The effect of Methylphenidate-OROS® on the narrative ability of children with ADHD

by

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ABSTRACT:

Key words: ADHD, stimulant medication, narratives, macrostructure, microstructure, children, executive functions.

Background: The growing number of children diagnosed with attention deficit hyperactivity disorder (ADHD) underscores the importance of the role speech language pathologists play in addressing the language difficulties experienced by this population, including difficulties in narrative production, especially due to the close correlation between narrative performance and academic, as well as social, achievement. Although stimulant medication is the primary method of treatment for children with ADHD and is known to successfully address the behavioural and academic difficulties experienced by this population, few studies have focused on the effect of this medication on language difficulties. The need for speech-language services in the ADHD population is well documented in the literature, but it is not fully understood whether stimulant medication should be regarded as a replacement for, or an essential adjunct to speech language pathology services.

Objectives: The goal of the current study was to investigate the effect of Methylphenidate-OROS® (MPH-OROS®) on the narrative ability of children with ADHD, through the analysis of microstructure and macrostructure elements. Research has shown that children with ADHD experience difficulty in planning, organizing, and monitoring narratives. The current study was based on evidence suggesting that MPH may improve aspects of language production through its effect on the primary symptoms of ADHD.

Methods: A multiple single-subject pretest-posttest design was employed to examine the effect of MPH-OROS® on the narrative ability of children with ADHD. Wordless picture books were used to elicit narrative production as these books display the narrative structure valued by story grammar analysis (Stein & Glenn, 1979) while minimising the need for language comprehension and auditory memory capacity (McCabe, Bliss, Barra, & Bennett, 2008). Narratives were obtained from 12 children with ADHD (between the ages of 7 and 13 years). The children were presented with the wordless picture books for preview prior to the production of story narratives. The narratives were recorded and orthographically transcribed. For microstructure, narratives were coded using the Systematic Analysis of Language Transcripts (SALT) (Miller & Iglasias, 2012) coding conventions. Number of words, type-token ratio, and mean length of utterance were determined. For macrostructure, the narratives were analyzed and coded according to the Narrative Scoring Scheme (NSS) (Miller, Andriacchi, DiVall-Rayan, & Lien, 2003) which includes introduction, character development, mental states, referencing, conflict resolution, cohesion, and conclusion as well as a composite score reflecting the child's overall narrative ability.

Results: The administration of MPH-OROS® had a significant effect on aspects of language macrostructure, namely conflict resolution and cohesion, as well as overall narrative ability, based on the NSS total score. Little effect was noted, however, in microstructure elements. The effect of stimulant medication differed between participants, with particular differences noted in measures of productivity. MPH-OROS® increased productivity in certain participants while decreasing productivity in the remaining participants.

Conclusions: The positive effect of stimulant medication on the macrostructure elements conflict resolution and cohesion as well as overall narrative ability, in the

absence of an improvement in microstructure linguistic elements, suggests that the language difficulties experienced by this population may be due to difficulties in executive functions as well as inattention, hyperactivity, and impulsivity, all of which may have a negative impact on early language acquisition. While stimulant medication improves behaviours of attention and concentration, it cannot fully compensate for the poor structural and pragmatic language abilities, and the accompanying cascading effects, associated with the primary symptoms of ADHD. Therefore, a combination of treatments is advocated so as to ensure that children with ADHD are successful in reaching their full potential. In addition, the results highlight the possibility that response to stimulant medication may differ between ADHD-presentations, based on the presence or absence of the hyperactive component of ADHD.

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DEFINITION OF TERMS

The terminology employed in this study is listed below in alphabetical order. Definitions of the relevant terms and, in some cases, clarification of the terms as they are to be used in this report, are provided. In order to optimise the flow of the discourse these basic concepts will not be defined or explained again within the body of the dissertation.

List

Attention Deficit Hyperactivity Disorder	Pragmatics
Executive functions	Semantics
Language	Stimulant medication
Macrostructure	Story grammar
Microstructure	Syntax
Narrative	

Definitions

Attention Deficit Hyperactivity Disorder (ADHD) refers to a condition shared by a heterogeneous group of individuals who display developmentally inappropriate levels of inattention and/or hyperactivity-impulsivity (hyperactivity combined with impulsivity). This pattern of behaviour is persistent, with symptoms presenting in two or more settings (e.g. at home, school and/or work), and impacts negatively on social, academic, and/or vocational functioning (DSM-V; American Psychiatric Association, 2013). The acronym ADHD is used throughout the text to include inattentive, hyperactive/impulsive, and combined presentations of the disorder.

Executive functions is an umbrella term used to refer to the processes that are responsible for higher-level cognition necessary for achieving and maintaining a goal in possibly adverse circumstances (van Lambalgen, van Kruistum, & Parigger; 2008). In the context of ADHD, executive functions can be subdivided into 6 clusters: a)

activation, which refers to the organization and prioritisation of tasks, estimation of time, and task initiation; b) focus, which includes achieving, sustaining, and shifting focus; c) effort, involving the regulation and maintenance of alertness as well as processing speed; d) emotion, including the ability to modulate emotion and manage frustration; e) memory, including working memory; and f) action, which pertains to monitoring and regulating self-action (Brown, 2009).

Language refers to a "socially shared code or convention system for representing concepts through the use of arbitrary symbols and rule-governed combinations of those symbols" (Owens, 2001: 472). Language is generative in nature, providing users with a finite set of symbols and rules which can be used to express an infinite number of meanings (Hoodin, 2011:5).

Macrostructure, in linguistics, refers to the global or overall aspects of language that extend beyond the basic utterance level (Heilmann, Miller, Nockerts, & Dunaway, 2010; Kintsch & van Dijk, 1978). Producing narrative macrostructure (or achieving narrative *coherence*) therefore requires from an individual the ability to systematically formulate ideas and to sequence these events within a causal-explanatory framework (story grammar – see definition below), while engaging pre-suppositional skills, ensuring the entirety of the meaning reaches the listener intact (Losh & Capps, 2003). Macrostructure is analysed utilising story grammar, which proposes that a story should have a setting (background information) and episode structure (i.e., story components including, at least, an initiating event or problem, attempt at resolving the problem, and subsequent outcome or consequence) (Heilmann et al., 2010; Justice, Bowles, Kaderavek, Ukrainetz, Eisenberg, & Gillam, 2006; Kintsch & van Dijk, 1978). The term *macrostructure* cannot be discussed adequately without reference to the many tools of coherence with which story events are related to one another (Hoff, 2005:411). Examples of these tools include, but are not limited to, referential coherence (clarification of the object or event to which one is referring, achieved through the use of verbal clarifiers such as pronouns and antecedents) (Miller, Andriacchi, & Nockerts, 2011), as well as the sequencing and description of story events with regard to location, causality and time (Gernsbacher, 1997; Hoff, 2005:382).

Microstructure refers to the local level of discourse, concerned with the internal linguistic structures used in the construction of narratives at the sentence level (Justice et al., 2006; Kintsch & van Dijk, 1978). Microstructural language elements include linguistic form and content of individual utterances (Heilmann et al., 2010). Linguistic form can be separated into productivity (typically measured by total number of words produced during narration) and grammatical complexity, including syntactic (mean length of T-units) and semantic complexity (number of different words) (Justice et al., 2006; Petersen, Gillam, Spencer, & Gillam, 2010). Linguistic content refers to the expressive vocabulary employed by the individual and includes lexical diversity (measured by type-token ratio) (Heilmann et al., 2010).

A *narrative* is a form of discourse that is usually self-initiated and self-controlled by the speaker (Owens, 2014:226). When engaging in narrative language, one typically shares information about an event or story. In general, the emphasis during narration is on the speaker to tell or retell the story, necessitating little input from the communication partner (Miller et al., 2011:15-16). Formulation of a mature narrative is dependent upon two distinct underlying components, namely narrative macro- and microstructure elements (Justice et al., 2006).

Pragmatics refers to the linguistic rules governing the use of language for communication within social contexts (Hoodin, 2011: 237). These rules can be divided into three general categories, namely alternation, co-occurrent constraint, and sequence. The rules of alternation are concerned with the selection of linguistic forms based on listener characteristics which include, but are not limited to, age, race, gender, and role. Co-occurrent constraint provides limitations to, and encourages the appropriate use of, language forms when communication partners assume roles or use dialects. Sequential rules relate to the use of ritualised language sequences, such as greeting, within social situations. Pragmatic rules include the organization and coherence of conversation including turn taking, as well as the initiation, maintenance, and conclusion of conversation (Owens, 2001:26-27).

Semantics refers to the meaning of language (Gleason & Ratner, 2009:480). Language meaning can be regarded from three broad perspectives, namely lexical semantics, grammatical semantics and logical semantics. Lexical semantics is concerned with the meaning of "content" words. Grammatical semantics refers to those aspects of meaning imparted by the syntax of language, including semantic

categories (referring to those words which can be used as a verb, adjective or noun depending upon their placement within a sentence) and the meaning portrayed by grammatical morphemes such as "-ed" or "-er". Logical semantics relates to the link between language and logical systems such as the meaning extracted through the implementation of predictive and pre-suppositional skills (Cruse, 2004:13-14).

Stimulant medication refers to a class of psychoactive drugs that excite the nervous system, thereby activating neural systems and increasing mental or physical activity temporarily (Julien, 2001; Voeller, 2004). Stimulant medication is the most popular form of management for ADHD and is available in a variety of preparations (Curatolo, D'Agati, & Moavero, 2010).

Story grammar refers to a rule system that is used to describe the internal organization of a story, including story components and the interaction between these components (Owens, 2014:229). Story grammar states that a story comprises of a setting, theme, plot, and resolution. The setting includes the story's location, characters and time. The theme refers to the central significance or purpose of the narrative. The plot comprises of a series of episodes, in which one or more attempts by the characters lead the story to fruition (Owens, 2014:232).

Syntax refers to the organization of words into phrases and phrases into sentences in accordance with a set of rules rather than in a haphazard fashion (Hoff, 2005:421; Gleason, 1985:139). Phrase structure governs word combinations on a grammatical level, ensuring each sentence is comprised of a noun phrase (typically consisting of an article, such as *a* or *the*, and a noun, for example *baby;* or, alternatively, a pronoun or proper noun) and a verb phrase (consisting of a main verb with or without auxiliary verb/s, such as *held* or *was holding,* and a noun phrase, for example *the bottle)* (Carrow-Woolfolk & Lynch, 1982:23).

Abbreviations

ADHD: Attention Deficit Hyperactivity Disorder

ADHD-C: Attention Deficit Hyperactivity Disorder Combined

ADHD-PH: Attention Deficit Hyperactivity Disorder Primarily Hyperactive

ADHD-PI: Attention Deficit Hyperactivity Disorder Primarily Inattentive

ASHA: American Speech and Hearing Association

DSM-IV: Diagnostic and Statistical Manual of Mental Disorders Fourth Edition

DSM-V: Diagnostic and Statistical Manual of Mental Disorders Fifth Edition

MLU: Mean Length of Utterance

MPH: Methylphenidate

MPH-OROS®: Methylphenidate Osmotic Release Oral System

NSS: Narrative Scoring Scheme

SLP: Speech Language Pathologist

TCA: Tri-cyclic Antidepressants

TTR: Type Token Ratio

CHAPTER 1: LITERATURE REVIEW, PROBLEM STATEMENT AND RATIONALE

1.1. Introduction

Recent studies have shown a rising trend in the number of children diagnosed with Attention Deficit Hyperactivity Disorder (ADHD). Data from the federal Center for Disease Control and Prevention reveal that 11% of school aged children in the United States have been medically diagnosed with ADHD (Schwartz & Cohen, 2013). These results illustrate a marked rise in the prevalence of ADHD, with a 41% increase over the past decade and a 16% rise since 2007. In 2007 an extensive review of international research was carried out to determine the global prevalence of ADHD. Results demonstrated a worldwide pooled prevalence of 5.29%, making ADHD a diagnosis of global concern (Polanczyk, de Lima, Horta, Biederman, & Rohde, 2007). The high prevalence of ADHD, coupled with the far reaching effects of the symptoms and co-morbid conditions associated with the diagnosis of this disorder, dictates comprehensive management. Although medication has proven effective in reducing the behavioural symptoms associated with ADHD, the social, behavioural, psychiatric, and academic difficulties experienced by this population necessitate a team approach to intervention (Armstrong & Nettleton, 2004; Hill, 2000; Kalat, 2004; Voeller, 2004). Parents, teachers, speech-language pathologists (SLPs), occupational therapists, educational psychologists, and pediatric neurologists all play an important role in striving to ensure that each child is able to reach his or her full potential, despite the diagnosis of ADHD (Chacko, Fabiano, Williams, & Pelham, 2001; Chu & Reynolds, 2007; Hill, 2000; Levy, Hay, Bennett, & McStephen, 2005; Voeller, 2004).

Of particular interest to the field of speech-language pathology is the concomitant language impairment noted in this population (Westby & Watson, 2004; Voeller, 2004). Due to the fact that the ADHD population is increasing, SLPs are being faced with a growing number of children diagnosed with ADHD in their caseloads. A greater understanding of ADHD, the associated language difficulties, and the successful management of these difficulties is therefore essential if SLPs are to provide comprehensive intervention to this population.

Narrative impairment is well documented in children with ADHD and may exacerbate the academic underachievement experienced by this population. Since pragmatic development, with narrative skill as a significant component, forms an essential part of socialization in the early school years (Owens, 2001), narrative impairment may also negatively impact the ability to engage socially with peers (Loe & Feldman, 2007; Moonsamy, Jordaan, & Greenop, 2009). Therefore, narrative inability in children with ADHD needs to be addressed by those SLPs working with this population. While behavioural measures have been effective in many cases, carefully monitored medication has also been increasingly found to be beneficial (Roth, 2013). One avenue open to exploration, therefore, is the effect of appropriate medication. Stimulant medication has proven successful in improving inattention and basic academic performance associated with ADHD, but little is known about its effects on the higher order processing skills necessary for successful narrative production (Derefinko, Bailey, Milich, Lorch, & Riley, 2009). The current study aims to determine the effect of stimulant medication on the narrative ability of children with ADHD.

