely to use marked theme in the spoken story retells, 1.12 times as likely to use it in spoken recounts, and 0.71 times as likely to use it in spoken procedures, when compared to a similar control child. For written texts, a child in the ADHD group was estimated to be 0.97 times as likely to use marked theme in the written story narratives, 1.02 times as likely to use it in written recounts, and 2.4 times as likely to use it in written procedures, when compared to a similar control child.

**Summary of logistic regression**

Independent logistic regression was used to examine many of the variables in order to describe any relationship that may have existed between the groups, the mode of expression, and three text types. These results, along with the other results that were obtained by different methods, have been explained in the text. Table 4.12 summarises the outcomes of the logistic regression procedure.
## Table 4.12  Summary of odds ratios derived from logistic regression for suitable variables

<table>
<thead>
<tr>
<th>LANGUAGE FEATURE</th>
<th>VARIABLE</th>
<th>GROUP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>SPOKEN</td>
</tr>
<tr>
<td><strong>TEXT TYPES:</strong></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Clause structure</td>
<td>embedded clauses</td>
<td>1.00</td>
</tr>
<tr>
<td></td>
<td>dependent clauses</td>
<td>0.65 [0.51, 0.83]^*</td>
</tr>
<tr>
<td></td>
<td>independent clauses</td>
<td>0.76</td>
</tr>
<tr>
<td></td>
<td>major clauses</td>
<td>1.02</td>
</tr>
<tr>
<td></td>
<td>minor clauses</td>
<td>0.66</td>
</tr>
<tr>
<td>Thematic structure</td>
<td>imperative mood</td>
<td>1.00</td>
</tr>
<tr>
<td></td>
<td>ellipted subject</td>
<td>0.58 [0.41, 0.83]</td>
</tr>
<tr>
<td></td>
<td>multiple theme</td>
<td>1.54</td>
</tr>
<tr>
<td></td>
<td>marked theme</td>
<td>2.25</td>
</tr>
<tr>
<td></td>
<td>simple theme</td>
<td>2.85</td>
</tr>
<tr>
<td>Lexico-grammar</td>
<td>type/token ratio</td>
<td>1.16 [1.08, 1.24]</td>
</tr>
<tr>
<td></td>
<td>grammatical intricacy</td>
<td>0.66</td>
</tr>
<tr>
<td>Written conventions</td>
<td>spelling errors</td>
<td>n/a for spoken</td>
</tr>
<tr>
<td></td>
<td>punctuation errors</td>
<td>n/a for spoken</td>
</tr>
<tr>
<td>Behaviours in spoken</td>
<td>abandoned utterances</td>
<td>1.90 [1.27, 2.85]</td>
</tr>
<tr>
<td></td>
<td>utterances with a maze</td>
<td>0.74 [0.60, 0.93]</td>
</tr>
<tr>
<td></td>
<td>% maze words</td>
<td>1.26 [1.10, 1.45]</td>
</tr>
<tr>
<td></td>
<td>utterances with a pause</td>
<td>0.74 [0.58, 0.94]</td>
</tr>
</tbody>
</table>

Note:  
Text types: 1 = story narrative  
2 = recount  
3 = procedure  
Shading:  
Unshaded bars show main effects (ADHD compared to control)  
Light grey bars show two way interactions between group and either mode of expression or text type  
Dark grey bars show three way interactions between group, mode of expression, and text type  

* Footnote to the table: As a guide to the reader as to the impact of the small sample size on the uncertainty in the odds ratios, confidence intervals for odds ratios for the variables with main effects only are provided.
4.3. Summary of results

This study attempted to determine if the language use of children with ADHD differed from that of their non-ADHD peers, and to gauge the effect of context on the comparisons that were made between these two groups of children. These comparisons were examined using a variety of techniques that included statistical as well as descriptive analyses.

The results have articulated a response to the research questions. Most of the thirty-two variables that were examined showed differences between the groups. These differences were observed in the absence of any evidence from the formal test instruments to indicate language impairment, although the trends in the scores for the CELF-3 in particular may have indicated a lower level of ability overall for the children with ADHD.

The variables were grouped into categories. These were, ‘Clause structure’, ‘Thematic structure’, ‘Lexico-grammar’, ‘Conventions of written language’, ‘Behaviours of spoken language’, ‘Length of texts’, ‘Associated behaviours’, and ‘Macro textual organisation’. Differences between the two groups of children were observed for variables within each category. Many of these differences were also associated with the mode of expression or the text type. Differences in independent and major clauses, and grammatical intricacy were associated with the mode of expression, whereas differences in minor clauses, multiple theme, and punctuation were associated with the text type. Differences in the likelihood of use of marked theme and the likelihood of use of simple theme were associated with both the mode of expression as well as the text type.
CHAPTER 5

DISCUSSION

5.1. Introduction

The research question that motivated this thesis asked if there were differences in language use between children with a diagnosis of ADHD and their typically developing peers. This discussion attempts to extend our understanding of language use as it is affected by particular aspects of context. In this case, the aspects of context included the symptoms of the condition of ADHD itself, the mode of expression, and the designated text type. The research reported here presents some evidence that differences were detected between the two groups of children, especially in the way they organised texts, and that the mode of expression and the text type impacted on these organisational resources.

All the children in this study demonstrated results on formal tests that eliminated SLI. However, given the reassurance that all the participating children could demonstrate normal levels of language ability, it is of interest that despite this, there were differences between children with ADHD and their typically developing peers on other measures. Therefore, it is argued, that the types of difficulties that these children may experience may be better investigated by means other than formal tests of
language. The use of standardised test instruments reflects an approach to the understanding of language that is largely based on the contribution of form. However, when alternative approaches to language are adopted, such as those that are functional and context sensitive, it is possible to appreciate the relationships between the individual speaker’s particular choice of linguistic resources, and how the use of these resources in texts reflect form as well as function.

This study examined the contributions of both form and function by comparing the texts created by children with and without a diagnosis of ADHD using a systemic and functional approach. It adopted a sociolinguistic concept of language based on SFL and, with this model, used discourse analysis to examine language use. The results displayed how the children managed language features of clause structure, thematic structure, lexico-grammar, written conventions, behaviours of spoken language, text length, behaviour associated with speaking, and macro textual organisation. Each of the variables investigated in this study reflected at least one of these overarching features of language.

The unique contribution of this thesis is that the organisational differences observed between children with and without ADHD may be explained, in SFL terms, as reflecting the pattern of use of those resources that realise the textual metafunction of language. Textual organisation has also been identified previously in the extant literature as problematic for children with ADHD. In this study, the main differences found that suggested this were in thematic structure, clause structure, and lexico-grammar and these were affected by the mode of expression and the text type.
The study also reiterated other previous findings related to the difficulties experienced by children with ADHD with behaviours associated with spoken language. These were apparent both in their spoken discourse itself, as well as in behaviour that surrounded the discourse. Difficulties with written conventions were also found.

Since SFL focuses on the description rather than the evaluation of the functions of language, the findings by themselves do not imply that one group performed relatively better or worse than the other. In SFL, variation is frequently directly associated with aspects of context, and may also merely reflect the individuality of the human communicators. However, in this study, every attempt was made as far as was practicable to control for potential differences in context that could impact on the use of textual resources apart from those aspects of context (the mode of expression and the text type) that were manipulated as independent variables. For this reason, and since a diagnosis of ADHD is usually correlated with a heightened risk of language-related academic and social difficulties, it is reasonable to assume that the differences displayed between the two groups of children illustrated relative disadvantage for the children with ADHD. Furthermore, the findings from this study of an association between differences in the use of some linguistic resources and aspects of context, specifically mode of expression and text type, concur with the theoretical predictions of SFL, thereby demonstrating the value of discourse analysis and SFL as methodological approaches.

The discussion also considers salient outcomes apropos previous literature. The SFL approach and the various approaches that have investigated language previously may be seen as offering complementary rather than opposing viewpoints, each providing valuable insights into the language abilities of these children.
This chapter is structured to reflect the way that the results were presented. A brief discussion concerning the limitations of the formal tests is given first, since this information captures the difference between the perceptions of SLI compared to language use. The results of the study concerning theme gave the most information about the differences that were observed between the children with ADHD and the control children, and the way that mode of expression and text type impact on these differences. Therefore, these results are the first to be discussed. Discussion about the results for each of the language features follows. Possible clinical applications of the new information are suggested, where appropriate. The limitations of the present study are also discussed, as are directions for further research. The chapter concludes with a summary of the research findings and postulates the contribution that the study makes to the understanding of language use in children who have ADHD.

5.2. The Limits of Formal Testing In ADHD

This thesis argued that the usefulness of standardised test instruments for examining the language of children with a diagnosis of ADHD is questionable. This is because formal tests instruments are usually best suited to detecting SLI. The co-morbidity of ADHD and SLI raises particular issues. In addition, formal tests do not have a place in the assessment of language use, and the investigation of language use was the aim of this research.