1.2.   Characterising Attention Deficit Hyperactivity Disorder

Attention-deficit hyperactivity disorder (ADHD) is the most frequently occurring psychiatric condition (i.e. a condition that involves mental functioning that causes significant impairment) in school-aged children (McInnes, Bedard, Hogg-Johnson, & Tannock, 2003; Westby & Watson, 2004). Children with ADHD may find it challenging to inhibit a dominant response or interrupt an ineffective pattern of behaviour. This negatively impacts their ability to modify or alter any behaviour to reach an end goal successfully. Furthermore, competing intrinsic and extrinsic factors cannot be ignored, which leads to the interruption of concentration and self-regulation (Barkley, 1997). Onset of these symptoms is usually reported between the ages of three and four years. These characteristics are pervasive and negatively impact performance across a variety of settings throughout the individual's life (Armstrong & Nettleton, 2004; Kalat, 2004). The difficulties experienced as a result of ADHD affect school performance, family life, and social behaviour, and can lead to occupational difficulties as well as substance abuse in adult life (American Psychiatric Association, 2013; Kalat, 2004; Voeller, 2004).

The unique symptoms and behavioural characteristics of ADHD differ between individuals. According to the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; American Psychiatric Association, 1994) ADHD can be divided into three subtypes, or presentations as they are currently referred to in the most recent Diagnostic and Statistical Manual of Mental Disorders (DSM-V; American Psychiatric Association, 2013). The subtypes, or presentations, are assigned according to the presence or absence of a pattern of inattention and hyperactivity-impulsivity. See Table 1.1 for a summary of the ADHD presentations as outlined in the DSM-V (American Psychiatric Association, 2013). The pattern of presenting signs may change across an individual's lifespan. Only those behaviours experienced in the 6 months preceding the evaluation are considered when differentiating between presentations at a particular age (American Psychiatric Association, 2013).

Table 1.1. Presentation specifiers for ADHD (description and clarification of symptoms)

Presentation specifier	Description	**Clarification** of symptoms
Predominantly inattentive ADHD	Refers to those individuals who experience inattention in the absence of hyperactive-impulsive behaviours.	- Problems in sustaining attention which presents as distractibility, frequent abandonment of and shifting between activities with a failure to attend, or listen, to others.
Predominantly hyperactive/ impulsive ADHD	Refers to those individuals who present with hyperactive and impulsive behaviours in the absence of inattention.	- Hyperactivity refers to restless behaviour and is characterised by an inability to remain still when seated as well as an incessant need to jump or run. Hyperactivity may result in excessively noisy and talkative behaviour. - Impulsivity, otherwise termed disinhibition, presents as accident-prone behaviour and an inability to consider consequences prior to decision making. Impulsivity may result in poor turn taking skills during verbal and non-verbal tasks, as well as inappropriately intrusive behaviour.
ADHD Combined presentation	Specified by the presence of both inattentive and hyperactive-impulsive behaviours.	- Problems in sustaining attention with frequent abandonment of and shifting between activities and a failure to attend, or listen, to others. - Hyperactivity characterised by an inability to remain still when seated as well as an incessant need to jump or run. May result in excessively noisy and talkative behaviour. - Impulsivity presenting as accident-prone behaviour and an inability to consider consequences prior to decision making. May result in poor turn taking skills during verbal and non-verbal tasks, as well as inappropriately intrusive behaviour.

Adapted from: The DSM-V (American Psychiatric Association, 2013).
Note: the notation "hyperactive/impulsive", taken from the DSM-V, here indicates a co-occurrence of hyperactivity and impulsivity. In the text of this report the notation for this condition is typically "hyperactive-impulsive".

Although many parents report excessive motor activity during early years, behavioural symptoms associated with ADHD are difficult to differentiate from the variable behaviours typically found in children before the age of 4 years. ADHD is most frequently diagnosed far later, during early school years when inattention and/or hyperactivity-impulsivity impairs academic performance (American Psychiatric Association, 2013). See Table 1.2 for a summary of the temperamental, environmental, genetic, and physiological factors associated with ADHD as outlined in the DSM-V (American Psychiatric Association, 2013). Knowledge of these possible risk factors will assist professionals in making the appropriate referrals of children under the age of 3 years, who are at risk for developing ADHD and associated language difficulties.

Table 1.2. Risk factors associated with ADHD

Type of risk factors	Description
Temperament-related factors	- Reduced behavioural inhibition - Effortful self-control or restraint - Excessive displays of negative emotion - Elevated novelty seeking behaviours
Environmental factors	- Very low birth weight (<1,500 grams) increases the risk of developing ADHD two- to threefold. - Smoking or alcohol exposure during pregnancy is associated with the diagnosis of ADHD. This association, however, is often a reflection of common genetic risk. - A small percentage of cases of ADHD may be related to aspects of diet. - A history of child abuse or neglect, multiple foster placements, exposure to neurotoxins (e.g., lead), and infections (e.g., encephalitis) have all been correlated with increased risk for the diagnosis of ADHD. - Environmental toxicants have been associated with subsequent ADHD, but the nature of the relationship has not been defined as causal.
Genetic factors	- The heritability of ADHD is considerable, with an elevated prevalence of ADHD in first-degree biological relatives of those individuals diagnosed with ADHD.
Physiological factors	- Possible conditions influencing the presence of ADHD symptoms include visual and hearing impairments, epilepsy, metabolic abnormalities, nutritional deficiencies and sleep disorders. - ADHD cannot be directly associated with any specific physical features. The presence of minor physical anomalies is, however, elevated in the ADHD population. - Mild delays in motor development as well as other soft neurological signs may be present.

Adapted from: The DSM-V (American Psychiatric Association, 2013).

1.3. The underlying nature of ADHD

Many theories regarding the possible underlying nature of ADHD have been proposed in the literature. These theories can be organised into three categories, namely *neuroanatomical, neurochemical,* and *neurophysiological* perspectives, and are discussed below.

1.3.1. Neuroanatomical perspective

When viewed from a neuroanatomical perspective, the cause and symptoms of ADHD are explained with reference to specific locations within the brain which are associated with the regulation of attention and motor activity. Studies conducted using computed tomography, cerebral blood flow, and magnetic resonance imaging have shown smaller anatomic areas and volumes in the cerebrum, cerebellum, prefrontal cortex, corpus callosum, basal ganglia, and dorsal anterior cingulate cortex in individuals with ADHD than in neurotypical individuals (Emond, Joyal, & Poissant, 2009; Furman, 2005). Additional neuroanatomical research has focused on the frontal cortex which plays an important role in attention and impulsivity. In these studies, Positron Emission Tomography scans have shown reduced glucose utilisation, especially in the right frontal lobe, in children with ADHD (Castellanos et al., 2002; Giedd, Blumenthal, Molloy, & Castellanos, 2001; Mulder et al., 2008; Riccio, Hynd, Cohen, & Gonzalez, 1993). Based on the locations of the anomalies identified in these neuroanatomical studies, a deficit in executive function has been suggested (Brown, 2009; McInnes et al., 2003). Executive function is thought to be regulated in the five pathways of the frontostriatocortical circuitry that connects the subcortical areas to the frontal lobes (Furman, 2005).

The results obtained in studies focusing on ADHD from a neuroanatomical perspective suffer from a variety of limitations. These include small and varied sample sizes as well as control groups that are poorly matched. Results also fail to differentiate between those anomalies that are indicative of ADHD and anomalies that occur due to co-occurring conditions (Furman, 2005).

1.3.2. Neurochemical perspective

Studies focusing on the neurochemical basis of ADHD have implicated the dopaminergic neurotransmitter system. Neurotransmitters are chemicals that are responsible for the relay of messages between neurons through the synapses. Catecholamines (dopamine, norepinephrine) are the neurotransmitters that appear to be involved in behaviours such as attention, inhibition, and motivation (Ballard et al., 1997). Dopamine plays an important role in maintaining conditioned responses, carrying out goal-directed behaviours, and supporting working memory, therefore modulating the activity of those neurons that are involved in goal-directed motor activities. Dopamine is implicated in the functioning of the prefrontal-subcortical system (Voeller, 2004). An imbalance in the production of neurotransmitters, dopamine or norepinephrine, results in decreased stimulation of the locus coeruleus (Riccio et al., 1993). The locus coeruleus is the brainstem nucleus in which the majority of the brain's noradrenergic neurons are situated. This area is the primary source of noradrenergic innervation of the forebrain. The locus coeruleus is the sole provider of norepinephrine to the hippocampus and neocortex, regions that are responsible for higher cognitive and affective processes. Norepinephrine plays a role in maintaining alertness and attention while novel stimuli are being processed. In individuals with ADHD it is this system that appears to be impaired, as typical symptoms include an inability to monitor and sustain attention as well as to differentiate between important and unimportant stimuli (del Campo, Chamberlain, Sahakian, & Robbins, 2011; Voeller, 2004). Support for the neurochemical perspective is rooted in the efficacy of stimulant medication on improving the performance of children with ADHD (Berridge & Waterhouse, 2003; Pliszka, 2005; Wilens, 2008).

1.3.3. Neurophysiological perspective

Neither the neuroanatomical nor the neurochemical theory provides sufficient explanation for the many symptoms associated with ADHD. Rather, it is the dynamic interaction between the anatomical and neurochemical factors that are responsible for the variability in ADHD symptoms and focus should therefore turn to the functional connectivity of the neural network (Konrad & Eickhoff, 2010; Powel & Voeller, 2004; Voeller, 1991). The neurophysiological system is comprised of ascending/arousal pathways and descending/inhibitory pathways that create a system responsible for the

activation and inhibition of specific regions within the brain. When the ascending loop of the functional system is interrupted, a sufficient level of arousal cannot be maintained within the specific areas of the cortex. Similarly, when the descending loop of the functional system suffers interference, a sufficient level of inhibition or selective attention cannot be sustained (Riccio et al., 1993). The heterogeneity of the symptoms exhibited by those that fall into the diagnostic category of ADHD can therefore be explained by multiple specific causes within and along this neural network (di Michele, Prichep, John, & Chabot, 2005). Many studies have examined the brain activity in children with ADHD in contrast to that of their normally developing peers so as to elucidate the underlying neurophysiology of ADHD and the recognised subtypes. Findings vary between studies, however, and further research is necessary (Arns, Conners, & Kraemer, 2012).

Despite the fact that researchers have yet to identify the exact cause of ADHD, various effective treatments have been developed to improve the symptoms associated with this condition (Snider, Busch, & Arrowood, 2003; Pliszka, 2005; Wilens, 2008).

Treatment for ADHD has two important components: behavioural interventions and medication. Although there is a significant amount of research demonstrating that medication alone will not address all the core issues related to ADHD (Martin, 2007), there has been increasing interest in the supportive role of medication. SLP's need to take cognizance of this potential resource for a comprehensive approach to treating the communication difficulties associated with ADHD

1.4.   Pharmacological Treatment of ADHD

Psychopharmacological treatment of ADHD includes non-stimulant and stimulant medications. A summary of the benefits and side-effects of non-stimulant and stimulant medications used in the treatment of ADHD, together with an extensive discussion, is provided in Appendix A. The brief discussion provided in this section provides the backdrop for the choice of medication (stimulant medication, specifically MPH-OROS®) for the current study. The information regarding the delivery system and duration of effect has some bearing on the assessment protocol with regard to timing of post medication assessments.

Non- stimulant medication has been found to decrease ADHD symptoms, although effect size is lower than that of stimulant medication. One specific form of non-stimulant medication, Atomoxetine, reduces symptoms of ADHD in those who do not respond to stimulants or experience severe side-effects. All non-stimulant medications, however, have been demonstrated to cause negative side-effects.

The most common form of management for ADHD is the use of stimulant medication, which provides successful management of primary symptoms in 70% to 80% of children diagnosed with this condition (Curatolo et al., 2010; Labbate, Fava, Rosenbaum, & Arana, 2012). Despite the fact that stimulant medications cause side effects including sleep disturbances, loss of appetite, stomach aches and headaches (Barkley, McMurray, Edelbrock, & Robbins, 1990), they provide swift and dramatic reduction in the symptoms of ADHD. The most frequently prescribed medication for the treatment of ADHD is MPH (for example, Concerta, Focalin and Ritalin) which has been found to effectively treat the majority of children and adults diagnosed with this condition (Bekker, Kooij, & Buitelaar, 2008:263; Ryan & Trieu, 2013:464). MPH affects neurotransmitter levels within the brain, heightening electrical activity within the central nervous system, and thus increases arousal, alertness, and attention span, as well as decreasing physical activity (Ballard et al., 1997; Poulton, 2006). The result is improved classroom behaviour, academic performance, and interpersonal relationships, as well as decreased oppositional behaviour and anxiety (Elia, Ambrosini, & Rapoport, 1999; Goldman, Genel, Bezman, & Slantez 1998). This effect is achieved by inhibiting the dopamine transporters, regulating catecholamine and subsequently reducing inattention, impulsivity, and hyperactivity (Wilens, 2008; Volkow, Wang, Fowler, & Ding, 2005). Research has shown that MPH improves attention and behaviour in 60% to 90% of individuals with ADHD (Whalen & Henker, 1991).

The degree to which MPH improves ADHD symptoms changes in the period following intake. In standard release MPH, maximum effects on behaviour are obtained approximately 2 hours after ingestion of the medication. MPH's effect wears off after 4 to 5 hours with a complete dissipation immediately after the termination of the medication. This limited duration of effect has called for the development of long acting MPH preparations. MPH-Osmotic Release Oral System (MPH-OROS®), an extended-release MPH, was introduced in 2000 and is well suited to the pediatric

population due to the convenience of once-a-day administration (Castle, Aubert, Verbugge, Khalid, & Epstein, 2007). MPH-OROS® exerts an effect for 12 hours, delivering three doses of MPH through an osmotic controlled release delivery system. MPH levels quickly increase over the first two hours after which a slower increase ensues for three to four hours. After 24 hours, baseline blood levels are reached (Liu, Muniz, Minami, & Silva, 2005; Voeller, 2004).

It is conceivable that the effects of medication described above could have a significant impact on language-related behaviours.

1.5.   ADHD and language difficulties

There is evidence that many children with ADHD experience difficulties with aspects of communication, including expressive language, receptive language, language processing, and pragmatics (Baker & Cantwell, 1992; Kim & Kaiser, 2000; McInnes et al., 2003). Reports of the co-occurrence of language difficulties and ADHD ranges from 20% to 60% (Engelhardt, Ferreira, & Nigg, 2011; Oram, Fine, Okamoto, & Tannock, 1999).These language difficulties further amplify the behavioural difficulties experienced by this population but are often overlooked due to the child's more obvious disruptive behaviours (Cohen, Barwick, Horodezky, Vallance, & Im, 1998a; Cohen et al., 1998b).

Based on a review of the available literature focusing on the language difficulties experienced by this population, the language characteristics of children with ADHD can be discussed according to four primary areas of difficulty namely syntax, semantics, pragmatics, and narrative ability.

1.5.1. Syntactic difficulties experienced by children with ADHD

Reports in the literature suggest that children with ADHD experience difficulties with syntactic aspects of language. The language development of this population is often stunted with a delay in the onset of first words and word combinations (Redmond, 2004). Language difficulties appear to persist, with characteristic difficulty in adhering to the rules of syntax. Research shows that the sentence formulation of children with

ADHD is poor, with clause omissions and erroneous word order, especially during sentence production tasks when children are required to generate sentences from a target word (Oram et al., 1999). Children with ADHD who evidence language impairment demonstrate grammatical errors, namely grammatical abandonment and omission, as well as morphosyntactic errors (Redmond, 2004; Redmond, 2005).

1.5.2. Semantic difficulties in children with ADHD

Research indicates that children with ADHD are prone to verbal retrieval problems, resulting in many short pauses and ultimately manifesting as dysfluency in spoken language (Tannock, 2005). In addition to verbal retrieval difficulties, children with ADHD demonstrate the use of inappropriate word substitutions (Purvis & Tannock, 1997; Tannock, Purvis, & Schachar, 1993) and non-specific vocabulary (Kim & Kaiser, 2000). These deficits in verbal retrieval, fluency, and expressive vocabulary can be attributed to poor semantic processing in children with ADHD. These children find it challenging to access and differentiate between similar terms with variable and overlapping semantic boundaries. The greater the degree of resemblance between category exemplars, the higher the semantic processing demands, leading to erroneous or delayed lexical retrieval and increased verbal dysfluency (Tannock, Martinussen, & Frijters, 2000; Tannock, 2005).

1.5.3. Pragmatic difficulties in children with ADHD

Reports of pragmatic difficulties in the available literature focusing on children with ADHD are abundant (Baker & Cantwell, 1992; Bailey, Derefinko, Milich, Lorch, & Metze, 2011; Francis, Fine, & Tannock, 2001; Purvis & Tannock, 1997; Tannock, 2002; Tannock et al., 1993). Many diagnostic characteristics included in the DSM-V (American Psychiatric Association, 2013) refer to inappropriate pragmatic behaviour. More specifically, diagnostic characteristics included in the description of impulsivity include talking excessively, ongoing interruptions, and blurting out answers prior to the completion of the question. Tannock (2002) refers to these pragmatic difficulties as the inappropriate implementation of timing and quantity aspects of language within social and academic contexts. The timing difficulties experienced by children with ADHD include poor initiation of conversation, turn taking and maintaining or shifting topics. With regard to quantity, the language output of children with ADHD is excessive

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during spontaneous conversation but decreases below normal limits when these children are faced with tasks relying on planning and organization (Tannock, 2002). Inappropriate use of language is common in children with ADHD due to a failure to recognise verbal, non-verbal, and situational cues as well as overlooking social context (Whalen & Henker, 1991).

1.5.4. Narrative difficulties in children with ADHD

Many studies centering on language in children with ADHD have focused on expressive language abilities, reporting difficulties with the organization, coherence, and self-monitoring of verbal production during narrative tasks (Baker & Cantwell, 1992; Bailey et al., 2011; Francis et al., 2001; Purvis & Tannock, 1997; Tannock et al., 1993). As the current study is concerned with narrative ability, it is justified to provide some brief additional background regarding this ability.

The investigation of narratives has been motivated in the literature, and is a popular point of interest, for a number of reasons. Foremost is the fact that narration is the culmination of a multitude of higher-level language and cognitive skills. Narrative production is the result of all the components of language converging into a meaningful, well planned and cohesive story (Seiger-Gardner, 2009). The analysis of narratives consequently provides a wealth of information, including grammatical ability, sentence formulation, use of cohesive ties to highlight the relationship between story components, as well as planning of story content into an organised and meaningful whole (Vandewalle, Boets, Boons, Ghesquière, & Zink, 2012). This large range of information obtained provides reliable insights into the global organization of narrative content (macrostructure), as well as the structure within and across sentences (microstructure) (Liles, Duffy, Merritt, & Purcell, 1995).

Furthermore, a close correlation exists between academic success and narrative ability in children with language impairment (Paul & Smith, 1993). Paul and Smith (1993) reported that pre-school children who are identified with poor narrative abilities are at risk for developing later academic and language difficulties.

Social communication is also dependent upon the development of competent narrative abilities. Oral narratives allow one to engage in social interactions, developing social

relationships through the sharing of thoughts, emotions and experiences. Weak narrative abilities impede this process, leading to a feeling of isolation and negatively impacting socio-emotional development (Coupland & Jaworski, 2003).

The use of narratives as an assessment tool is well documented in international and South African literature, highlighting the inclusion of both micro- as well as macrostructure elements. Extensive work has been carried out by Klop, Visser and Oosthuizen (2011; 2012a; 2012b) focusing on narrative analysis, including micro- and macrostructure elements, as a multilingual assessment tool. The analysis of narratives provides a valuable source of information regarding children's language abilities in a naturalistic context. It is a highly effective assessment method, used extensively in communication pathology. As indicated previously, a single narrative sample provides SLPs with information regarding a variety of cognitive and linguistic components, including micro- and macrostructure elements (Heilmann et al., 2010; Miller et al., 2011; Moonsamy et al., 2009). Narrative analysis is therefore a valuable tool when working with the ADHD population, as it provides insights into the daily language difficulties experienced by these children as a result of the characteristics which negatively impact tasks of inhibition, planning and organization (Vandewalle et al., 2012). Children with ADHD tire easily during formal assessment situations, losing concentration and ultimately providing an unrealistic representation of their abilities. Furthermore, results obtained through formal assessments of language are negatively impacted by the pervasive nature of ADHD, leading to underestimates of the child's abilities. This underperformance during standardised testing is not only of concern to the field of speech-language pathology, but offers a similar problem for professionals concerned with the psychological and academic assessment of children with ADHD (Oram et al., 1999). In addition, narrative production, unlike standardised testing, does not require the presentation of lengthy verbal instructions which negatively impacts the child's ability to carry out the task successfully, due the influence of inattention on listening skills as outlined in the DSM-V (American Psychiatric Association, 2013).

Currently, there are no accepted and agreed upon guidelines, available to SLPs, outlining the essential areas to be investigated during narrative assessment (Justice et al., 2006). Some progress has been made in this area in local settings such as the Western Cape (Klop et al., 2012a; Klop et al., 2013). Discussions of best practice emphasize the importance of analysing narrative samples at both micro- and

macrostructure levels (Hughes, McGillivray, & Schmidek, 1997). In Figure 1.1 the components of narrative production are outlined. Research has shown that micro- and macrostructure elements represent two distinct branches of narrative competence (Liles et al., 1995) and a comprehensive assessment of narrative ability therefore needs to acknowledge both of these narrative aspects (Hughes et al., 1997).

Microstructural language elements (as reported in Figure 1.1) can be divided into linguistic form and linguistic content at an utterance level (Heilmann et al., 2010). Linguistic form includes productivity and grammatical complexity (which can be further deconstructed into syntactic and semantic complexity) (Justice et al., 2006; Petersen et al., 2010). Linguistic content refers to lexical diversity of the vocabulary used during narration (Heilmann et al., 2010). *Macrostructural* language elements are concerned with an individual's ability to use language to formulate and share narratives through the implementation of story grammar. Macrostructural elements are dependent upon pragmatic aspects of language as pragmatic rules regulate the organization and coherence of narration through the introduction, maintenance, and conclusion of the selected topic (Owens, 2001:26-27). The macrostructure elements, as presented in the Narrative Scoring Scheme (NSS) (Miller et al., 2003), have been included in Figure 1.1 and consist of seven story grammar components namely introduction, character development, referencing, mental states, conflict resolution, cohesion, and conclusion.

Successful narration is dependent upon attention to incoming stimuli, recognition of meaning, and judgements regarding significance of details, as well as planning and organization of story events (Francis et al., 2001). It is therefore evident that narrative production is reliant upon both linguistic abilities and executive functions, both of which are known to be deficient in the ADHD population (Barkley, 1997). As a result, children with ADHD display several difficulties that interfere with narrative ability. The narrative production of children with ADHD is characterized by excessive sequencing errors, which research attributes to a breakdown in the global organization of language. Included in the description are reports of an inability to acknowledge the needs of the communication partner and failure to achieve and monitor cohesion at a sentence level (Purvis & Tannock, 1997). Poor implementation of pragmatic rules, as discussed above, negatively impacts these children's ability to tell a focused and cohesive narrative. Various studies report difficulty in implementing the basic pragmatic rules essential to successful narrative production, including turn taking, introduction, and
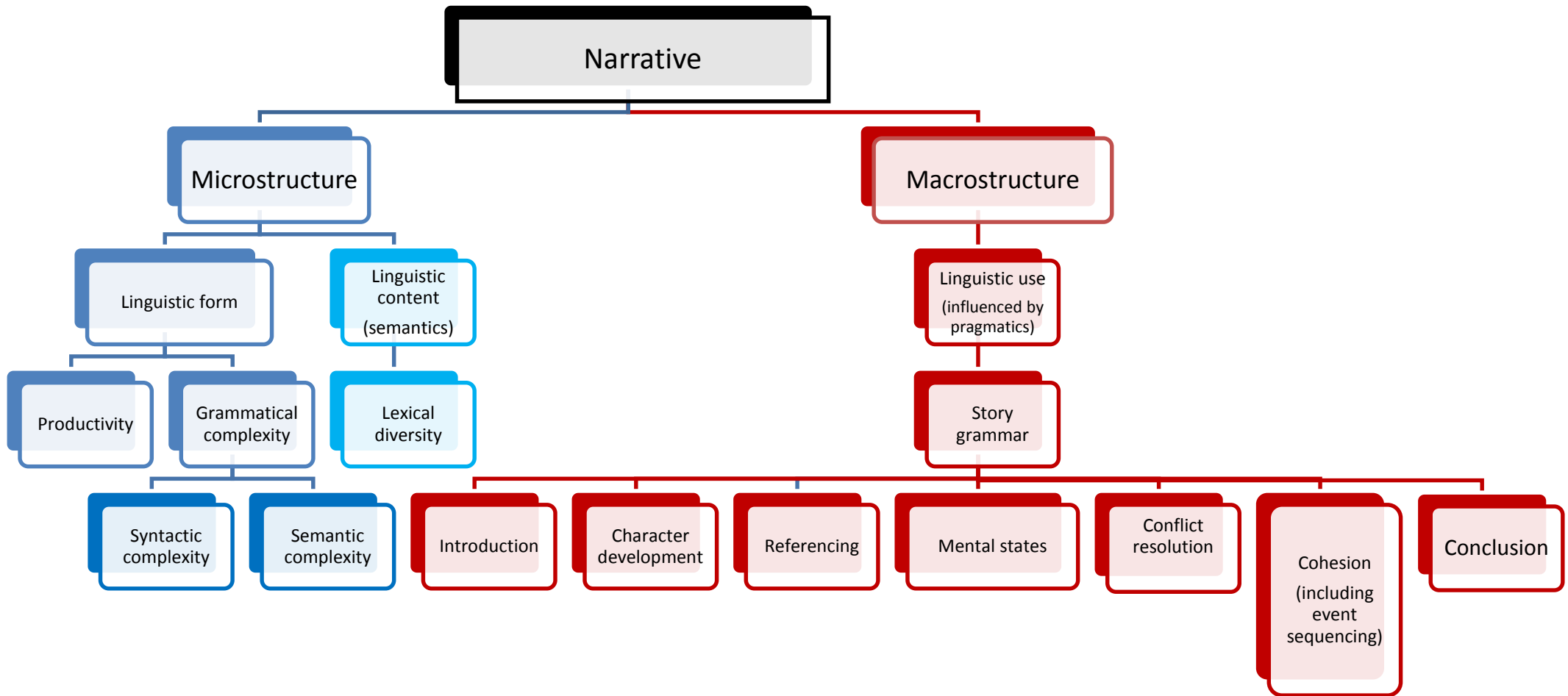
Figure 1.1. Micro- and macrostructure elements of narrative production

topic maintenance. In addition, children with ADHD are prone to producing ambiguous statements during narrative production due to the unclear use of referents and a lack of cohesive devices (Oram et al., 1999; Purvis & Tannock, 1997; Tannock, 2002; Väisänen, Loukusa, Moilanen, & Yliherva, 2014; van Lambalgen et al., 2008). Figure 1.1 indicates that, macrostructure elements are indicative of linguistic use during narrative production and macrostructural components are therefore affected by the pragmatic abilities of the speaker.

1.6.   Theories of ADHD and language impairment

Although the concomitance of language impairment and attention disorders is not arbitrary, there continues to be discussion regarding the underlying mechanisms responsible for language impairments in children with ADHD. Many theories have been proposed and three main trains of thought have emerged, namely general developmental delays, attention deficits, and impairments in executive function.

1.6.1. *General developmental delays as a causal factor for language disorders in ADHD*

One explanation for the documented co-occurrence between attention disorders and language impairment is that both are rooted in general developmental delays. Support for this theory is found in studies that have focused on the relationship between the development of attention, cognition, and language (Redmond, 2004). High correlations between language, attention, and motor functioning have been identified, suggesting that the correlation between language difficulties and attention deficits identified in children with language disorders may be related to neurodevelopmental delays in perceptual and motor functioning (Tallal, Dukette, & Curtiss, 1989). Barkley's (1997) hybrid neuropsychological model of executive functions links the behavioural symptoms of ADHD to a "temporal myopia", resulting from a lack of behavioural inhibition and the subsequent effects on working memory. Boucher (2000) went further to suggest that the known co-occurrence of developmental disorders such as ADHD and language difficulties may be indicative of a disruption in the development of underlying "time parsing mechanisms". *Time parsing mechanisms* refer to a range of cognitive and perceptual processes that are implicated in the segmentation and

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analysis of linguistic and non-linguistic material. This continuum of cognitive and perceptual processes provides a platform that supports the variation observed in the attentional, cognitive, and linguistic symptoms associated with ADHD.