In this study, the results of standardised language testing demonstrated that all the participating children were able to achieve scores that were above the level that is considered appropriate for a child functioning with normal language skills. The formal tests did not differentiate between the language abilities of the children with ADHD and
the children in the control group, although that there appeared to be a general tendency for children in the ADHD group to score at a lower level than the controls. Lower scores for these tests gives rise to speculation that the group may be functioning with a systematic variation for linguistic ability in the areas that were assessed. In other words, linguistically, children with ADHD may represent the lower end of a continuum of linguistic ability. This is not detected by formal test instruments, which are, after all, designed to detect SLI, or in some cases, abnormally low levels of language ability.

It can be argued that an alternative method, such as discourse analysis, does not readily lend itself in the same way as formal tests procedures for ease of administration and scoring, statistical analyses or reliable re-assessment. However, as noted by Adams, “the nature of pragmatics as a set of context-dependent behaviours casts doubt upon the capability of formal testing procedures to reproduce these behaviours reliably” (Adams, 2002, p976). It may well be that discourse analysis yields information which is as at least as useful at the present time.

5.3. **Interpretations of Thematic Choices**

In SFL, theme is one of the structural resources available to speakers and writers that helps generate meaning in texts. In this study, theme was investigated by examining the patterns of use of the different types of theme (simple or multiple; marked or unmarked), the use of ellipsis of the subject, and the use of the imperative mood. The finding of importance was that for all but the imperative mood, the patterns of thematic structure that were typically used by children with ADHD differed from the patterns of theme used by the control children. Mode of expression and text type were associated with some of the differences in thematic choice-making that were observed (simple
theme, multiple theme, and marked theme). The mode of expression and the text type constitute aspects of context, so for these results the expectation of SFL, that context would impact on the choice of linguistic resources used in texts, was fulfilled. However, the results imply that the children with ADHD and the control children responded to context in different ways, and that the differences reflected a simpler form of textual development and also a simpler form of cohesion on the part of the children with ADHD.

5.3.1. **Revisiting theme**

As described in Chapter 2 (2.3.2), theme in SFL has to do with the choices made in organising texts and the components of texts to create the meanings intended. Theme provides a guide for the listener or reader to use to interpret intended meanings in the unfolding text (Mathiessen, 1995). Meaning in this sense refers not only to the signifying of semantic concepts, but also to what Halliday terms those “…abstract functions of language … that form the basis of the organisation of the entire linguistic system” (Halliday, 1974, cited in deJoia & Stenton, 1980, p31). These more general abstract functions of meaning potential are: the ideational, or what the text is about; the interpersonal, involving attitudes, interaction, and relationships; and the textual, which organises the other two meanings into a coherent whole (Butt, Fahey, Feez, Spinks, & Yallop, 2000).

Structurally, theme may be readily identified by its position at the beginning of the clause, but it is semantically important as the “…point of departure for the clause as a message” (Halliday, 1967, p212). It is theme, then, that helps create the patterns of meaning that are woven into individual clauses as well as across the clauses that constitute texts. The potential options for theme are the type of theme, namely topical
theme, simple and multiple theme, and theme markedness, which is whether the thematic element is marked or unmarked. These choices highlight the main idea, or as Halliday says, “the point of departure”, of each clause (Butt et al., 2000, p136). In addition to selection of theme at the clause level, the pattern of the choice of theme across the entire text is of importance in creating its coherence, and in engaging and maintaining the listener’s or reader’s interest.

Theme, however, does not function in isolation. As Halliday (1994) points out, the choice of theme in English clauses “depends on the choice of mood.” (Halliday, 1994, p42). Mood is realised in texts in the nature of each independent clause, which may be declarative, interrogative, or imperative, and is largely responsible for conveying the interpersonal tone of the message (Butt et al., 2000). Language, even a written text created for an unseen audience, is a social interaction. It is mood that encodes the exchange of this interaction as giving information (declarative), asking for information (interrogative), or giving a command (imperative).

Particular patterns of theme are said to typify spoken and written texts. For spoken language the thematic choices are made on-line, made as we speak with the least degree of ‘pre-planning’. Since theme occupies the first position in the clause it is easy to see how in spoken texts theme is used to highlight the meanings that are of importance in the message. Coherent spoken discourse is typically created by the use of textual elements at the beginning of the clause, such as conjunctions that serve as links, for example “and …”, “since…”, “because… “, or “if …” (Matthiessen, 1995, cited in Ravelli, 2000, p51). Ravelli states that this creates an “easy flow of ideas” that is a hallmark of spoken language (Ravelli, 2000, p55). The use of other resources, such as
interpersonal theme, for example, “unfortunately …” and “in my opinion …” is also common.

Conversely, written language allows more time for the choice of linguistic options to be considered, revised if necessary, and implemented (Eggins, 1994; Ravelli, 2000). Theme is woven into written texts with an emphasis on careful selection that expresses the desired degree of formality and interpersonal distance. Written expression, therefore, usually reflects a more purposeful and considered use of theme that conveys the message as accurately as it was intended by the writer.

As described, the mode of expression (spoken as well as written language) and the mood (declarative, interrogative, and imperative) are two very important influences on theme. Theme is a resource of textual organisation and, as stated by Eggins, “... the textual is the enabling function.” (Eggins, 1994, p306). By this, she means that it is the textual metafunction that enables the meaning of the text to be imparted. The selection of theme in texts therefore has profound implications for effective communication.

5.3.2. **ADHD, mode of expression, and text type affect theme**

As may be implied from the above discussion about theme, the mode of expression and the text type are both expected to influence the patterns of theme in English text. This means that theme is influenced by the choice of either spoken or written material, and also by the mood. In this study, both of these were manipulated, with spoken as well as written texts being elicited, and mood largely being determined by the elicitation tasks that required a story retell and a recount (both typically declarative), a procedural text (typically imperative). However, results showed that the children with ADHD and the control children used the patterns of theme in different ways.
Simple theme

SFL proposes that the most ordinary thematic choice, meaning the simplest way of imparting straightforward information, is simple topical theme that is unmarked. Simple topical theme means that the theme of the clause is concerned with only one of the following elements of SFL; participant, process, or circumstance. It also means that this type of theme does not carry any additional interpersonal or textual information (Ravelli, 2000). Simple topical theme was called ‘simple theme’ in this research. Unmarked theme means that the theme is the usual choice for the mood of that particular clause, whether it is declarative, interrogative, or imperative (Eggins, 1994).

The following example, drawn from the data (C05, spoken story retell) serves to illustrate simple unmarked theme. For the clause, “The alien steals Krusty”, the simple topical theme is the participant, “the alien”. The clause is in declarative mood. “The alien” also functions as the grammatical subject of the clause. This conflation of theme and grammatical subject is typical of a declarative clause, and is known as the unmarked option.

The results of this study showed that the children with ADHD were significantly more likely than the control children to use simple theme in their spoken story retell texts than control children, and were also significantly more likely than to use it in their spoken procedural texts. This means that for these text types, the theme, or starting point of the message within the texts created by the children with ADHD, were more likely to express only one participant, process, or circumstance. They were also less likely to express additional interpersonal or textual information. This may have important implications for what the children with ADHD do as well as what they don’t do. For example, it may be that when telling stories orally the children with ADHD
started off most of their utterances with a new topic (simple theme). This was not always linked to other part of their story (by textual theme) nor did they tend to introduce any interpersonal meanings (for example judgements, agreements, disagreements, or appraisals)

Examples drawn from the data of the texts of the control children illustrate quite a different situation. For example, one control child’s spoken story (C06) began with, “Well it all starts when Homer and Bart are fiddling around.” “Well, it all...” is a multiple theme with an interpersonal element, “Well...”, and a topical element, “…it all.” This example helps to demonstrate some of the items of additional complexity that were absent from the texts of the children with ADHD.

Initially, it was somewhat surprising that the children with ADHD were less likely than the control children to choose simple theme for the spoken recount texts. This may mean that the children with ADHD used the alternative multiple theme, which is the common choice of theme in recount texts where an order of events is required. For example, the utterance “And then I got onto the computer” (S11, spoken recount) has a multiple theme. The multiple theme, “And then I”, consists of “And then” as a textual element that creates the sequence of the text, and “I” as the topical element. In terms of written language in the school setting, this style would become tedious and repetitious for the reader, usually a teacher, and would doubtless be thought of as indicating underdeveloped literary ability. Some inherent scaffolding in the text type may have prompted the use of this type of thematic structure for the children with ADHD. This prompting was perhaps not so evident in the story telling, which presents a much wider array of possible potential generic forms, or the procedural texts, which
often convey mood more strongly. For these latter text types, the children with ADHD resorted to the more usual and simple topical theme.

**Marked theme**

In this study the children with ADHD were significantly more likely to use marked theme, and also more likely to use multiple theme than the children without ADHD, in the spoken story telling texts. When using marked theme, it was frequently to draw attention to conditions of circumstance, or to help with the sequential organisation of information. Figure 5.1 shows examples of marked theme that were drawn from the data.

| (S23) Because of lots of waves… (CIRCUMSTANCE)   | …he comes over in his tube       |
|                                                | [MARKED TOPICAL THEME]          |
| (S29)...and (TEXTUAL THEME) Nelson (TOPICAL THEME) | …he’s just standing there       |
|                                                | [MARKED MULTIPLE (TEXTUAL AND TOPICAL) THEME] |

**Figure 5.1** Examples of marked theme in spoken stories by children with ADHD

Similarly, when the children with ADHD used multiple theme, it was often simply to add elements of circumstance or conjunction ahead of the topical theme. Examples are, “Firstly…”, “then …”, “next …”, “and…”, “but…”.

Eggins (1994) states that while marked themes are rare in casual conversation, they do more often occur in spoken monologues, which are what these spoken story retell texts resembled. That the children with ADHD were significantly more likely to
use these particular linguistic resources suggests that these children created spoken story retell texts that were more typical in terms of their spoken ‘feel’ than similar texts created by the control children. This was a somewhat surprising outcome. However, multiple theme was used by the children with ADHD in written texts in the same way as it had been used in spoken texts, so this spoken ‘feel’ characterised some of the written story texts of these children as well. The children with ADHD often created multiple theme by simply adding elements of circumstance or conjunction ahead of the topical theme. The result was that the children’s written stories frequently repeated the linkages provided by these conjunctives and lacked any degree of complexity. There is some similarity here with later results for clause structure and grammatical intricacy, where resources that are more commonly associated with spoken language were found to be used in the creation of written texts. It is feasible that these linguistic resources might be responsible for the often reported comment that children with ADHD write as they speak, or in SFL terms, do not accommodate to the expectations of the context in the same way as that shown by children without ADHD.

The children with ADHD were much more likely than the control children to use marked theme in the written procedural texts. Eggins describes ‘theme markedness’ as “to do with the relationships between the mood and theme structures of the clause.” (Eggins, 1994, p298). In the written procedural texts children with ADHD tended to use the imperative mood with ‘you’ ellipted, comprising marked theme, more often than the control children. The control children, on the other hand, used written point form and numbered procedural steps a little more than the children with ADHD.
5.4. Interpretations of Clause Structure Choices

SFL explores how meaning, function and linguistic form inter-relate. As mentioned in Chapter 3, clauses in SFL are considered the basic unit of information in texts, and are therefore a suitable starting point for analysis. Even meaningful one word utterances can be described and analysed in this way (as minor clauses). As Halliday says, “Because structure is … on the surface of the language, it can be played with to great effect … (This) play contributes to the overall making of meaning.” (Halliday, 1994, p16). In this study, the children with ADHD manipulated the clause structure in different ways to the control children when creating texts within similar contexts. This is best illustrated by comparing the two groups of children and their use of the three main types of English clauses; major (also called independent stand alone), independent, and dependent.

5.4.1. ADHD, mode of expression, and text type affect clause structure

Major clauses are the simplest form of clause structure. In written texts they correspond to simple sentences. They contain one process and realise a simple or basic information unit. By contrast, independent clauses and dependent clauses are the components of clause complexes, which begin to add to the complexity of the text. Minor clauses have been described as small yet complete fragments of information, and include such expressions as exclamations, (for example, “Stop!”), and abbreviated ways of speaking (for example, “Here?”). They usually typify spoken language. Minor clauses are typically discarded in many other methods of discourse analysis. The focus of SFL on the meaning of everything that the child utters enables it to uncover the function of such apparently insignificant elements as minor clauses.
This study demonstrated how children with ADHD and control children typically used patterns of clause structure differently, and that the mode of expression affected the likelihood of the use of the different types of clauses.

**Major clauses**

In this study, not only were the children with ADHD more likely to use major clauses than the control children, particularly in the written texts, but they were also less likely to use independent and dependent clauses than the control children. This suggests that the children with ADHD were less likely to create complexity in their texts than the control children, as shown by their pattern of use of the different clause types. It is interesting to speculate as to why this might be so. The findings from this study suggest that the mode of expression is an important consideration, since the result for the interaction between group and mode of expression was highly significant; written texts showed the differences more markedly than the spoken.

It seems that for written discourse, the children with ADHD tended to realise information in a simpler form, and that form resembled the form of spoken language. One explanation for this is that the children with ADHD did not respond to the contextual difference between spoken and written modes of expression by changing their choice of linguistic resource in the same way as their non-ADHD counterparts had done. This observation was also made in relation to the way the children with ADHD use thematic structure.

**Clause complexes**

In SFL, texts can be expected to show differences according to context, and mode of expression is an aspect of context. Halliday pointed out that “… the clause complex is
of particular interest in spoken language because it represents that dynamic potential of
the system … maintaining a continuous flow of discourse that is coherent without being
constructional.” (Halliday, 1994, p224) He also stated that “… spoken language
becomes complex by being grammatically intricate” (Halliday, 1994, p350). The
complexity becomes coherent through the system of interdependency of the clause
complexes, that is, the taxis. It also becomes coherent through the logico-semantic
relationships that the clauses represent, usually through expansion or modification of the
information expressed within them (Halliday, 1994). Written language, on the other
hand, tends to build complexity through the lexico-grammar, without such a reliance on
the use of clause complexes.

The children with ADHD were shown to be less likely than the control children
to use dependent and independent clauses, which are the components of clause
complexes. Therefore, it is likely that they used fewer clause complexes, particularly in
their written texts. So in a way, they showed the expected adaptation to the change in
mode of expression by using fewer clause complexes in written texts. However, overall
they did not create complexity in either spoken or written texts to the same degree as
their non-ADHD peers. The significantly lower grammatical intricacy shown overall in
the texts of the children with ADHD is one outcome from the study that gives further
supportive evidence for this, and is discussed more fully in the next section of this
chapter.

Clause complexes involve an ordering of elements, and a sequencing of
meaning. Therefore, one possible explanation for the difference in the manner of
creating complexity between the two groups of children may well be that this required
ordering presented particular difficulty for children with ADHD, but not for the control children.

5.5. **Interpretations of Lexico-grammatical Choices**

Grammatical intricacy (GI) and the type/token ratio (TTR) provided windows for observing the lexico-grammatical choices in texts made by the children.

5.5.1. **Understanding grammatical intricacy and type/token ratio**

GI refers to the percentage of clause complexes used throughout an entire text. The combining of clauses into clause complexes is one way in which meaning can be elaborated, extended, or enhanced in a text. It is a way that the content of the communication is enriched. It is related to semantic complexity and is quite independent of the length of the text being considered. For example, a text with a large number of clauses can have no clause complexes, and so no GI, whereas a text with very few clauses can have each clause within a clause complex, thereby having a GI of 100%. GI reflects how the speaker or writer is developing the idea or the content of the message they wish to impart by adding to its meaning using the strategies mentioned above. In this way, GI helps realise the ideational function of language, that is, what the message is about.

Differences in grammatical intricacy between spoken and written texts are thought to occur. Halliday (1994) suggests that the usual trend for spoken discourse is that it is more grammatically intricate than written. This means that in spoken language, complexity is usually created through a network of intricate relationships between
different clauses (the GI). This is not so for written language, which builds up complexity by other means, for example, by greater lexical diversity.

The TTR, the second feature of lexico-grammar that this study examined, is a measure of lexical diversity. It is a ratio calculated from tallying the number of new word ‘types’ as a proportion of the total word count in a text. A higher TTR usually means that more different words were being used. Lexical diversity is one way of maintaining interest and complexity in texts. The complexity created by TTR is more related to new items of information as conveyed by the vocabulary. This contrasts with the complexity created by, for example, grammatical intricacy, which elaborates on already given information.

5.5.2. ADHD and mode of expression affect grammatical intricacy and TTR

The children in the ADHD group were less likely to create spoken texts with high grammatical intricacy than children in the control group, and were also less likely to create written texts with high grammatical intricacy than children in the control group. The children in the ADHD group were more likely than the control children to have a higher TTR.

Grammatical intricacy

Unlike Halliday’s prediction, the actual data showed that all the children in this study (ADHD and controls) tended to show greater grammatical intricacy in their written texts than in their spoken. This finding might have been quite puzzling if it were not for two additional outcomes from the analyses. One was that the children with ADHD showed a lower grammatical intricacy overall than the control children, and the differences in GI
between their spoken and written texts was not nearly as marked as the differences observed for the control children. This may indicate that the children with ADHD were not as competent in forming clause complexes as the control children, nor did they differentiate for the mode of expression as effectively as the control children. The outcomes from the study would suggest that this might be so because the children with ADHD were also less likely than the control children to use dependent and independent clauses (the main components of clause complexes), particularly in written texts.

*Type token ratio*

Results for TTR indicated that the children with ADHD were likely to have a higher TTR. It is possible that the children in the ADHD group used words rather than clause structures to encode given and new information. This is consistent with other observations that the children with ADHD, when compared to the control children, used simpler ways of encoding the textual metafunction (theme, clause structure, lexico-grammar).

5.6. **Interpretations of Behaviour When Children With ADHD Speak**

There were two language features investigated with specific reference to spoken language. One was ‘Behaviours of spoken language’, (abandoned utterances, mazes, pauses etc.), and the other was ‘Associated behaviours’ (avoidance, unrelated information, seeking clarification, interrupting speech, and overlapping speech).
5.6.1. **Observations of spoken language and associated behaviours**

*ADHD affects the way children speak*

In this study, the children with ADHD displayed several behaviours that may be interpreted as typical. Some of these behaviours could possibly have been related to disinhibition. For example, they were less likely to pause when speaking than the control children. They were also more likely than the control children to abandon utterances. This may have been because they recognised that their attempts at language revision and repair were unsuccessful. Reference to the data shows this as occurring, with repeated mazing often being followed by the utterance being abandoned. The abandoned utterances observed in this study did not seem to be associated with distinct changes in topic, which would have suggested that the children were unable to remain on task.