1.6.2. Deficits in attention as a causal factor for language disorders in ADHD

An alternative theory suggests that the acquisition of language may be negatively influenced by deficits in attention. The transactional model of mother-child interaction has been used to provide an explanation for the impact of ADHD and its core symptoms on the process of language acquisition. The transactional model focuses on the interaction between child and adult, which is crucial to the development of comprehensive language abilities (Camarata & Gibson, 1999; Sameroff & Mackenzie, 2003). Based on this model, it is proposed that ADHD negatively influences a child's ability to participate fully in language learning opportunities, upsetting these important interactions and disrupting the process of language learning.

1.6.3. Impairments in executive functions as a causal factor for language disorders in ADHD

In addition to general developmental delays and attention deficits, executive dysfunction is observed in this population. Researchers propose that a deficit in executive functions, which has been linked to ADHD, is responsible for core behavioural symptoms as well as the language difficulties experienced by this population (Barkley, 1997; Tannock & Schachar, 1996). Furthermore, Tannock and Schachar (1996) suggest that executive dysfunction may be responsible for the development of a profile of language difficulties unique to the ADHD population. The research of Tannock (2005) and Westby and Watson (2004) provides support for this theory. The findings of these studies indicate that the language characteristics of children with ADHD can be summarized as an inability to initiate or plan an intended message due to poor organization of their thoughts, and a failure to maintain the necessary sequence of behaviours or events. Based on these language characteristics one can predict that narrative production would be impaired in children with ADHD, given the skills necessary to generate a rich and cohesive narrative.

1.7.   Speech-language intervention and ADHD

Traditionally, the treatment of ADHD rested entirely in the realm of the medical practitioner. Not until the 1960s to 1980s did researchers begin to investigate the effect of environmental and cognitive factors in ADHD. This new emphasis led to the development of non-medical treatments, which allowed mental health workers and educators to share in the responsibility of ADHD management. Thus began the drive toward a multimodal approach to the diagnosis, management, and treatment of individuals with ADHD (Hill, 2000). Due to the variability in the symptoms associated with ADHD, as well as the high levels of co-morbid conditions often accompanying this disorder, treatment requires a multimodal, holistic approach. Although medication has been proven effective in the treatment of ADHD, optimal management of this condition requires integrated medical and behavioural intervention (Voeller, 2004). As a result, there is a rising consensus among parents and professionals, advocating the notion that successful treatment of ADHD is the responsibility of a multidisciplinary team of persons who should work in unison to assist the child in meeting the daily demands and expectations (Hill, 2000).

Popular suggestions for multidisciplinary team members to be involved in the assessment and treatment of ADHD include parents, teachers, educational psychologists, medical practitioners, and mental health workers. Despite the important role the SLP can play in addressing the needs of children with ADHD, however, these professionals are rarely included in service delivery efforts for this population (Hill, 2000). Identification of possible language impairment and referral to a SLP therefore becomes the responsibility of the existing team members. Unfortunately, 30%-40% of children referred for psychiatric or behavioural problems have language impairments that remain unrecognised and therefore the necessary referrals to SLPs are not being made (Cohen, Davine, Horodezky, Lipsett, & Isaacson, 1993; Cohen et al., 1998a). These findings highlight the importance of including a SLP in the multidisciplinary assessment of children with ADHD. This notion is supported by the American Speech-Language-Hearing Association (ASHA, 1997) who recommends that SLPs form part of the multidisciplinary teams for the assessment of this population, based on the co-occurring speech and language difficulties experienced by children with ADHD.

SLPs should not simply be involved in assessment practices for children with ADHD, but should have an important role to play as members of the multidisciplinary team focusing on the provision of multimodal intervention to this population. According to Britain's National Institute of Health and Care Excellence, previously National Institute of Health and Clinical Excellence (2009:137) SLPs are responsible for providing direct intervention to children who have been diagnosed with ADHD and co-occurring speech, language and/or auditory processing difficulties.

Because of the potential academic underachievement and negative social impact caused by poor narrative ability (Loe & Feldman, 2007; Moonsamy et al., 2009), SLPs have a responsibility to provide intervention services to this population focusing on the development of comprehensive narrative abilities that successfully support academic and social functioning.

1.8. Review of previous research findings regarding the effect of ADHD medication on language ability

Although extensive research has been carried out regarding the effects of Methylphenidate (MPH) (see Appendix A) on the core behaviours of individuals with ADHD, little is known about its effect on higher-order processing skills and language functioning necessary for academic achievement (Derefinko et al., 2009; McInnes et al., 2003). In the review of ADHD and the perspectives on this condition (Section 1.3), it became evident that the cognitive profiles associated with attention difficulties can be linked to the skills necessary for the successful production of narratives. In view of this cognitive-linguistic relationship, it would be particularly informative to study the effects of stimulant medication on language production. The notion that the use of stimulant medication may impact on the expressive language abilities of children with ADHD has been documented in a few studies, which are discussed below.

Francis et al. (2001) aimed to determine the effects of stimulant medication on story grammar, errors, and comprehension in children with ADHD, through a randomised, placebo controlled cross over trial with two single doses (10mg and 20mg) of MPH. Fifty children with ADHD, aged 7 to 12 years, were presented with a wordless picture

book accompanied by the audiotaped story. After presentation of the story, participants were required to engage in a narrative recount as well as to answer questions focusing on story comprehension. The narratives obtained were transcribed and coded according to story grammar, length, and errors. Results indicated that MPH increased the participants' inclusion of the character's internal responses and attempts, but did not impact on story length or story comprehension. The results of this study were, however, influenced by the participants' understanding of the audiotaped story, implicating the children's receptive language abilities, and ultimately providing insights into the effect of MPH on the summation of expressive and receptive language abilities.

In a similar study by Derefinko et al. (2009), the effects of stimulant medication on the inclusion of goal-based story events during online story narration were investigated. Online narration requires the individual to tell a story from a wordless picture book, thereby allowing the investigation of narratives while decreasing demands on memory. In this study, the narrative abilities of 17 children with ADHD, aged 9 to 13 years, were compared on and off medication, as well as against the performance of their peers. The use of a comparison group allowed the researchers to evaluate the degree to which the medication regulated the narrative performance of children with ADHD. The participants produced narratives, based on the picture books, which were recorded and analysed according to story grammar categories. Although the administration of stimulant medication resulted in the inclusion of a larger total number of clauses in narrations, no further significant effects were noted.

Following this study by Derefinko et al. (2009), Bailey et al. (2011) examined the effect of stimulant medication on the free recall of story events in children with ADHD. The study was similar to that of Derefinko et al. (2009), with Bailey et al. (2011) including the same participants and incorporating the same study design and stimulant medications used (Wilson, 2013). However, in this study, children were requested to retell both televised and audiotaped stories. The participants' free recall of the stories were transcribed and analysed according to whether the information recalled by the participants was coherent, part of the causal chain and important to the story. Participants with ADHD were shown to be less sensitive to the stories' central events and causal chains, producing less coherent accounts of the audiotaped stories.

Results indicated that stimulant medication could be linked to an increase in the number of events recalled, but this improvement did not translate into an increase in the recall of those events central to the stories and there was no documented improvement in the coherence of recounts.

The research by Francis et al. (2001), Derefinko et al. (2009), and Bailey et al. (2011) provides evidence to suggest that stimulant medication may have a role to play in improving certain microstructure and macrostructure elements of narration in children with ADHD and further investigation is warranted.

1.9.   Problem statement and Rationale

The worldwide incidence of ADHD in children continues to grow, as indicated by global research (Polanczyk et al., 2007; Schwartz & Cohen, 2013). This increased incidence, coupled with the pervasive nature of the condition, necessitates research to provide valuable information regarding effective and holistic management of this population (Chu & Reynolds, 2007; Levy et al., 2005; Voeller, 2004).

Due to the growing number of children diagnosed with ADHD and the subsequent increase in the number of children with ADHD included in SLPs' caseloads, the SLP has an important role to play in addressing the language difficulties documented in children with ADHD by providing evidence-based intervention. Available literature discussing the language abilities of children with ADHD reports difficulties in narrative production (Baker & Cantwell, 1992; Purvis & Tannock, 1997; Tannock et al., 1993). Narrative inability needs to be addressed by the SLP due to the close correlation between narrative performance and academic, as well as social, achievement (Loe & Feldman, 2007; Moonsamy et al., 2009).

Although stimulant medication is the most popular method of treatment for children with ADHD and is known to successfully address the behavioural difficulties experienced by this population (Ballard et al., 1997; Poulton, 2006), as well as improve academic performance (Elia et al., 1999; Goldman et al., 1998), few studies have focused on the effect of this medication on the language difficulties experienced by

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this population. While there is a well-documented need for speech-language services to improve the language abilities of children with ADHD (Hill, 2000), it is not fully understood whether medication should be regarded as a replacement for, or an essential adjunct to SLP services. The current study aimed to provide clarification on this subject by extending the prior work of Francis et al. (2001), Derefinko et al. (2009) and Bailey et al. (2011). The adaptations made to the previous studies in order to address the possible pitfalls identified are discussed below.

1.9.1. Macrostructure analysis

Although previous research has investigated the effect of stimulant medication on narrative macrostructure elements, traditional measures of story grammar only identify the presence or absence of story grammar components. The NSS (Miller et al., 2003), selected for macrostructure analysis in the current study, is a sensitive measure developed for the comprehensive assessment of children's overall narrative organization skills in seven categories, namely introduction, character development, referencing, mental states, conflict resolution, cohesion and conclusion (Miller et al., 2011:272-273). The analysis of results goes beyond basic story grammar features, allowing for the comprehensive scaled measurement of story grammar rather than the mere indication of the presence or absence of story grammar elements. In addition, the NSS (Miller et al., 2003) provides a composite score which could potentially be indicative of the effect of MPH-OROS® on overall narrative performance (Heilmann et al., 2010; Miller et al., 2011).

1.9.2. Narrative elicitation with wordless picture books

Previously, studies examining the effect of MPH on the narrative ability of children with ADHD have implicated the participants' receptive language abilities by employing narrative retell methods (Francis et al., 2001). The current study eliminates this dependence on auditory comprehension skills by eliciting narrative production through the presentation of wordless picture books. The results will therefore be truly representative of the effect of stimulant medication on narrative ability without the influence of the participants' narrative comprehension.

1.9.3. Type and dosage of medication

Previous studies focusing on the effect of stimulant medication on narrative ability have been carried out using a variety of stimulant medications (Bailey et al., 2011; Derefinko et al., 2009) or a fixed dosage of medication for all participants (Francis et al., 2001). Different MPH preparations reach effective levels at different times (Liu et al., 2005; Voeller, 2004). Consequently, results obtained in previous studies, regarding effect of medication, may have been negatively influenced by less than optimal timing of data gathering procedures. The current study addresses this issue by ensuring that all participants included were being treated with the administration of the same medication. Choosing a single medication allowed for all data gathering procedures for post-medication assessments to be carried out at the same time of day, for all participants, thereby ensuring that the results were obtained at the time of maximum effect. Prescribed dosage of MPH needs be carefully considered based on the individual's distinct characteristics (Ballard et al., 1997; Labbate et al., 2012:272-275). In the current study the dosage of medication was not fixed. MPH-OROS® was administered to participants at the dosage prescribed to them by their medical practitioner, thereby ensuring optimal response to the medication during post-medication assessments.

1.10 Purpose of the research

As made evident by the discussion of available research, there is a dearth of information regarding the effects of stimulant medication on microstructure elements of narration in children with ADHD. In addition, there is room for elaboration on the effect of stimulant medication on macrostructure elements.

The current study attempts to extend prior work focusing on the effects of stimulant medication on the narrative production of children with ADHD. The current research design precludes those gaps identified in previous research by adopting an elicitation procedure that circumvents reliance upon receptive language abilities. Furthermore, the current study investigates the effect of MPH-OROS® on narrative ability by analysing pre- and post-medication narrative samples at micro- and macrostructure levels thereby providing comprehensive information about multilevel language

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components. In the available research, emphasis was placed on the effect of medication on the macrostructure of narration, ignoring measures of microstructural language elements despite the fact that the literature emphasizes the importance of analysing narrative samples at both micro- and macrostructure levels (Hughes, McGillivray, & Schmidek, 1997). Although Fine et al. (2001) and Derefinko et al. (2009) reported on a single microstructure element of linguistic form, namely productivity, they failed to address the remaining aspects of linguistic form, i.e. grammatical complexity, or linguistic content, i.e. lexical diversity. The current study, however, includes measures of productivity, grammatical complexity, and lexical diversity in order to provide a comprehensive understanding of the effect of stimulant medication on the microstructure level of narration. In addition, by making use of the NSS (Miller et al., 2003), a sensitive measure developed for the assessment of children's overall narrative organization skills, analysis of results will not merely identify the presence or absence of story grammar components but will provide information regarding the degree of improvement, as a function of medication, in each macrostructure component.

Comprehensive investigation of the effect of medication on micro- as well as macrostructure elements of narration will assist SLPs in identifying and prioritizing goals for treatment planning. In addition, this study may provide SLPs with valuable information that should be discussed with parents who are in two minds regarding their child's treatment options. Through the investigation of the effects of stimulant medication on narrative ability, insight may be gained into the underlying nature and origin of the language difficulties experienced by children with ADHD. Macrostructure analysis using the NSS (Miller et al., 2003) will also provide researchers with information regarding the effect of stimulant medication on the overall quality and efficacy of narrative ability (Heilmann et al., 2010; Miller et al., 2011), thus providing a comprehensive answer to the research question: "What is the effect of MPH-OROS® on the narrative ability of children with ADHD?

1.11 Summary

In this chapter a brief over of ADHD, the language difficulties associated with the diagnosis thereof and effective management was provided. The problem statement identifies the need to further investigate the effect of MPH-OROS® on narrative ability, including micro- and macrostructure elements, in children with ADHD and this was also explained.