Mazing, which in high levels is thought to be indicative of language formulation difficulty, has been investigated previously in the literature. Redmond (2004) reported that children with ADHD used significantly more mazes and longer mazes than both children with language impairment and typically developing children. The present study was able to show similar results in that the children with ADHD used more mazes for the spoken story retell texts, but not for the recount and the procedural texts.

This presented an interesting picture of the language formulation strategies of the children with ADHD. Having begun to speak, perhaps prematurely, the children were in need of strategies for formulation that require heightened on-line monitoring. Revisions, repetitions, and restarts in the data, such as constitute mazing, provided an insight into the effectiveness of these monitoring skills. Even though the results showed that the children with ADHD were less likely than the control children to use utterances
that contained a maze, when they did use a maze, they were significantly more likely to maze a higher percentage of words, perhaps in repeated attempts to clarify their emerging spoken language. Furthermore, the rate of mazes in their story retell texts was estimated to be greater than that of the control children, but it was lower in the recount and in the procedural texts. As suggested earlier, these latter text types may have been inherently less challenging for the children with ADHD because of their more tightly constrained generic structure, which possibly assisted the language formulation of these children for these particular text types.

These results may suggest that the children with ADHD made on-line judgments of their spoken language as it emerged, and frequently identified their attempts as too problematic to continue. It has been suggested in the literature that children with ADHD do in fact have adequate language competence but often fail to demonstrate this in their language performance. The present study provided evidence that this could be the case, with the interesting additional finding that children themselves were aware of this inadequacy.

**ADHD affects behaviour when children are speaking**

Anecdotal information about the behaviour of children with ADHD, as well as previous research, has described them as generally displaying more avoidance to tasks, less compliance, more off task behaviour, and less regard for the turn-taking conventions of spoken language compared to children who do not have ADHD. Bearing in mind the limitations associated with the small sample size of the present study and the low counts of these descriptive outcomes, there some interesting possibilities associated with this information.
Several spoken behaviours might have reflected the difficulties that the children with ADHD had in initiating or maintaining language use. It is possible that children with ADHD may be more likely to experience difficulty with the demands of language use, and to display this difficulty in their behaviour by avoiding the task, by giving unrelated information, and by more instances of interrupting and overlapping speech. In this study, they did, however, ask for clarification more often than the control children, which would suggest that they were in fact quite willing to comply with the task, at least initially. It might also suggest that they lacked the confidence to proceed with the task once they understood its demands.

5.7. Interpretations of the Use of Written Conventions in Texts

Both spelling errors and punctuation errors were much more likely to occur in the texts of children in this study who had a diagnosis of ADHD. Problems with literacy are strongly associated with the condition of ADHD. However, in this sample none of the children with ADHD had been identified as learning disabled. This may in fact be a comment on the educational resources available to the children who participated, although attempts were also made to match the children for school progress and to match the schools themselves in terms of socio-economic rank.

Given that every effort was made to achieve close matching on relevant factors, it remains to question this discrepancy found in written language ability between the two groups of children. Possible explanations are that, although not formally identified as learning disabled, the children with ADHD may have fallen towards the lower end of a continuum of ability in their classrooms, or that their difficulties with creating written
texts were not apparent in other aspects of their work. Further details concerning academic ability in the sample group would be required in order to explore this speculation. Nonetheless, these issues provide potentially fruitful material for further research into the abilities of ostensibly normally achieving students with ADHD.

5.8. Macro Textual Organisation

The ways of investigating the texts for macro textual organisation were intended to give a crude impression of the use of such devices as openings and overviews (beginnings), concluding remarks and summaries (endings), and of the typographical layout of written texts (specifically numbered procedural steps and written point form). It was found that the children with ADHD showed a lesser use of these strategies when compared to the control children (see Table K2 in Appendix K). These results may have some concurrence with the more fundamental, underlying difficulties with the organisation of texts that were displayed in other ways by the children with ADHD. However, the value of these crude measures is that they may be useful as teaching strategies in remediation programmes, and provide a macro level marker for the use of these other linguistic resources. For example, commencing a procedural text with numbered procedural steps may assist with the organisation of the ideas, and the resulting text.

5.9. Length of Texts

The texts created by the two groups of children were not significantly different in length when length was assessed by utterance counts and by word counts. Therefore, comparisons between the groups could be made with the confidence that the texts created by the children could be considered essentially equal in length in terms of the
number of clauses and the number of words that comprised them. This occurred independently of any design requirement of the study.

Mention has been made in the literature of differences in the quantity of verbal material in the texts of children with ADHD when compared those of children who do not have ADHD. Findings have reported both verbal paucity as well as verbal excessiveness among the children with ADHD. This is often attributed to problems with inhibition that children with ADHD are known to experience. Results from the current study did not replicate this expectation.

In this study, the method undertaken differed from that used in previous studies in that particular effort was made to sample the children’s language in several contexts (two different modes of expression and three different text types). In addition, particular effort was made to maximise the positive engagement of the children by using activities that were age-appropriate in terms of high interest and fun. This was intended to provide both groups of children with high motivation. This may have been more pertinent to children with ADHD who are accustomed to academic failure and disinterest. The method may have given the children with ADHD increased opportunity to create texts that would be comparable to those of the control children, in that they were not disadvantaged in terms of motivation. Children with ADHD are frequently reported to show differential application to tasks depending on their apparent interest with the topic or the activity.

In summary, the findings from the current study suggest that it is the ‘quality’ rather than the quantity of the texts that the children create that differentiates the language abilities of children with ADHD when compared with their non-ADHD peers.
5.10. Summary of the Discussion

The discussion attempts to present the case that ADHD affects language use, and that the mode of expression and the text type are likely to contribute to the differences that result. As presented in detail in Chapter 4, differences between the children with ADHD and the control children in their patterns of language use were observed during this study, and these differences were associated with the mode of expression and the text type.

Using notions drawn from SFL, the differences provided evidence of particular difficulties experienced by children with ADHD in the organisation, complexity, and coherence of texts. The findings are similar to many that have been previously reported. The mode of expression and the text type exemplified the important role of context in language use, as suggested at the beginning of the thesis.

The discussion attempted to describe how ADHD, the channel of communication, and the type of text influenced the options with respect to the various linguistic resources available for creating texts. The most informative result concerned the use of thematic structure and clause structure, which were both sensitive to the effects of all three independent conditions, namely the diagnostic status of the children, the mode of expression, and the text type. Thematic structure and clause structure are two aspects of the textual metafunction of language. This means that these two abilities are involved in the way that the child creates a coherent and linear text. For the children with ADHD, these abilities were affected by what channel of language was being used (spoken or written) and what the general purpose of the language was (the text type). The impact of all this differed to the way these factors influenced the control children.
Other results were in a similar vein, and contributed to the conclusion that the children in this study who had ADHD displayed difficulties with the textual metafunction of language. These observations were determined separately to those using formal assessment tools, which indicated that the children displayed age appropriate language skills. This means that any assessment that relied on formal language assessment tools only would probably not be able to detect the types of difficulties experienced by the children with ADHD.

5.11. **Clinical Applications**

This research suggests several areas where clinical practice may benefit from the results. Firstly, it appears that difficulties in language use exist for children with ADHD. The sensitivity of standardised tests to the types of language difficulties that children with ADHD may experience is questioned. The challenge for clinicians lies in developing a repertoire of language sampling and analysis techniques that give an indication of the child’s functioning in different contexts, across different modes of expression, and for a wide variety of functions of language.

Assessment procedures that are highly engaging and naturalistic may yield more useful information than formal tests. In this research, the one to one relationship between the child and the researcher appeared to have a positive influence on compliance and motivation, which are important considerations when the child’s ‘best efforts’ are required. Best efforts with these children do not always typify usual efforts, and the circumstances surrounding both need to be clearly understood.
The assessment of language skills in children with ADHD may be more valid when the task is highly engaging. This is intuitively acknowledged by clinicians. However, many may feel constrained to adhere to models of practice that primarily require the administration of, for example, formal test instruments. Alternatively, if they do conduct language sampling, clinicians may be pressured to attain texts of a prescribed length. While it is no doubt necessary to ensure that a realistic representation of the child’s language abilities has been observed in order to assess function and to plan the necessary intervention, clinicians may be better advised to be mindful of gaining this information by observing the child in multiple contexts rather than worrying about the length of sample texts that are obtained in any one setting. This approach has useful parallels with the overall behavioural observations that should be made in multiple settings when ADHD is being investigated by other professionals, as advised by DSM-IV.

It is more than likely that the treatment of theme is not usually considered in clinical settings. However, the relative simplicity with which some forms of theme can be identified (as occupying the initial position in the clause or text) means that the study of theme as a clinical tool could be incorporated with ease into treatment regimes. The potential benefits of some instruction in the art of use of this textual ‘enabling function’ to children struggling with coherence in their spoken and written language provides a potential avenue for further investigation.

As Halliday (1994) suggested, it is in written texts that the structural use of elements of grammar can most easily be demonstrated. Clinically, it is often the practice to only assess children’s spoken language. As a useful clinical tool, examining the written texts of children with ADHD in terms of clausal structure and the relationships
between clauses might be enlightening. Instructing children with ADHD in the ways of enriching and expanding their written texts using extension, elaboration, and enhancement may be of benefit, and might also generalise to the more dynamic spoken mode of expression.

5.12. Limitations of the Study

The limitations of the small sample size to this type of research are acknowledged. As explained, the decision was made to cease the recruitment process in view of the high number of children who were ineligible to participate in the study, mainly because of SLI. Only two tests were used to assess language ability. It would be interesting to determine the contribution of different formal test instruments, or different functional scales, for example, those used to assess pragmatic language ability. In addition, distinctions between the different subtypes of ADHD, which is a factor that is being increasingly seen as significant in the literature, were not made.

The cognitive ability and the academic performance of the children may have benefited from a more rigorous approach, especially with regard to the literacy skills of the sample. As with the number of participants, the decision was made to proceed without this information in an effort to complete the study within a reasonable time frame.

Similarly, the exact equivalence of the groups in terms of semantic and syntactic language ability remains in question. In this thesis, normal performance on the standardised text instruments was one of the eligibility criteria. It is interesting to speculate about what contribution these characteristics of language may have on the
spoken and written discourse of sample children. Nonetheless, of importance is the observation that the formal test instruments appear to have examined the children’s language from one perspective, while the SFL analysis has focused on something else, and in doing so has demonstrated distinct differences between the groups.

The effect of administering the elicitation tasks in order was not examined, and there could possibly have been some practice effect that was not addressed. Such an effect could have contributed to an erosion of equivalence across the different tasks for the children. In addition, some of the texts were short and perhaps not sufficiently comprehensive to validly reflect the children’s overall language abilities. Despite this, the decision was made to adhere to the elicitation method so as to preserve the naturalness and meaningfulness of the task and the enjoyment of the children.

At no stage of the research was the experimenter blind to the group membership of the participants, and so the study was open to experimenter bias. The experimenter conducted each phase of the research alone, and was assisted in the transcription and coding processes. Reliability for clause division was examined, but for other judgments, this proved difficult. However, coding was discussed extensively with other individuals who were familiar with SFL.

Perhaps the most significant limitation relates to the complex array of statistical procedures that were used. The logistic regression, for example, did not provide the usual statistical information, such as confidence intervals. This means that the size of the effects that were observed could not be further evaluated. However, it was a reasonably suitable method considering the exploratory nature of the study. Every effort was made to progress with the exploration of the texts, and to include the various
linguistic features in the texts as data, even though this meant that the types of data varied. However, the decision was made to proceed, mindful of the constraints of the different statistical methods.

At the other extreme were the descriptions of some of the features of the texts that were used as data. Again, it was thought that rather than exclude this data, it could be included with the knowledge that the information gained from it would be little better than anecdotal.

5.13. Directions for Further Research

The high exclusion rate of potential participants because of SLI is an important consideration for future research. It should be anticipated in research as well as in clinical settings that SLI will co-occur with ADHD to a substantial degree. An interesting area of further research could explore potential differences to the types of outcomes observed in this study among children with ADHD and co-morbid SLI.

This research was exploratory in nature. However, further research to differentiate between those children who have ADHD plus SLI, and those who appear to have ADHD only, appears to be warranted. Further research that explores the scale of language performance, from variability to disorder, and how judgments are made concerning language appropriateness, is also valid.

Further research into those aspects of language use that were presented as descriptive outcomes with low incidence counts would help to elucidate their importance. The use of other formal test instruments, including the newer scales and
checklists of pragmatic language ability (for example the Children’s Communicative Checklist), would also be of interest as comparisons for SFL analyses.

The consideration of the results in the light of theories about the role of executive function in contributing to the behaviours seen in ADHD would be of interest. Since language is a behaviour that requires high level organisation, the association between executive function and language use requires further investigation.

In this study, information about exactly how the component clauses within clause complexes relate to each other, and what different combinations mean, was not systematically collected or analysed. Doing so would greatly enhance the understanding of the present findings, and provide an avenue of valuable further research.

One way of organising thematic choice throughout texts is known as thematic progression. These patterns were not investigated in this study. However, doing so would contribute much to this discussion, and is an area of potentially fruitful further research. It is these patterns that contribute significantly to the cohesion and coherence of texts.

The spoken text types used in this study were brief, and there was some overlap between the genres that were elicited. For example, the story retell resembled a monologue more than it resembled typical spoken language. Further research, using the SFL framework into other forms of spoken language, particularly conversation as well as other spoken genres (such as exposition) would be of great interest.

Finally, an interesting outcome of this study was that the children with ADHD seemed to be aware of some of the difficulties they were experiencing with language
formulation. They often went on to produce efforts at repair, for example, by mazing, or by abandoning their attempts. It has been suggested in the literature that children with ADHD may possess adequate linguistic skills but fail to demonstrate their use of these skills. Anecdotal reports suggest that it is often assumed that these children are either unaware of the errors they make, or that their characteristic disinhibition overrides their sense of consideration of linguistic rules. The findings from this research question those assumptions. Research into the judgmental capacities of children with ADHD with regard to linguistic correctness or adequacy may prove fruitful in illuminating this issue.

5.14. Conclusions

The aims of this thesis were to explore the language use of children with ADHD so that comparisons could be made with the language use of typically developing children. This study provided a clear demonstration that the way children with ADHD used their language was different to the way their non-ADHD peers used language. Furthermore, the study found that differences in language use occurred independently of any specific language impairment.

The mode of expression of language, and the text type were investigated in relation to the differences in language use, and were considered as contextual factors. These aspects of context influenced the way the differences in language use became evident, and so context, which has already been identified as significant in ADHD behaviour generally, is particularly so in terms of its association with differences in language use.
The perspective of Systemic Functional Linguistics used in the study helped to illustrate that these differences were beyond the scope of normal variation, and were indicative of the difficulties experienced by the children with ADHD with the organisation of discourse, with cohesion, and with complexity. In SFL the textual metafunction, the organisation and coherence of texts, whether spoken or written and irrespective of length, has been termed ‘the enabling function’. To children already struggling, or those at risk of difficulties with coherence in their spoken and written language, the potential benefits of discovering the importance of this linguistic resource and some instruction in the art of its use should not be underestimated.


tasks in videogame play and on a visit to the zoo. *Journal of Abnormal Child Psychology, 30*(5), 447-462.


APPENDIX A

PARENT QUESTIONNAIRE

The following questionnaire was given to the parents or caregivers of each of child who was recruited for the study. The section headed, “Diagnosis” was contained in the questionnaires given to the parents of children with ADHD only. The remainder of the questionnaire was the same for both ADHD and control groups.

Parent Questionnaire

It would be appreciated if you would supply the following information. It is important because I need to be able to accurately describe the nature of the group of children I am studying. Neither you nor your child will be individually identified, and the content of these forms remains confidential.

It may be necessary to tick more than one box for some items. If you are concerned about any question, I would be very happy to discuss it with you in person.

CHILD: Month and year of your child’s birth:

- **Sex**: M … F
- **Main language**: English … Other
- **Health**: Generally well … Unwell/health problems
- **Hearing**: No problem … Hearing impaired
- **Vision**: No problem … has difficulties
- **Motor development**: Normal … Has difficulties
- **Where born**: Australia … elsewhere
- **Aboriginal or Torres Straight Islander descent**: Yes … No
**SCHOOL:** government/non-government:

Class/year:
General ability: average/above average/below average
General school progress: average/above average/below average
English: average/above average/below average
Reading ability: average/above average/below average
Speech & language: average/above average/below average

(This is an important aspect of the study. Please indicate in the space below whether or not you feel your child communicates effectively. If not, what is the nature of the difficulty? Has your child ever previously been seen by a Speech Pathologist or had Speech Pathology attention suggested? If ‘yes’, what was the outcome?)

Tutoring: Yes … No

**OTHER DIFFICULTIES IDENTIFIED BY AN OUTSIDE PROFESSIONAL:**

Behaviour problems: yes/no
Conduct problems: yes/no
Learning problems: yes/no

**COMPUTER EXPERIENCE:** average/above average/below average

**FAMILIARITY WITH ‘SIMPSON’S’ SOFTWARE:** very familiar/familiar/not familiar/don’t know

**[DIAGNOSIS]:**

Child’s age & year of diagnosis:
Diagnosis: ADD/ADHD; mixed ADD+ADHD/unsure
Who diagnosed?: Medical specialist/ family doctor/ teacher/ other
Suggested treatment: Ritalin/ other drug / counselling/ other
Treatment history:
Current treatment: …]
FAMILY: number of children:
Children living at home:
Child’s position in family:
Languages spoken at home: English/other

LOCATION OF FAMILY HOME: postcode:

PARENTS:
Marital status: married/never married/de facto/separated/divorced/single
(Complete for Mother as well as Father where applicable)
Where born: Australia/elsewhere
Completed high school: yes/no
Completed further qualifications: yes/no
Completed degree or higher: yes/no
Working: yes/no; full time/part time
Occupation:

Thank you for taking the time to complete this form. Your co-operation and that of your child during this research has been truly appreciated. I wish you and your child all the very best in the future.
APPENDIX B

ATTRITION OF INITIAL PARTICIPANTS

Many more children with ADHD than control children were volunteered by parents, and a large proportion of these children were unable to meet the criteria for the study. The attainment of suitable control children, particularly those that came close to matching the characteristics of the children in the subject group, became difficult. Considerable time was spent in the recruitment process and eventually, in the interests of advancing the study, recruitment was stopped. It was decided that a further investment of time may not result in a significantly increased number of suitable participants.