CHAPTER 2: METHOD

2.1. Introduction

Chapter 2 presents a description of the planning and implementation of the current study. The aim of the study is presented, followed by an outline of the research design. A comprehensive explanation of the ethical considerations, participants, elicitation stimuli and procedures, as well as data processing is included.

2.2. Research Aims

2.2.1 Primary Aim

To determine the effect of MPH-OROS® on the narrative ability of children with ADHD as revealed in their narrative production.

2.2.2 Sub-aims

In order to achieve the primary aim of the study, the following sub-aims were formulated:

- To determine the effect of MPH-OROS® on microstructure language production elements during story narration as measured by productivity, grammatical complexity, and lexical diversity.

- To determine the effect of MPH-OROS® on macrostructure language production elements during story narration as measured by the Narrative Scoring Scheme (Miller et al., 2003).

2.3 Research Design

A multiple single-subject pretest-posttest design was employed to examine the effect of MPH-OROS® on microstructure and macrostructure elements of narratives produced by children with ADHD, during a narrative production task (Barlow, Nock, & Hersen, 2009:136-138; Kirk, 2009:23-45). Twelve children were included in the study. Primary data collection took the form of a structured observation and recording of children's narratives during a story narration task, elicited through the use of wordless picture books from the "Frog Where Are You?" series by Mercer Mayer (Mayer, 1969; Mayer & Mayer, 1975). Performance was recorded pre- and post-medication. Narrative samples were elicited from the participants using wordless picture books as this allowed for pre- and post-medication measures of narrative ability to be gathered without the reliability of narrative production being affected by additional factors such as story length, number of characters and subject matter (John, Lui, & Tannock, 2003; Petersen, Gillam, & Gillam, 2008; Strong, 1998). In addition, the use of wordless picture books provided samples of narrative ability without placing demands on participants' memory or receptive language ability. This method of elicitation has been used extensively to assess narrative ability in both typical and atypical populations (Losh & Capps, 2003) because the books display the narrative structure valued by story grammar analysis (Stein & Glenn, 1979) while minimising the requirements of narrative comprehension and auditory memory capacity (McCabe et al., 2008). The wordless picture books were randomly assigned for the pre- and post- medication assessments.

Assessment of all participants was carried out under controlled conditions, including time of day, personnel involved, instructions given, nature of material used, and location (Barlow et al., 2009:63).To minimize the possibility of interference, data gathering procedures were carried out on a single day, thereby decreasing the possibility of external factors impacting performance. Ensuring that data gathering procedures were strictly controlled allowed the researcher to investigate the effect of MPH-OROS® (independent variable) on the narrative ability (dependent variable) of children with ADHD, without the influence of additional variables that may have biased the results. The narratives were recorded, transcribed using the Systematic Analysis

of Language Transcripts (SALT) guidelines and software (Miller & Iglasias, 2012), and then analysed according to micro- and macrostructure elements. Microstructural analysis was carried out using the SALT software (Miller & Iglasias, 2012) and included measures of productivity (number of words per description), grammatical complexity (mean length of utterance/MLU) and lexical diversity (type token ratio/TTR). Analysis of macrostructure elements was carried out using the Narrative Scoring Scheme (NSS) (Miller et al., 2003) and included analysis of seven story components namely introduction, character development, referencing, mental states, conflict resolution, cohesion, and conclusion (Miller et al., 2011). Results were compared within subjects, pre- and post-medication.

The study therefore followed a quantitative research paradigm as the analysis of the speech samples provided quantifiable data that was subjected to statistical procedures. Quantitative research involves the gathering of data that can be expressed by numerical measures and subjected to statistical analysis. This paradigm aims to confirm or validate a theory as well as to predict and explain a specific phenomenon (Leedy & Ormrod, 2005:94-96).

2.4 Ethical considerations

Researchers have a responsibility to respect the well-being of their participants, colleagues and other professionals, as well as society, by conducting research in an honest and moral manner (Maxwell & Satake, 2006:67). Research ethics offer moral guidelines which help the researcher carry out a study in a way that is morally acceptable (Struwig & Stead, 2003:66). Data gathering procedures were initiated once ethical clearance had been obtained from the Faculty of Humanities Research Proposal and Ethics Committee at the University of Pretoria (See Appendix B) and Janssen Pharmaceutica Ethics Committee (See Appendix C).

Based on the American Psychological Association's Ethics Code (American Psychological Association, 2010), the following ethical principles applied throughout planning and execution of this study.

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2.4.1. Competency of the researcher

Research ethics require researchers to be competent in both subject matter and research methodology (De Vos, 2002:69-73).The appropriate qualifications and competence on the part of the researcher are required for a study to be ethically acceptable. The researcher is a qualified speech-language therapist, and therefore held the qualifications necessary to carry out this study. An additional qualified speech-language therapist was also involved in data gathering procedures so as to ensure that narrative samples were gathered within the time limits set for the research project. The additional speech-language therapist was briefed on the nature of the study, as well the elicitation stimuli and instructions, prior to commencement of the data collection. Both researchers held positions at a school for children with learning disabilities and therefore both were experienced in working with children with ADHD. Both researchers were registered with the Health Professions Council of South Africa.

2.4.2. Respect for others

Researchers should respect the privacy and autonomy of participants (Mouton, 2011:245; Struwig & Stead, 2003:67). As the participants in this study were children, who are amongst the most vulnerable populations when it comes to research, special care was taken to ensure that they were not exploited or taken advantage of. The participants' privacy was respected by assigning an identification code to each narrative sample and associated data set thereby ensuring confidentiality was maintained (Leedy & Ormrod, 2005:102).

2.4.3. Beneficence and non-maleficence

The welfare of the participants included in this study was of paramount importance to the researcher throughout the design and implementation of the research project. Of particular importance and consideration was the administration of medication. Sleep patterns can be interrupted if MPH-OROS® is administered too late in the day due to its long acting release system, which results in behavioural effects of up to 12 hours (Liu et al., 2005; Voeller, 2004). The study was designed so that the administration of medication was not altered in any way. Administration of ADHD medication to many

of the pupils at the school involved in this research project is the daily responsibility of the respective class teachers and is carried out prior to or at the commencement of the formal school day. Participants included in this study received their medication from their class teachers, as per usual. This allowed for the four hours required for MPH-OROS® to reach effective levels for the on-medication assessment.

2.4.4 Informed consent and ethical clearance

A letter of informed consent, detailing the nature of the study and with a clear outline of the data gathering procedures, was presented to parents prior to the onset of testing (Appendix D). The letter clearly stated that participation in the study was entirely voluntary and that participants could withdraw from the study at any time. Included in the letter was information regarding the dissemination of the results in a Master's dissertation, as well as possible publication in a scientific journal. The contact details of the researcher and study supervisor were included and parents were encouraged to make contact should any further questions or concerns arise.

The assent of the participants was also sought. For the younger children, ages seven to nine years, informal pictures depicting "consent" and "reject" were used (Appendix E). These took the form of a smiling and a frowning face respectively. For the older children, ages 10 to 13, assent was obtained verbally. Prior to each data gathering session, the children were reminded that their participation was voluntary and that they could withdraw should they so wish. Thus, only those participants for whom informed consent had been obtained were included in the study.

Furthermore, the consent of the school principal was sought, as assessment of the participants took place on the school property, during the school day (Appendix F). As the participating school is an independent, private school, it is not governed by the Department of Education. Therefore, the authority of the principal was sufficient when seeking consent for conducting this study.

Prior to the onset of data gathering, a detailed outline of the study and data gathering procedures, including the administration of medication, was presented to the appropriate committees for ethical consideration. Approval by the Department of

Speech-Language Pathology and Audiology Research Committee was obtained prior to submission to the Faculty of Humanities Research Proposal and Ethics Committee. As in accordance with the research policy of the University of Pretoria, the data obtained during the study will be stored in electronic format in the Department of Speech-Language Pathology and Audiology for a period of 15 years.

2.5. Participants

2.5.1. Inclusion and Exclusion Criteria

For the purpose of this study, the following selection criteria were applied for selection of experimental participants:

Diagnosed with ADHD: The diagnosis of ADHD is complex and relies heavily on the subjectivity of the observer (Voeller, 2004). Therefore it was necessary that the diagnosis of ADHD be made by a qualified medical practitioner, experienced in this specific field. The participants had to be previously diagnosed with ADHD by a qualified child neurologist or child psychiatrist, using the *Diagnostic and Statistical Manual of Mental Disorders-IV (DSM-IV)* (American Psychiatric Association, 1994).

Treating ADHD through the use of MPH-OROS®: Participants' method of treatment for ADHD, at the time of data gathering, had to be through the prescribed use of MPH-OROS®. Participants had to have been receiving treatment with MPH-OROS® for a minimum of three months prior to the commencement of the data gathering procedures. This allowed time for review of the medication by each participant's respective medical practitioner, ensuring that the child was responding well to the medication and that the optimal dose was being administered.

Consent from parents to administer medication at school: Only those children whose parents had previously completed the school's Medication Administration Form (Appendix G), and who were therefore receiving their prescribed MPH-OROS® at school, at the time of data gathering, were included in this study.

Previously diagnosed as having language difficulties: The participants selected for this study had to be diagnosed as having language difficulties, by one of the full-time speech language therapists working at the school. Prior to their enrolment at the school, all children undergo a comprehensive evaluation by a team of professionals. Included in this assessment is a comprehensive speech and language assessment. This test battery includes aspects of the Clinical Evaluation of Language Fundamentals (CELF-4) (Semel, Wiig, & Secord, 2003), Test of Auditory Processing Skills (TAPS-3) (Martin & Brownell, 2005), Phonological Awareness Skills Programme (PASP) (Rosner, 1999), the Peabody Picture Vocabulary Test (PPVT- 4) (Dunn & Dunn, 2007), and the Test of Auditory Comprehension of Language (TACL) (Carrow-Woolfolk, 1998).

Currently receiving speech-language therapy: At the time of the study, children included in this study had to be receiving intervention for language difficulties by a speech-language therapist, during the course of the school day.

Intellectual functioning: Research has indicated that low non-verbal IQ is often associated with poor narrative abilities (Wetherell, Botting, & Conti-Ramsden, 2007). Low non-verbal IQ is typically reflected in a low IQ score. Therefore children with cognitive impairment were excluded from this study. All of the participants were currently attending a school for children with learning difficulties but average or above average IQs. Average IQ is defined as ± 1SD from the mean (100). Therefore IQ scores of average intelligence range from 85 to 115 (Flanagan & Kaufman, 2009). However, the literature highlights the fact that IQ results cannot be accepted in isolation but should always be interpreted in conjunction with additional evidence (Flanagan & Kaufman, 2009). This was an important consideration for the study as children with ADHD are known to underperform on standardized IQ testing and on- versus off-medication IQ scores have been shown to differ significantly (Gimpel et al., 2005; Skuse, Bruce, Dowdney, & Mrazek, 2011). Results for IQ scores were obtained from the school files and considered in conjunction with their medication status at the time of testing as well as their ability to cope in a school for children with average IQs that follows the National Curriculum.

First language English speakers: The children included as participants in the study had to be first language English speakers. This ensured that difficulties experienced by second language English speakers did not influence the results (Owens, 2001:443).

2.5.2. Sampling methods

Quota sampling, a non-probability sampling method (Leedy & Ormrod, 2005:206), was implemented in the selection of participants for the study. The experimental participants were selected according to the selection criteria outlined in the previous section. When researchers make use of quota sampling, the selection of participants is not made in a random fashion but rather based on their individual characteristics (Leedy & Ormrod, 2005:206). Therefore, the participants had to meet certain selection criteria to be deemed eligible for inclusion in the study.

2.5.3. Experimental participants

Twelve children with ADHD (3 females, 9 males), ranging between the ages of seven and 13 years (mean age of 11.23 with a standard deviation of 2.28) with average intelligence (mean of 96.42 with a standard deviation 10.05), were selected from a private remedial school. They were receiving speech-language therapy to address their language difficulties. Suitability was determined by reviewing the participants' school files, after the necessary permission was obtained from parents and the school principal. The school files include records of diagnosis and current medication, IQ testing and speech-therapy assessments. See Table 2.1 for a summary of participant characteristics.

2.6 Elicitation Stimuli

Narrative samples were elicited from the participants by the administration and subsequent scoring of language production elicited by narrative production procedures. The wordless picture books *Frog, Where Are You?* (Mayer, 1969), and *One Frog too Many* (Mayer & Mayer, 1975) were used to elicit narratives and order of presentation of the books were randomized between pre- and post-medication sessions. *Frog Goes to Dinner* (Mayer, 1974) was used for warm-up and the narrative

obtained was recorded but discarded without analysis. These stories are similar with regard to theme, structural complexity, number of main characters, and length (John et al., 2003; Petersen et al., 2008; Strong, 1998) and have been used extensively to assess children's narrative abilities (Berman & Slobin, 1994) with both typical and atypical populations (Losh & Capps, 2003).

Table 2.1. Demographics of study participants.

		Mean	SD	Range
Age		11.23	2.28	6.6
IQ (Van Eeden, 1997)		96.42	10.05	32
Clinical Evaluation of Language Fundamentals (CELF)(Semel, Wiig, & Secord, 2003)	Formulated sentences	7.5	3.06	12
	Understanding spoken paragraphs	8.08	3.8	12
	Familiar sequences	7.91	2.6	10
Test of Auditory Processing Skills (TAPS) (Martin & Brownell, 2005)	Word discrimination	11	1.35	4
	Phonological blending	10.17	3.76	14
	Number memory forward	9.84	2.29	8
	Number memory reversed	8.17	2.98	10
	Word memory	10.5	3.15	14
	Sentence memory	9.25	2.67	8
	Auditory comprehension	8.58	2.5	9
	Auditory reasoning	8.75	1.66	5
Peabody Picture Vocabulary Test (PPVT) (Dunn & Dunn, 2007) age equivalents.		8.89	2.39	6.5

*Notes: Norms for the TACL are only available up to the age of 10 years and available scores are therefore not reflected in the table. Similarly, scores for the CELF subtest Concepts and Following Directions have been omitted due to a lack of norms for participants above the age of 12 years.