Table B1  Attrition of Initial Participants

<table>
<thead>
<tr>
<th></th>
<th>ADHD</th>
<th>CONTROL</th>
</tr>
</thead>
<tbody>
<tr>
<td>SLI</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>Unable to contact</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Incomplete data</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Medicated</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total ineligible</strong></td>
<td><strong>9</strong></td>
<td><strong>6</strong></td>
</tr>
<tr>
<td>No suitable match</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total lost to study</strong></td>
<td><strong>14</strong></td>
<td><strong>10</strong></td>
</tr>
</tbody>
</table>
# APPENDIX C

## ADHD and Control Groups: Age, CELF and TOPL Scores

Table C1  Summary statistics for age and two formal test outcomes (CELF; TOPL)

<table>
<thead>
<tr>
<th>GROUP</th>
<th>AGE</th>
<th>CELF</th>
<th>TOPL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CONTROL</strong></td>
<td>n = 11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MEAN</td>
<td>11.13</td>
<td>115.27</td>
<td>104.82</td>
</tr>
<tr>
<td>MEDIAN</td>
<td>11.33</td>
<td>119.00</td>
<td>106.00</td>
</tr>
<tr>
<td>RANGE</td>
<td>3.60</td>
<td>33.00</td>
<td>19.00</td>
</tr>
<tr>
<td>SD</td>
<td>1.22</td>
<td>11.00</td>
<td>6.19</td>
</tr>
<tr>
<td><strong>ADHD</strong></td>
<td>n = 11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MEAN</td>
<td>11.03</td>
<td>105.91</td>
<td>104.55</td>
</tr>
<tr>
<td>MEDIAN</td>
<td>11.00</td>
<td>106.00</td>
<td>105.00</td>
</tr>
<tr>
<td>RANGE</td>
<td>3.40</td>
<td>40.00</td>
<td>35.00</td>
</tr>
<tr>
<td>SD</td>
<td>1.20</td>
<td>11.52</td>
<td>12.62</td>
</tr>
<tr>
<td>p-value</td>
<td>0.82</td>
<td>0.08</td>
<td>0.97</td>
</tr>
</tbody>
</table>
Socioeconomic status was estimated using the guidelines of the NSW Department of Health (NSW Department of Health, 2002, p16). In this document, socio-economic indices for areas (SEIFA) were derived from multiple weighted variables, and were based on figures from the 1996 Australia-wide census.

**Table D1**  Index of Education and Occupation

<table>
<thead>
<tr>
<th>AREA</th>
<th>REFERENCE SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>1000</td>
</tr>
<tr>
<td>Hunter</td>
<td>965</td>
</tr>
<tr>
<td>NSW a</td>
<td>1012</td>
</tr>
</tbody>
</table>

*a NSW range = 1142 - 925

**Table D2**  Index of relative socioeconomic disadvantage

<table>
<thead>
<tr>
<th>AREA</th>
<th>REFERENCE SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>1000</td>
</tr>
<tr>
<td>Hunter</td>
<td>972</td>
</tr>
<tr>
<td>NSW a</td>
<td>1007</td>
</tr>
</tbody>
</table>

*a NSW range = 1121 - 914
E1.1. Transcription markers used for spoken texts

… = pause of greater than 3 seconds; shorter pauses (marked in transcripts as . or .. ) were not coded

^ = rising intonation

~ = rise/fall/rise pattern of intonation

↓ = falling intonation

E1.2. Text examples from control children

“well it starts off with Bart um..and ... Bart and h’ um Lisa were going to do a magic show↓ and Homer fell asleep on the set↓ ... so ... they had him in the middle of it↓ and then ... when Barts experiment went wrong~ Lisa um wasn’t sure what to do so then ... Bart ... um ... was going to run off and he told Lisa to go the other way↓ ... and ... then this big ... blobby green thing which is what they were afraid of kept … um ... jumping up and down↓ it scared all the audience↓ yeah ... and then ... um the scene was going to blow up↓”

Figure E1   Control child’s (C18) spoken story retell
“um ... well ... yer can ... you start off um just explaining what we're going to do and then ya ya start doing (points to computer)... cartoon studio and then ... um ... when you finish it you have to um ... write down a ... about ... just do a story about the um cartoon ... and then do a recount ... umm you have to make the cartoon for ... fox studio and ... and that's all really”

Figure E2  Control child’s (C04) spoken recount

“um ... first you have to go into um background^ ... which is the one with the sun on it^ picture with the sun on it^ you have to choose one of your favourite backgrounds^ and whichever one you think would ... make your story the best^ ... and then choose some props or the characters~ ... and then get the characters to do whatever you want and then um you can ... put sound in^ and ... use um ... other ... characters to help out your story more↓ and you can ... um ... you can only use one thousand two hundred scenes^ ... sort of thing^ ... and ... (unintelligible)”

Figure E3  Control child’s (C03) spoken procedure
Lisa got home from school, dragged herself into the kitchen to grab a packet of chips, and slowly walked into the lounge room. She flicked on the tv, plonked herself on the lounge, and started crunching on her chips whilst watching Krusty the clown. Just at that moment, Marj walked in.

“Hi mum!” Lisa said. Marj noticed the chips in her hand.

“Oh Lisa!” Marj exclaimed, a bit annoyed with Lisa.

“Oh hu?” Lisa didn’t know what was wrong.

“That was your father’s dinner! Oh well, we will have to buy some more. Come on!” so off they went, to buy some more chips for Homer.

**Figure E4**      Control child’s (C16) written story retell

Through the weeks we have been doing lots of pitures and what is happening in the pitures. We’ve done shapes and colours. We’ve also done some phases. I had to name as many items of clouthing and food that I could and make sentences out of some words. The last thing I can think of is doing the Simson Cartoon Studio with the camra and the recorda.

**Figure E5**      Control child’s (C05) written recount
### Simpson's studios.

**Procedure**

1. Enter Simpson's studios.
2. Enter a new file and select the background.
3. Click on the sofa and put in furniture.
4. Position your furniture on the screen.
5. Select your character and his action and position him on the map.
6. Put in the special effects.
7. Select music.

**Figure E6**  Control child’s (C24) written procedure

### E1.3. Text examples from children with ADHD

"well . um it's bart's dream and he's so and miss there's jus' .. hu-homer is in one of those little golf cars and mister burns is flying over and maggie is like sitting in the middle dancing kind of .. and skinner's there and um lisa gets electrocuted and nelson he's just standing there and mister skinner's standing there but mister skinner was meant to um .. do a moonie^ but he didn't^ and then bart gets on his skateboard as bartman .. and he um .. he moves very slowly along and he he gets goes away .. and then .. um he (unintelligible) and then he comes back in a little car^.. Yep and then that's the end of it."

**Figure E7**  Child with ADHD (S29) spoken story retell
"recount↓ like (other child’s name) and (other child’s name) ^ (researcher) ... recount↓ ... (researcher) .. yep~ recount↓ well first of all~ ... we ... (um) done half the book ... the booklet thing~ ... on answers and questions and stuff ... and then~ ...next time we done the rest of the book and the box ... and today I done a good (unintelligible)↓ ... (researcher) .. ooh .. kind of ... (researcher) ... and it's not too hard↓ ... not too hard↓ ... ooh oh ..that's it~ yeah↓.

**Figure E8**  Child with ADHD (S04) spoken recount

"I don't think I can↓ ... (researcher) ... so ... do you need just need to go through what we do^ or ... or how .. what you do and how you do it^ ... (researcher) .. just what they do^ ... (researcher) .. you start~ ... by^ ... (researcher) .. why don't you write it as I speak↓ ... (researcher) .. you start ... by ... setting your background~ ... as in what room or place it's in~ .. then you .. put your props which .. place your props which ... are: normally things like tables refrigerators toasters etcetera~ .. you add ... you .. no↓ you .. then you put in your characters~.. and animate the characters~ .. and then animate the props~ .. and then add the sound effects and special effects↓ there you go↓.’

**Figure E9**  Child with ADHD (S03) spoken procedure
Bart and Homer hiking.
Bart sneaks off.
Homer secretly follows Bart.
Bart accidentally walks off cliff.
Homer laughs at Bart.
Bart gets out a parachute.

**Figure E10**  Child with ADHD (S03) written story retell

The 1st day we did boring stuff. The 2nd day was a little more fun because I got to go onto the computer and make a scene of the Simpsons. The 3rd day was the most fun because I got to make a whole scene of the Simpsons and I got taped on a camera.

**Figure E11**  Child with ADHD (S11) written recount

1 choose backdrop.
2 choose character.
3 choose action.
4 Hold in button and act.
5 Rewind.
6 Use music.
7 choose sound effects.
8 Make-up ending.