**CELF and TAPS scores are represented by standard scores.

2.7 Procedures

The following procedures were followed:

2.7.1. Practice

Prior to the commencement of the data collection, participants were presented with the wordless picture book *Frog Goes to Dinner* (Mayer, 1974). This allowed the participants to familiarize themselves with the type of elicitation stimuli and the nature of the response required. This familiarization was carried out during off-medication sessions prior to data gathering procedures. The narratives obtained during familiarization were recorded for consistency but were later discarded without analysis.

2.7.2. Conditions

- All participants were assessed on a Monday morning, allowing for a two day "drug holiday", during which no medication was administered. This provided ample time for offset of the medication. The assumption is that after 24 hours, normal blood level baselines will be reached, thus ensuring that the pre-medication results obtained were truly representative of language abilities of children with ADHD without the influence of MPH-OROS® (Liu, et al., 2005).

   Physicians are in disagreement when it comes to the administration of MPH over weekends and holidays. Although many physicians believe that MPH should be given seven days a week, it is not uncommon for physicians to recommend drug holidays over weekends in order to manage the side effects associated with the administration of MPH (Leung & Lemay, 2003). As a result, studies have been conducted to determine whether drug holidays negatively influence the efficacy of the treatment of ADHD symptoms with MPH. In a study by Martins et al. (2004), drug holidays proved effective in reducing insomnia and appetite suppression without any significant increase in the behavioural characteristics associated with ADHD. Other professionals believe that as MPH is administered to reduce the impairment experienced in target environments, medication regiments should be set up through careful consideration of the individual's impairment. A child should

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only receive medication in situations in which the child is otherwise unable to function effectively. For some children, this will be limited to the school day, whereas other may require medication during afternoons or over certain weekends (Chacko et al., 2001; Rader, McCauley, & Callen, 2009). Therefore, the drug holiday that was required to ensure offset of the medication is in accord with information available in the literature. A survey was conducted by the researcher, in which parents at the school were questioned regarding the administration of medication over weekends. The results obtained indicated that eight out of ten parents choose not to administer medication during weekends and holidays. Therefore, participation in this study did not require a change in the routine administration of MPH-OROS® for the majority of the participants.

- Participants were assessed twice on a single day, once prior to receiving their daily dose of medication and once after the medication had taken effect.

- Two children were assessed per day per examiner.

- Duration of assessment was approximately 15 minutes.

- The first participant was assessed at 7:00 (off-medication) and 11:15 (on-medication).

- The second participant was assessed at 7:15 (off-medication) and 11:30 (on-medication).

- Immediately after the pre-medication assessment, the children received their prescribed daily dose of MPH-OROS® from their respective teachers. This ensured that the study did not disrupt the routine of a normal school day and medication was administered as per usual. The administration of medication is the daily responsibility of the class teachers and is carried out at the start of the formal school day. Administering the medication immediately after the pre-medication assessment allowed for the four hours needed for MPH-OROS® to reach effective levels.

- All data collection took place in a quiet room. Only the participant and the examiner were present and were seated, side by side, at a table.

- A Dictaphone was placed on the table at an appropriate distance to allow for high quality recordings.

2.7.3. Data collection procedures

- The wordless picture books were randomly assigned to each assessment session.
- The selected book was placed on the table in front of the child.
- The instructions presented to the subjects were pre-formulated to avoid any additional influence on performance and were as follows: *"Here is a picture book that tells a story. This book has no words. I want you to look through the book from start to finish. Then we will go through the book together and I want you to tell me the story for each picture."*
- If the child remained silent for prolonged periods of time, the prompt *"Tell me more"* was used once only, after which no further prompts were given.
- The examiner provided no feedback regarding performance, but provided occasional social continuants such as head nods and "uh-huh".
- All responses by the participants and prompts from the examiner were recorded, allowing for later analysis by the researcher.

2.7.4. Data recording

- The speech samples obtained from the subjects were recorded by the researcher.
- Recording took place on Olympus VN-713PC Dictaphones to allow for later playback and analysis.

2.7.5. Analysis of outcome measures

The recordings were transcribed orthographically, using the Systematic Analysis of Language Transcripts (SALT) (Miller & Iglasias, 2012), to allow for a thorough analysis of the narrative samples. The transcriptions were divided into utterances and the utterances where then broken up into C-units using the SALT coding conventions. Once the transcripts were successfully loaded onto the SALT system, the software was able to calculate the desired microstructure elements. For analysis of macrostructure the researcher evaluated the narratives, and assigned scores, based on the scoring rubric for the 7 NSS components (Miller et al., 2003). Analysis of micro-

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and macrostructure elements is discussed in more detail below. See Table 2.2 for a definition of micro- and macrostructure outcome measures.

Analysis of microstructure elements: After transcription, the samples were analysed using the SALT guidelines and software (Miller & Iglasias, 2012). SALT is a computer based programme developed to provide clinicians and researchers with a reliable and consistent method of carrying out language sample analysis (LSA). LSA is an important assessment measure as it provides insight into the speaker's typical language use and functioning. The SALT programme's features include transcription rules and error checking tools, as well as a data base for normally developing language samples (Miller at al., 2011).

For microstructure elements, productivity (the number of words), lexical diversity (type-token ratio) and grammatical complexity (mean length of utterance) were determined using SALT analyses (Miller & Iglasias, 2012).

Analysis of macrostructure elements: For macrostructure elements, the transcripts were analysed according to SALT's Narrative Scoring Scheme (NSS) (Miller et al., 2003). The Narrative Scoring Scheme (NSS) (Miller et al., 2003) is a narrative assessment tool that provides examiners with a representation of a child's ability to produce a coherent narrative. This tool was developed with the goal of creating a more objective, metric method of measurement to analyse narrative ability in school aged children. It is based on the Rubric for Completing a Story Grammar Analysis, which was developed by the Madison Metropolitan School District SALT working group in 1998, subsequent to the work of Stein and Glenn (1979; 1982). The NSS focuses on multiple narrative skills that are required to produce a rich and coherent story. The skills included in the NSS extend beyond those of basic story grammar. Basic story grammar includes introduction, conflict resolution, and conclusion. The NSS builds on these basic approaches by incorporating a range of abilities into a single scoring rubric which can provide a comprehensive summary of narrative ability. This scoring scheme combines the basic features of story grammar analysis with higher level cognitive skills that develop throughout the school age years. In addition to including a wider range of narrative skills into the scoring scheme, the NSS is based on an amalgamation of discrete coding criteria and examiner judgement (See Table 2.2. for a description of

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NSS categories). The NSS builds upon basic measures of story grammar by demanding that inter-utterance text-level judgements be made. This information has been shown to be highly efficacious, more so than discrete coding schemes, in the identification of school aged children with language disorders (McFadden & Gillam, 1996). By grouping the skills into seven areas of ability, examiners are able to make judgements regarding a child's competency in each component of the narrative process. These judgements are made based on the explicit examples provided for each of the scoring categories. The examples provide scoring criteria, therefore decreasing the abstractness of the categories themselves. The combination of distinct scoring guidelines and the freedom to allow examiner judgement culminates in the construction of this hybrid measurement tool. The scores of these 7 categories are combined by the SALT software (Miller & Iglasias, 2012) to produce a composite score indicative of the child's overall narrative ability (Heilmann et al., 2010; Miller et al., 2011:271-286).

The NSS includes instructions for the coding of story grammar according to a 0 to 5 point Likert-type scale. The NSS includes 7 categories focusing on the following aspects of narratives: introduction, character development, mental states, referencing, conflict resolution, cohesion, and conclusion (Miller et al., 2011:272-273). Performance within each narrative category was assigned a score of 1 (minimal/immature), 3 (emergent) or 5 (proficient). Scores of 2 and 4 were assigned when performance fell somewhere between the major anchors (Bajaj, 2007). A score of 0 is assigned when narrative categories cannot be analysed due to unintelligibility; an inability, on the part of the participant, to complete the task; or when the narrative produced by the participant has no correlation with the elicitation material provided. The scores from the seven categories were then combined to provide a composite score reflecting the child's overall narrative ability (Miller et al., 2011:277).

Table 2.2: Description of microstructure and macrostructure elements.

	Definition
Microstructure	
Productivity, measured by number of words	A quantitative measure that focuses on the number of words produced by a speaker in order to convey an intended message. Number of words per elicited response can easily be influenced by the examiners' prompts. Therefore strict guidelines were followed by the examiners during presentation of the elicitation stimuli as outlined in section 2.6.3. (Data collection procedures).
Lexical diversity, measured by type token ratio (TTR)	A quantitative measure that represents the ratio of different words to the total number of words in a given speech sample (Miller et al., 2011:47). TTR is a useful tool in determining the variability and flexibility of one's language.
Grammatical complexity, measured by mean length of utterance (MLU)	MLU refers to the average number of morphemes per utterance taken from a number of utterances (Shipley & McAfee, 2009:263). As described by Owens (2001:306), "an utterance may be a sentence or a shorter unit of language that is separated from other utterances by a drop in the voice, a pause, and/or a breath that signals a new thought".
Macrostructure	
Introduction	Introduction of the setting and main characters.
Character development	The use of metalinguistic verbs (e.g. *say, talk*), differentiation between characters, and use of first person to depict story characters.
Mental states	The use of metacognitive verbs (e.g. *think, know*) to describe thoughts and feelings necessary for development and advancement of the story plot.
Referencing	Referential cohesion achieved through the use of verbal clarifiers including pronouns and antecedents (the word a pronoun refers to).
Conflict resolution	The highlighting of major conflicts and resolutions critical to the advancement of the plot of the story.
Cohesion	The use of lexical and conjunctive aspects including ordering, emphasis, and transition between story events.
Conclusion	The use of concluding statements to wrap up the whole story.

2.7.6. Validity and Reliability

According to Leedy and Ormrod (2006:97), validity can be defined as "the accuracy, meaningfulness and credibility of the research project as a whole". Internal validity addresses the issue of ensuring that the independent variables, rather than other extraneous variables, are the reason for changes in the dependent variable. Extraneous variables negatively impact the outcomes of the study as one cannot be sure whether the changes recorded are as a result of the independent variable or whether additional variables, that were not sufficiently controlled, were responsible. To ensure the internal validity of the study, the only variable that was altered was the presence and absence of MPH-OROS® during testing. All other variables were strictly controlled. This included the instructions given to the subjects, the elicitation material and the environment in which the assessments took place. So as to ensure that the pre-medication assessments were truly representative of performance without MPH-OROS®, they were scheduled for a Monday morning after a weekend free of medication. This allowed more than enough time for the offset of the medication (Liu et al., 2005). In addition, scheduling data gathering on a Monday morning allowed for the children to be more rested, after the weekend, thereby minimising the influence of the hours of school before the post-medication assessment was carried out.

Although the researcher was responsible for the transcription and coding of narrative samples, which may result in human error, the SALT software (Miller & Iglasias, 2012) has built-in error checking devices that help users identify possible errors in coding. In addition, using the SALT software to calculate number of words, TTR and MLU, as well as the NSS composite score, circumvented the possibility of computational errors during manual calculations. It seems plausible, therefore, that the reliability of the current study's results was increased through the use of the SALT programme for narrative analysis.

"Reliability is the consistency with which a measuring instrument yields a certain result when the entity being measured hasn't changed" (Leedy & Ormrod, 2005:29). To address scoring reliability, intra- and inter-rater agreement and reliability procedures

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were carried out on 20% of the data. Five of the 24 narratives were randomly selected, including both on- and off-medication samples. These narratives were rescored by the researcher and an additional unbiased speech language therapist, who has 10 years of experience working with the pediatric ADHD population. Narratives were re-transcribed and all micro- and macro-structure elements were processed using the SALT software (Miller & Iglasias, 2012) and the NSS (Miller et al., 2003). Accuracy of transcription was calculated using point-to-point percentage agreement.

Reliability measures for Microstructure elements: For microstructure elements, inter- and intra- rater agreements were determined using Pearson correlations (Ellis & Levy, 2009). The results for *inter-rater reliability* were 1.00 for number of words, 0.997 for mean length of utterance and 0.987 for type-token ratio. For *intra-rater reliability*, the results obtained were 1.00 for number of words 1.00 for length of c-unit and 0.996 for type-token ratio.

Reliability measures for Macrostructure elements: For macrostructure elements, Krippendorff's alpha values were calculated with ordinal level scaling to determine *inter-rater reliability* of the NSS scores. Benchmarks were set at 0.67 (acceptable) and 0.80 (adequate) (Hayes & Krippendorff, 2007). This reliability metric is typically used in the literature when determining inter-rater reliability with NSS scoring (Heilmann et al., 2010). The results obtained were as follows: Introduction 0.25, character development 0.99, conflict resolution 0.64, mental state 0.79, referencing 0.79, cohesion 1.00, conclusion 1.00, total macro elements 0.73.

Although the reliability scores appeared low for the introduction category of the NSS, it should be noted that raw scores never differed by more than a single point (e.g. 2 [intermediate score between immature and emergent] vs. 3 [emergent]). Scores assigned within one point of one another are considered consistent, given that the NSS scale was constructed using clear anchors of 1, 3 and 5 (with intermediate scores of 2 and 4) and is reliant upon the subjective judgment of scorers. In addition, the low reliability scores can, in part, be attributed to the limited number of reliability transcripts. Rescoring twenty percent of the narrative samples translated into a mere five language transcripts, leaving little margin for error. With regard to the difference

in points between scorers, no trends in participant characteristics were noted between the two transcriptions with a scoring discrepancy. Both transcripts were one hundred per cent intelligible and the wordless picture book used to elicit the narratives differed between transcripts, as did the presence or absence of MPH-OROS®. Reliability scores for conflict resolution also appeared low; once again, however, scores never differed by more than a single point and scores of reliability were identical for 4 of the 5 transcripts.

One possible reason for the discrepancy between the scores assigned may be the individuals' interpretation of the descriptions of the scoring criteria for the NSS. For example, assigning an emergent score (3 points) under the introduction category requires the following: 1) *Setting: "states general setting but provides no detail", "descriptions or elements of setting are given intermittently through story"* and *"may provide description of specific element of setting (e.g., the frog is in the jar)"* and 2) *Characters: "characters of story are mentioned with no detail/description".* Allocating an immature score (1 point) requires that the speaker *"Launches into the story with no attempt to provide setting"* (Miller et al., 2011:275). The indications are clear for whether or not to assign a score of 1, but it is far more challenging to determine whether the narrative sample meets all the descriptors necessary to warrant an emergent score of 3. For example, interpretation of "descriptions… given *intermittently* throughout the story" may differ between scorers. If a scorer's best judgment is that the descriptions were not met in their entirety, a score of 2 should be awarded instead. Similar discrepancies were reported in Petersen et al.'s (2008) "Emerging Procedures in Narrative Assessment: The Index of Narrative Complexity" which provided a summary and evaluation of available measures of narration. Included in the review was a discussion of the NSS scoring criteria, noting particular discrepancies with the coding of mental states and cohesion (Petersen et al., 2008).