**Figure E12**  Child with ADHD (S23) written procedure
APPENDIX F

CLAUSE DIVISION

F1.1. Examples from control children

| Clause 1 | Homer is laying on a couch watching TV |
| Clause 2 | and he says                              |
| Clause 3 | boring                                  |
| Clause 4 | 'cos there's nothing to watch on TV     |
| Clause 5 | Then Lisa is just standing on the side of the picture |

Figure F1 Control child’s (C17) spoken story retell
| Clause 1 | The Day the Power plant melted down |
| Clause 2 | One day Homer Simpson goes to work. |
| Clause 3 | Like always he feel asleep. |
| Clause 4 | while he is sleeping |
| Clause 5 | the power plant started to melt down. |
| Clause 6 | A loud red flashing sigren wakes Homer up. |
| Clause 7 | Homer tries to stop the melt down. |
| Clause 8 | and gets electricuted. |
| Clause 9 | he goes up to heaven |
| Clause 10 | but falls back down again |
| Clause 11 | he gets up |
| Clause 12 | and runs home again crying. |
| Clause 13 | The end |

**Figure F2**  Control child’s (C04) written story retell
Clause 1  well first of all you have to go into new
Clause 2  yeah
Clause 3  um then you go into this little sun thing
Clause 4  and it's um it's down the bottom
Clause 5  and um it's
Clause 6  you pick your set
Clause 7  sort of like you can have it on the Simpson's couch or on in the tree house or something
Clause 8  then um you go into all your props that you want which is a picture of the Simpson's lounge
Clause 9  and the props like um like
Clause 10  you can have chairs and tables and blenders and all that
Clause 11  after you've got all your props
Clause 12  you go to your characters

**Figure F3**  Control child's (C06) spoken procedure

**F1.2.  Examples from children with ADHD**

Clause 1  well at the start Bartman is playing around in his cubby
Clause 2  and he starts to fly
Clause 3  but accidently flies out the window
Clause 4  and then MrBurns sees that he's flying
Clause 5  and thinks
Clause 6  he'll fly.
Clause 7  fly in through the window
Clause 8  and actually makes it safely
Clause 9  and then at the start Marge was bowling

**Figure F4**  Child with ADHD (S13) spoken story retell
| Clause 1 | on the planet Namek 2 aliens appear from nowhere |
| Clause 2 | and then Bart zaps them into another dimension |

**Figure F5**  Child with ADHD (S11) written story retell

| Clause 1 | you do the background |
| Clause 2 | then you get your character |
| Clause 3 | you get your part |
| Clause 4 | you choose which one you want |

**Figure F6**  Child with ADHD (S23) spoken procedure
APPENDIX G

EXAMPLES OF MAZES

SALT describes mazes as “…any false start, repetition, or reformulation” (SALT electronic reference guide; Mazes and Part Words). As directed by the SALT software, mazes were designated by enclosing the portion of each text that was mazed within parentheses.

The following randomly selected examples of mazes are drawn from each of the spoken text types. These examples are not divided into clauses.

Key to tables:
: indicates a pause of more than three seconds
* indicates a part word within an utterance when the utterance was not abandoned.
C = control, followed by 2 digit identification number
S = ADHD, followed by 2 digit identification number

Table G1   Examples of mazes in spoken story retell texts of control children

<table>
<thead>
<tr>
<th>C03</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>(: and that : um) he just : gets it all wrong</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C26</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>(um) I've named it (um ah :) a general day at the Quickie Mart (um :) Bart has an unusual reaction (um : the :) when he runs off</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C24</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>so (heh) Homer runs up after he gets electrocuted from the tv and the (er) power plant thing there</td>
<td></td>
</tr>
</tbody>
</table>
Table G2  Examples of mazes in spoken recount texts of control children

C03 (and I um) we had a go of the simpson's cartoon studio and you made me (do a recount r) write down a recount
C04 (um :) well (: yer can :) you start off (um) just explaining what we're going to do you have to (um : write down a : about :) just do a story about the (um) cartoon
C26: (um : wuh) it's really easy

Table G3  Examples of mazes in spoken procedural texts of control children

C05 (um oh you drag) you click and drag
C06 and (it's um : ) it's down the bottom (and or) you put all the characters (where they) where you want them
C16 (you can put in) you can put in more than one character

Table G4  Examples of mazes in spoken story retell texts of children with ADHD

S04 and there's a fire extinguisher and (everyth* like) all that kind of stuff in the background
S09 well all the Simpsons are (on their : at their : at the f*) out the front of their house
S31 and : he's standing there (thinking : of :) thinking What's going on there must be aliens inside the : ray : gun controlling it (: puh*) and making (all) all these things he sees (or) all (thee*) these people that (: m) making (muh* :) something

Table G5  Examples of mazes in spoken recount texts of children with ADHD

S15 (then you have then) you have to do a writing thing then
S29 and gets you into the school(and um go up to : department) office or somewhere
S34 and she'll ask you (like) : a question like

Table G6  Examples of mazes in spoken procedural texts of children with ADHD

S11 (and you put um :) you get to put some sound effects on it
S13 you go down to the (um) people (in the Simpson) where the Simpson's live
S15 (It's gonna take long long :) this is like a long boring test
Where a word was repeatedly misspelt throughout a text, it was only counted as one error. Spelling errors that were observed in the texts are listed below with the error preceding the correct spelling.

**H1.1. Errors made by control children:**

- bemed/beamed
- depresed/depressed
- tryes/tries
- electrocuted/electrocted
- sigren/siren
- Alien/alien
- flouting/floating
- Zaps/zaps
- exploction/explosion
- carachters/characters
- caracter/character
- camra/camera
- costum/costume
- tire/tyre
- trys/tries
- feel/fell
- alain/alien
- alot/a lot
- zapping/zapping
- coach/couch
- carecter/character
- caracters/characters
- right/write
- clouthing/clothing
H1.2. **Errors made by children with ADHD:**

- Of/off
- buggie/buggy
- screan/screen
- he/her
- there/their
- wif/with
- another/another
- cubbes/cubby’s

- capeable/capable
- crean/screen
- electroed/electrocuted
- minny-mini
- ther/there
- alions/aliens
- apear/appear
- flys/flies
<table>
<thead>
<tr>
<th>is/his</th>
<th>marres/Marge’s</th>
</tr>
</thead>
<tbody>
<tr>
<td>pall/pal</td>
<td>were/where</td>
</tr>
<tr>
<td>blod/blob</td>
<td>chadse/chased</td>
</tr>
<tr>
<td>dy/by</td>
<td>geling/getting</td>
</tr>
<tr>
<td>geting/getting</td>
<td>haven/heaven</td>
</tr>
<tr>
<td>Hmomi/Homie</td>
<td>invechen/invention</td>
</tr>
<tr>
<td>Lieze/Lisa</td>
<td>macks/makes</td>
</tr>
<tr>
<td>MR BURENS/Mr Burns</td>
<td>stroy/story</td>
</tr>
<tr>
<td>thals/that’s</td>
<td>inter/inner</td>
</tr>
<tr>
<td>grabbed/grabbed</td>
<td>gulf/golf</td>
</tr>
<tr>
<td>marvlous/marvelous</td>
<td>seret/secret</td>
</tr>
<tr>
<td>skateboard/skateboard</td>
<td>vido/video</td>
</tr>
<tr>
<td>avrebody/everybody</td>
<td>cosd/caused</td>
</tr>
<tr>
<td>freesse/freeze</td>
<td>Nisen/Nelson</td>
</tr>
<tr>
<td>stening/standing</td>
<td>thicking/thinking</td>
</tr>
<tr>
<td>steels/steals</td>
<td>busuy/busy</td>
</tr>
<tr>
<td>hapens/happens</td>
<td>moing/mowing</td>
</tr>
<tr>
<td>to/too</td>
<td>indendifining/identifying</td>
</tr>
<tr>
<td>eposode/episode</td>
<td>Simpons/Simpsons</td>
</tr>
<tr>
<td>senses/sentences</td>
<td>littel/little</td>
</tr>
<tr>
<td>activeites/activities</td>
<td>bequick/be quick</td>
</tr>
<tr>
<td>coular/colour</td>
<td>coulours/colours</td>
</tr>
<tr>
<td>ment/meant</td>
<td>picher/picture</td>
</tr>
<tr>
<td>sarcasikly/sarcastically</td>
<td>audot/about</td>
</tr>
<tr>
<td>bo/do</td>
<td>mack/make</td>
</tr>
</tbody>
</table>
H1.3. **Punctuation errors**

This variable began in the thesis as grammatical errors but it soon became clear that the errors were falling into a category that would best suit the name ‘punctuation’. There were 11 different examples of punctuation errors that were coded from the data presented in the texts.