2.8. Data Processing

The resultant data was captured onto spreadsheets using Microsoft EXCEL 2013. The Statistical Package Social Sciences (SPSS) was used for statistical analysis, during which descriptive and inferential statistics were employed. The statistical results obtained are provided in more detail below.

2.8.1. Statistical Analysis

A limited number of potential participants (n=12) met the strict selection criteria of the current study. Adherence to selection criteria ensured uniformity among participants and allowed for the generalization of findings to the greater population. Due to this small sample size and the skewed distribution of the data, non-parametric statistical techniques were used in the current study when analysing the data.

Descriptive statistics: Descriptive statistics offer an overall summary of the findings (Leedy & Ormrod, 2005:30) thereby providing a description of, and insights into, the data obtained (Maxwell & Satake, 2006:280).The first step of statistical analysis involved the calculation of descriptive statistics for the pre- and post-medication data sets.

The median (*me*) and interquartile range (*IQR*), i.e. the difference between the third quartile and the first quartile, were reported as measures of location and spread of the data. These descriptive measures were chosen in favour of the mean and standard deviation due to the small sample size and skewed distribution of the data (Leedy & Ormrod, 2005:257), as they are more robust than means and standard deviations and are not influenced by outliers (Weinberg & Abramowitz, 2008:78-79).

Inferential statistics: Inferential statistics allow researchers to draw conclusions about the population at large according to the data obtained from a relatively small sample (Maxwell & Satake, 2006:280). The second step of statistical analysis involved statistical inference to test hypotheses about the effect of stimulant medication on the narrative ability of the overall population of children with ADHD.

The Wilcoxon Signed-Rank test, a non-parametric equivalent of the one sample t-test (Wilcoxon, 1945), was selected in order to determine the effectiveness of MPH-OROS® on improving micro- and macrostructure elements during narrative production. The Wilcoxon Signed-Rank test should be used when dealing with a small amount of data which has been obtained by testing the same group of participants on two separate occasions and was therefore employed by the current study to generalise

the findings from the study sample to the greater population (Struwig & Stead, 2003:167).

In order to determine the significance of the results obtained from the Wilcoxon Signed Rank test, a 5% level of significance was set, which meant that a p-value less than 0.05 would indicate a significant result (Leedy & Ormrod, 2005:270-271).

2.8.2. Graphical representation of results

Scatter charts were drawn up for each micro- and macrostructure element, depicting the individual scores obtained by each participant, off versus on medication. Data tables have been included to provide exact values and to illustrate the effect of MPH-OROS® on the raw scores obtained.

Boxplots were drawn up to graphically depict the results obtained for each macro- and microstructure element, providing clarity with regard to the dispersion and skewness of data as well as indicating variability outside of the interquartile range (IQR). Boxplots are an appropriate choice when graphically representing skewed data obtained from a small sample (Rubin, 2013:68) because they provide information regarding the median (me), lower and upper percentile as well as plotting outliers as single points.

2.9. Summary

Chapter 2 offered an overview of the planning and execution of the current study. A description of the research method was presented, followed by a discussion of the research design. A comprehensive explanation of the ethical considerations, research participants, elicitation stimuli and procedures, including data collection, recording and analysis were provided. The reliability and validity of the current study was also addressed.

CHAPTER 3: RESULTS

3.1. Introduction

The main aim of the current study was to determine the effect of MPH-OROS® on the narrative ability of children with ADHD. In order to achieve this objective, two sub-aims were formulated, focusing on the effect of MPH-OROS® on narrative ability as measured by microstructure and macrostructure elements respectively. To that end, a single pre- and single post- medication sample of narrative production was elicited from each of the 12 participants, using the wordless picture books *Frog, Where Are You?* (Mayer, 1969) and *One Frog too Many* (Mayer & Mayer, 1975). The narratives obtained were analysed according to micro- and macrostructure elements. Analysis of *microstructure* elements included measures of productivity (number of words per description), grammatical complexity (MLU) and lexical diversity (TTR). *Macrostructural* analysis was carried out using the NSS (Miller et al., 2003) and included the analysis of seven story categories namely introduction, character development, referencing, mental states, conflict resolution, cohesion, and conclusion, with an additional composite score representing overall narrative ability. Within-participant comparisons of pre- and post-medication narration were carried out, and the results obtained are presented in this chapter.

The participants' individual off- versus on-medication raw scores for each micro- and macrostructure element are depicted in scatter charts (Figures 3.1, 3.3, 3.5, 3.8, 3.9, 3.10, 3.11, 3.12, 3.13, 3.14 and 3.15). Data tables accompany each figure and provide the exact values for each data point.

Descriptive results and p-values obtained for micro- and macrostructure elements have been summarized and presented in Table 3.1. Based on this summary of results, box plots (Figures 3.2, 3.4, 3.6 and 3.7) were created to highlight the main trends observed.

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3.2. Overview of results

Table 3.1 provides an overview of the group results obtained for each micro- and macrostructure element, off- versus on-medication. Descriptive results, including median and IQR, as well as p-values have been included. The p-values in Table 3.1 range from 0.906 to 0.008. Three p-values fell below 0.05, indicating that MPH-OROS® had a significant effect on aspects of narrative macrostructure. A *p-value* of *0.026* was obtained for *conflict resolution*, *0.020* for *cohesion* and *0.008* for *overall narrative ability* (as represented by the NSS total score) indicating that the administration of MPH-OROS® significantly improved narrative ability in children with ADHD as measured by the NSS. The remaining p-values were greater than 0.05, indicating that MPH-OROS® did not have a significant effect on narrative microstructure, including productivity *(p=0.255)*, grammatical complexity *(p=0.906)* and lexical diversity *(p=0.455)*, or on the remaining macrostructure elements, namely introduction ($p=0.236$), character development ($p=0.121$), mental states ($p=0.124$), referencing ($p=0.527$), and conclusion ($p=0.121$).

3.3. Results for microstructure elements

The first research question pertains to the effect of medication on microstructure language production elements, namely productivity, grammatical complexity and lexical diversity, during narrative production. Results obtained indicate that MPH-OROS® did not have a significant effect on microstructure elements of narration (all p-values were greater than the level of significance of 5%, as reported in Table 3.1.). The results for microstructure elements are discussed further according to the three microstructure elements, under the headings of *productivity, grammatical complexity* and *lexical diversity*.

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Table 3.1. Effects of MPH-OROS® on the narrative production of children with Attention Deficit Hyperactivity Disorder.

		Off medication		On medication		Effect of medication	
		Median	IQR	Median	IQR	Z	p-value
Microstructure	Productivity (Number of words)	301.5 (*m*=361.25)	166.5	389 (*m*= 410)	216	- 1.138	0.255
	Grammatical complexity (Mean length of c-unit)	7.93 (*m*= 7.73)	1.3	7.78 (*m*= 7.67)	1.93	-0.118	0.906
	Lexical diversity (Type token ratio)	0.33 (*m*= 0.33)	0.08	0.325 (*m*= 0.32)	0.09	-0.747	0.455
Macrostructure Scored range of 5 – 1 (per Miller et al., 2003)	Introduction	2.17 (*m*= 2.17)	0	2.58 (*m*= 2.58)	1	-1.186	0.236
	Character development	3 (*m*= 2.67)	1.5	3.33 (*m*= 3.33)	1	-1.522	0.121
	Conflict resolution	2 (*m*= 2.17)	2	3 (*m*= 3)	0.8	-2.226	0.026
	Mental states	2.5 (*m*= 2.5)	1	2 (*m*= 3.25)	1.8	-1.538	0.124
	Referencing	3 (*m*= 2.75)	0.8	3 (*m*= 2.92)	1.8	-0.632	0.527
	Cohesion	2 (*m*= 2.25)	2	3 (*m*= 2.83)	2	-2.333	0.020
	Conclusion	2.5 (*m*= 2.58)	1.8	3.5 (*m*= 3.16)	1.8	-1.552	0.121
	NSS total score	16.5 (*m*= 17.08)	4	21 (*m*= 21.08)	5	-2.673	0.008

*Notes: Z-value represents results for the Wilcoxon Signed Ranks Test for the difference between performance on- and off- medication.

** *m* values represent mean (averages).

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3.3.1. Productivity

Figure 3.1 represents the individual productivity scores (number of words produced) obtained from each participant, off- versus on-medication. Results indicate that productivity decreased after administration of MPH-OROS® in 4 of the 12 participants. In the remaining 8 participants, productivity scores increased after the administration of the medication. As is evident from Figure 3.1, scores of productivity differed greatly between participants. Off-medication scores ranged from 214 to 668 words per narrative sample and on-medication productivity ranged from 199 to 699 words per narrative sample.

For four participants, the number of words decreased on medication. The scores obtained from participant 6 and participant 8 for number of words during off-medication narration were 657 and 668 respectively, indicating maximum off-medication values for productivity (as represented by the points 176 and 174 in Figure 3.2., as these scores lay outside the IQR). These narratives were characterised by exhaustive accounts of story events with an inability to differentiate between important and irrelevant detail. After the administration of medication, productivity decreased by approximately 100 words in both participants 6 and 8. Similar results were observed in participant 12. Although participant 1's off-medication productivity scores were low, the administration of MPH-OROS® resulted in a further decrease in the number of words produced during story narration.

Conversely participants 1, 5 and 10 produced short narratives before the administration of medication, with minimum productivity values of 241, 214, and 215 words respectively. The narratives obtained from these participants were short, superficial narratives which merely provided a basic outline of the story. Although the MPH-OROS did not increase productivity in participant 1, participant 5 showed a slight increase in number of words and participant 10 showed a marked increase in productivity after the administration of medication. Contrary to these results, a large increase in productivity after the administration of MPH-OROS® was noted in participants 3, 7 and 9.
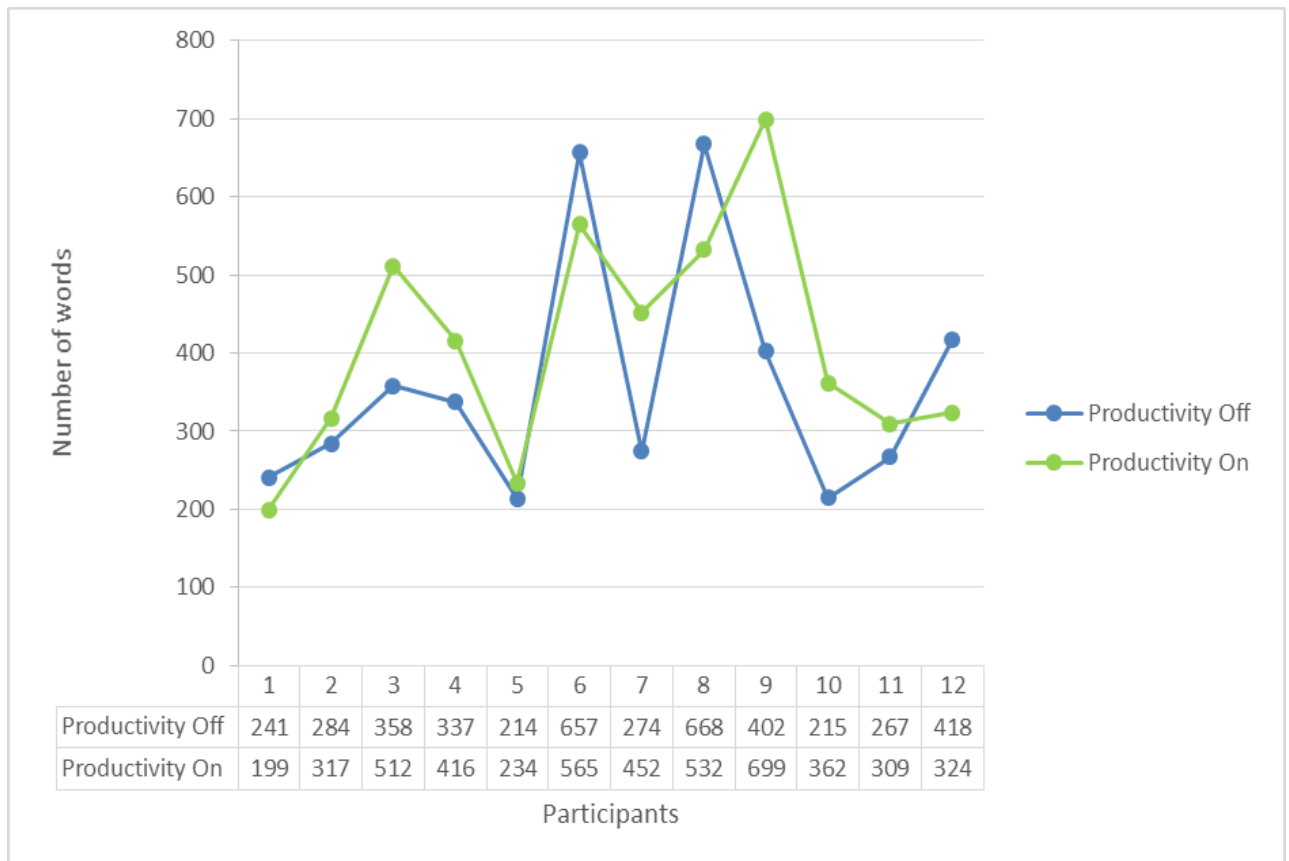
Figure 3.1. Individual scores for productivity (number of words produced), off- and on-medication.

Note: Scatter charts representing off- and on-medication results for each narrative element have been presented on a single axis to allow for a visual depiction of the effect of medication on each micro- and macrostructure element.