Apm = apostrophe missing  
Ea = error article  
Am = article missing  
Cm = capital missing  
Dsmm = direct speech marker missing  
Ecm = error capital missing  
Ep = error pronoun  
Smm = sentence marker missing  
Eva = error verb agreement  
Cmm = contraction marker missing  
Et = error tense
Cross validation of the outcomes of independent logistic regression was conducted using the GLMM approach. The output for this procedure is presented electronically (please see file on attached CD-ROM).
## Appendix J

**Formal Test Scores**

### Table J1

Formal test scores and comparisons

<table>
<thead>
<tr>
<th>ADHD ID</th>
<th>CELF-3</th>
<th>TOPL</th>
<th>CONTROL ID</th>
<th>CELF-3</th>
<th>TOPL</th>
</tr>
</thead>
<tbody>
<tr>
<td>S09</td>
<td>101</td>
<td>93</td>
<td>C06</td>
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<td>109</td>
</tr>
<tr>
<td>S29</td>
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<td>115</td>
<td>C16</td>
<td>127</td>
<td>107</td>
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<td>S23</td>
<td>109</td>
<td>111</td>
<td>C26</td>
<td>112</td>
<td>95</td>
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<tr>
<td>S03</td>
<td>128</td>
<td>119</td>
<td>C24</td>
<td>126</td>
<td>113</td>
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<td>S15</td>
<td>112</td>
<td>90</td>
<td>C17</td>
<td>119</td>
<td>112</td>
</tr>
<tr>
<td>S31</td>
<td>93</td>
<td>115</td>
<td>C13</td>
<td>120</td>
<td>106</td>
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<td>S33</td>
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<td>C09</td>
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<td>C04</td>
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<td>105</td>
<td>C03</td>
<td>109</td>
<td>94</td>
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</table>

The overall CELF-3 score, the total language score or TLS, is broken down into two main parts; the receptive language score, or RLS, and expressive language score, or ELS. RLS in turn is made up of scores for the subtests; concepts and direction (C & D), word classes (WC), and semantic relationships (SR). ELS is made up of scores for the subtests; formulated sentences (FS), recalling sentences (RS), sentence assembly (SA), and the supplementary subtests, listening to paragraphs (LP), and word associations (WA).
### Table J2  Breakdown of mean CELF-3 results

<table>
<thead>
<tr>
<th>GROUP</th>
<th>TLS</th>
<th>RLS</th>
<th>C &amp; D</th>
<th>WC</th>
<th>SR</th>
<th>ELS</th>
<th>FS</th>
<th>RS</th>
<th>SA</th>
<th>LP</th>
<th>WA</th>
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<td>10</td>
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<tr>
<td>CONTROL</td>
<td>115</td>
<td>120</td>
<td>15</td>
<td>12</td>
<td>13</td>
<td>110</td>
<td>11</td>
<td>12</td>
<td>12</td>
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</table>

### Table J3  Breakdown of median CELF-3 results

<table>
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<th>GROUP</th>
<th>TLS</th>
<th>RLS</th>
<th>C &amp; D</th>
<th>WC</th>
<th>SR</th>
<th>ELS</th>
<th>FS</th>
<th>RS</th>
<th>SA</th>
<th>LP</th>
<th>WA</th>
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<tbody>
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<td>11</td>
<td>106</td>
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<td>112</td>
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<td>12</td>
<td>12</td>
<td>11</td>
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## APPENDIX K

### RAW DATA TALLIES FOR DESCRIPTIVE VARIABLES

Table K1  Raw counts for variables of associated behaviour for both modes, and each text type. Categorical variables; N = 11

<table>
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<th>VARIABLE:</th>
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<th>UNRELATED</th>
<th>CLARIFICATION</th>
<th>INTERRUPTING</th>
<th>OVERLAPPING</th>
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<tr>
<td>SPOKEN</td>
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<td></td>
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<td>0</td>
<td>3</td>
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<tr>
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<td>4</td>
<td>1</td>
<td>1</td>
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<tr>
<td>procedure</td>
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<td>4</td>
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<td>2</td>
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</tr>
<tr>
<td>WRITTEN</td>
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<tr>
<td>story retell</td>
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<td>n/a</td>
<td>n/a</td>
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<tr>
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<td>1</td>
<td>0</td>
<td>n/a</td>
<td>n/a</td>
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<tr>
<td>procedure</td>
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<td>0</td>
<td>n/a</td>
<td>n/a</td>
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<td>CONTROL</td>
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<td>SPOKEN</td>
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<td>1</td>
<td>1</td>
<td>2</td>
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<tr>
<td>recount</td>
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<td>0</td>
<td>3</td>
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<tr>
<td>procedure</td>
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<td>1</td>
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<td>WRITTEN</td>
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<tr>
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<td>0</td>
<td>n/a</td>
<td>n/a</td>
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<td>procedure</td>
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Table K2  Raw counts for variables of macro textual organisation for both modes, and each text type. Categorical variables; $N = 11$

<table>
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<th>VARIABLE</th>
<th>TITLE</th>
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<th>PROCEDURAL STEPS</th>
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<td>N/A</td>
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<td>recount</td>
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<td>7</td>
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<tr>
<td>procedure</td>
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<td>5</td>
<td>N/A</td>
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<tr>
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</tr>
<tr>
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</tr>
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<td>0</td>
<td>N/A</td>
</tr>
<tr>
<td>procedure</td>
<td>2</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>CONTROL</td>
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<td></td>
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</tr>
<tr>
<td>SPOKEN</td>
<td></td>
<td></td>
<td></td>
</tr>
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<td>8</td>
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</tr>
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<td>2</td>
<td>8</td>
<td>N/A</td>
</tr>
<tr>
<td>procedure</td>
<td>2</td>
<td>7</td>
<td>N/A</td>
</tr>
<tr>
<td>WRITTEN</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>story retell</td>
<td>5</td>
<td>3</td>
<td>N/A</td>
</tr>
<tr>
<td>recount</td>
<td>2</td>
<td>0</td>
<td>N/A</td>
</tr>
<tr>
<td>procedure</td>
<td>4</td>
<td>0</td>
<td>7</td>
</tr>
</tbody>
</table>
## APPENDIX L

### LOGISTIC REGRESSION OUTCOMES

#### Table L.1
Outcomes of logistic regression showing degrees of freedom, deviance, and p-values

<table>
<thead>
<tr>
<th>VARIABLE</th>
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<th>DF</th>
<th>DEVIANE</th>
<th>P-VALUE</th>
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<tbody>
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<td>14.49</td>
<td>&lt; 0.001</td>
</tr>
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<td>Dependent</td>
<td>G</td>
<td>1</td>
<td>14.53</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td></td>
<td>M</td>
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<td>0.055</td>
</tr>
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<td></td>
<td>T</td>
<td>2</td>
<td>26.06</td>
<td>&lt; 0.001</td>
</tr>
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<td>Independent</td>
<td>G</td>
<td>1</td>
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<td>&lt; 0.001</td>
</tr>
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<td>M</td>
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<td>0.060</td>
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</tr>
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<td>5.64</td>
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<td>T</td>
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</tr>
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<td>23.49</td>
<td>&lt; 0.001</td>
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<td>0.040</td>
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<td>8.04</td>
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<td>10.48</td>
<td>0.001</td>
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<td>M</td>
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<td>16.16</td>
<td>&lt; 0.001</td>
</tr>
<tr>
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<td>EFFECT</td>
<td>DF</td>
<td>DEVIANCE</td>
<td>P-VALUE</td>
</tr>
<tr>
<td>------------------</td>
<td>--------</td>
<td>----</td>
<td>----------</td>
<td>---------</td>
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<td>G*T</td>
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<td>13.03</td>
<td>0.002   **</td>
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<td>3.78</td>
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<td>3.42</td>
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<td>G<em>M</em>T</td>
<td>2</td>
<td>12.97</td>
<td>0.002   **</td>
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<td>0.060</td>
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<td>M</td>
<td>1</td>
<td>83.04</td>
<td>&lt; 0.001 ***</td>
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<tr>
<td></td>
<td>T</td>
<td>2</td>
<td>9.40</td>
<td>0.010   *</td>
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</tr>
<tr>
<td></td>
<td>G*T</td>
<td>2</td>
<td>7.53</td>
<td>0.020   *</td>
</tr>
<tr>
<td></td>
<td>M*T</td>
<td>2</td>
<td>7.98</td>
<td>0.020   *</td>
</tr>
<tr>
<td></td>
<td>G<em>M</em>T</td>
<td>2</td>
<td>10.14</td>
<td>0.010   *</td>
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</table>

**LEXICO-GRAMMAR**

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<th>DEVIANCE</th>
<th>P-VALUE</th>
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<td>T</td>
<td>2</td>
<td>388.39</td>
<td>&lt; 0.001 ***</td>
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</tr>
<tr>
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</table>

**WRITTEN CONVENTIONS**

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<td>G*T</td>
<td>2</td>
<td>11.93</td>
<td>&lt; 0.001 ***</td>
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</table>

**SPOKEN BEHAVIOURS**

<table>
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<tr>
<th>VARIABLE</th>
<th>EFFECT</th>
<th>DF</th>
<th>DEVIANCE</th>
<th>P-VALUE</th>
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<tbody>
<tr>
<td>Abandoned</td>
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<td>10.07</td>
<td>0.002   **</td>
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**NOTE:**
- G = group main effect
- M = mode main effect
- T = text type main effect
- G*M = interaction between group and mode
- G*T = interaction between group and text type
- G*M*T = interaction between group, mode, and text type
- * 0.05 ≤ p ≤ 0.01
- ** 0.01 < p ≤ 0.001
- *** p ≤ 0.001