Figure 3.2 represents the group results obtained for productivity. The median (n=12) number of words *off medication* was 310.5. The middle 50 percent of scores fell between 247.5 and 414, resulting in an interquartile range (IQR) of 166.5. *On medication* results for number of words was a median of 389. The middle 50 percent of scores fell between 389 and 527 resulting in an IQR of 216. These results suggest that MPH-OROS® did not significantly impact the number of words produced by participants during story narration i.e. MPH-OROS® did not significantly increase or decrease the productivity of the group *(p=0.255)*. The results may reflect the variability in response to medication: while certain participants' productivity increased with the administration of MPH-OROS®, the productivity for the remainder of participants decreased.
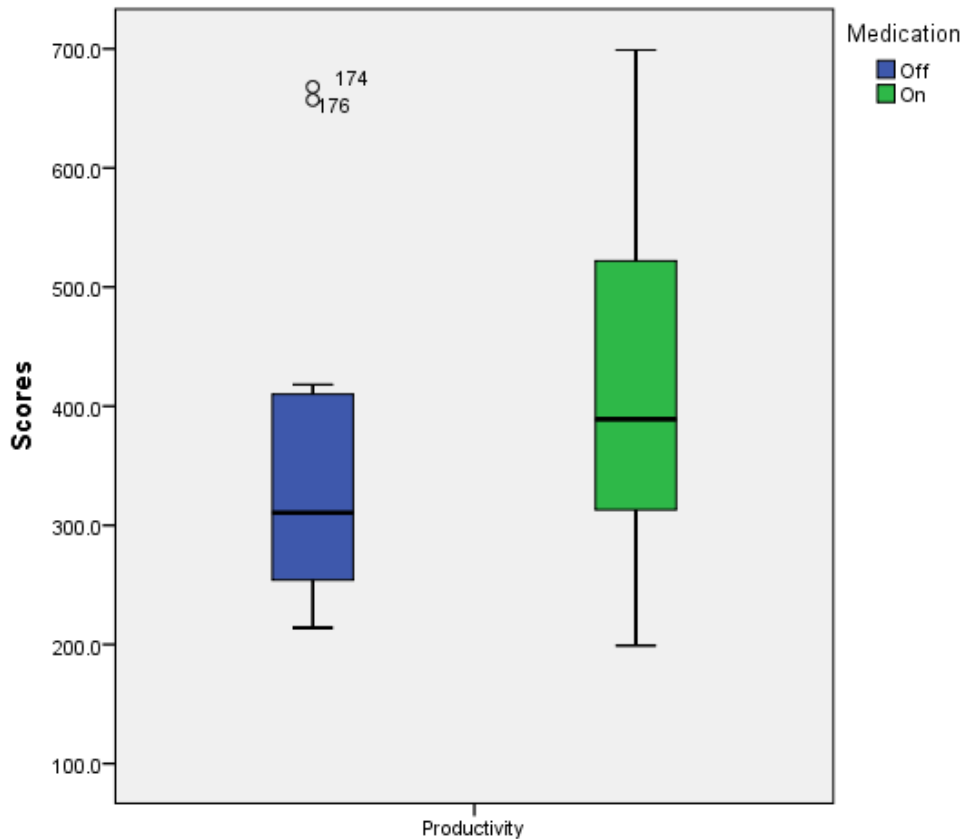
Figure 3.2. Box plots representing median and interquartile ranges for productivity (number of words produced), off- and on-medication (n=12).

Note: The thick line represents the median value and the vertical lines that extend above and below the box are representative of the range. The two horizontal lines found above and below the vertical lines represent the maximum and minimum quartile values respectively. Outliers have been plotted as individual points on the axis (Rubin, 2013:68). Box plots representing off- and on-medication results for each narrative element are presented on a single axis to allow for a visual comparison of results indicating effect of medication.

3.3.2. Grammatical complexity

Figure 3.3 represents the individual scores for grammatical complexity (MLU) obtained from each participant off- versus on-medication. Results indicate that grammatical complexity increased in 7 of the participants, but decreased in the remaining 5 participants. Although MLU increased in 7 of the 12 participants, the degree of improvement for most of these participants was slight, with the exception of

participants 6 and 9 whose MLU values increased by 1.91 and 0.93 respectively. A large decrease in MLU was noted in participant 12, subsequent to the administration of medication, with a drop of 2.40. Figure 3.4 represents the group results obtained for grammatical complexity, as represented by MLU off- and on-medication. As can be seen in Figure 3.4, median values for MLU (n=12) were 7.93 (IQR=1.3) *off medication* and 7.78 (IQR=1.93) *on medication*. Point 197 represents participant 5's off-medication MLU of 4.46 that fell outside the IQR. MPH-OROS® did not significantly affect the participants' grammatical complexity during story narration i.e. the administration of MPH-OROS® did not significantly increase or decrease the group MLU *(p=0.906)*.

Participants	1	2	3	4	5	6	7	8	9	10	11	12
Grammatical complexity Off	7,37	7,39	9,22	8,58	4,64	8,03	5,84	7,39	7,82	8,71	8,28	9,47
Grammatical complexity On	6,52	8,08	9,34	7,22	5,07	9,94	6,48	8	8,75	7,7	7,85	7,07
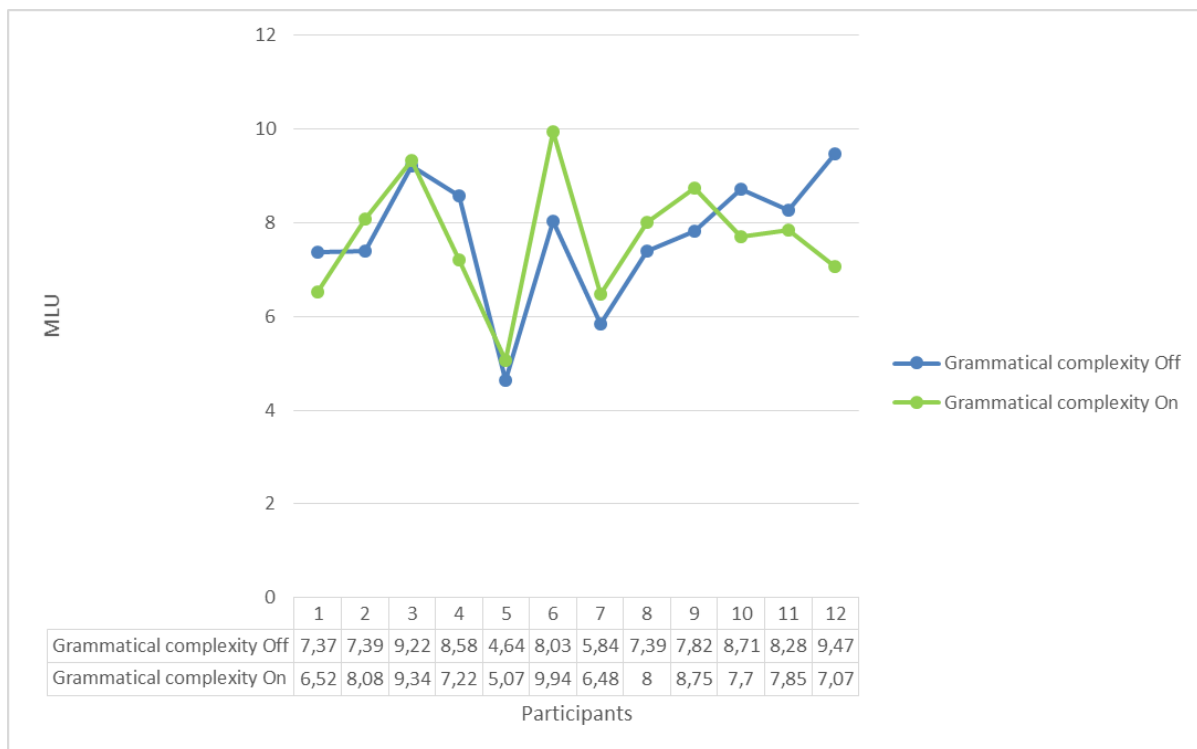
Figure 3.3. Individual scores for grammatical complexity (MLU), off- and on-medication.
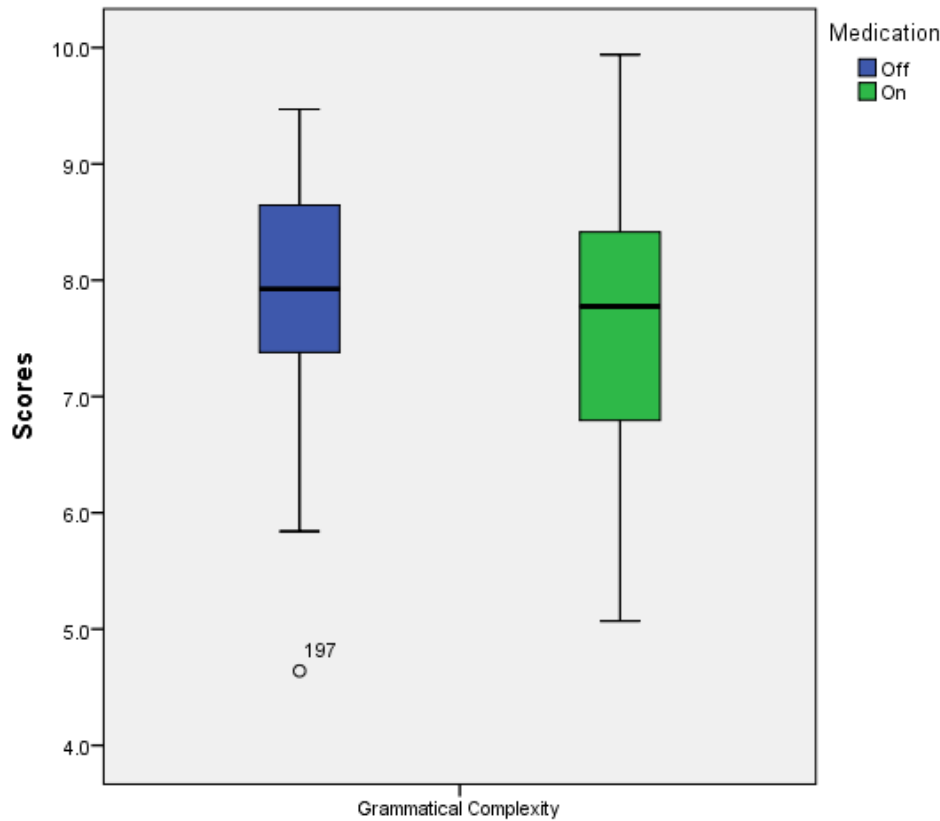
Figure 3.4. Median and interquartile ranges for grammatical complexity (MLU), off- and on-medication (n=12).

3.3.3. Lexical diversity

Figure 3.5 represents the individual scores of lexical diversity (TTR) obtained from each participant off- versus on-medication. Results indicate that lexical diversity showed little increase or decrease in the majority of participants. As indicated in Figure 3.6, median values (n=12) for TTR were 0.33 (IQR=0.08) *off medication* and 0.325 (IQR=0.09) *on medication*. Exceptions were noted however in participants 7, 8, 9 and 10 whose TTR scores differed substantially following to the administration of MPH-OROS®. TTR increased by 0.1 in participant 8 and decreased by 0.07, 0.1 and 0.11 in participants 7, 9 and 10. These results reveal that MPH-OROS® did not significantly impact on participants' lexical diversity during story narration, as no significant change was noted in the group TTR after the administration of medication (*p=0.455*).
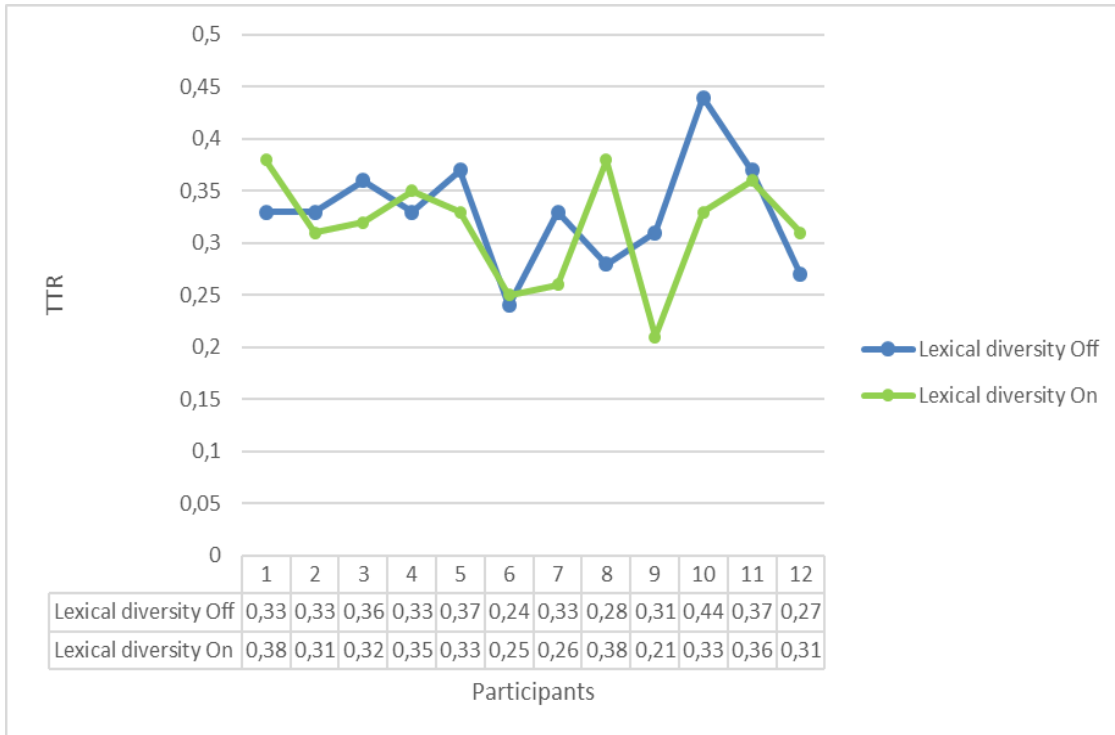
Figure 3.5. Individual TTR scores (representing lexical diversity) for each participant, off- versus on-medication.

	1	2	3	4	5	6	7	8	9	10	11	12
Lexical diversity Off	0,33	0,33	0,36	0,33	0,37	0,24	0,33	0,28	0,31	0,44	0,37	0,27
Lexical diversity On	0,38	0,31	0,32	0,35	0,33	0,25	0,26	0,38	0,21	0,33	0,36	0,31
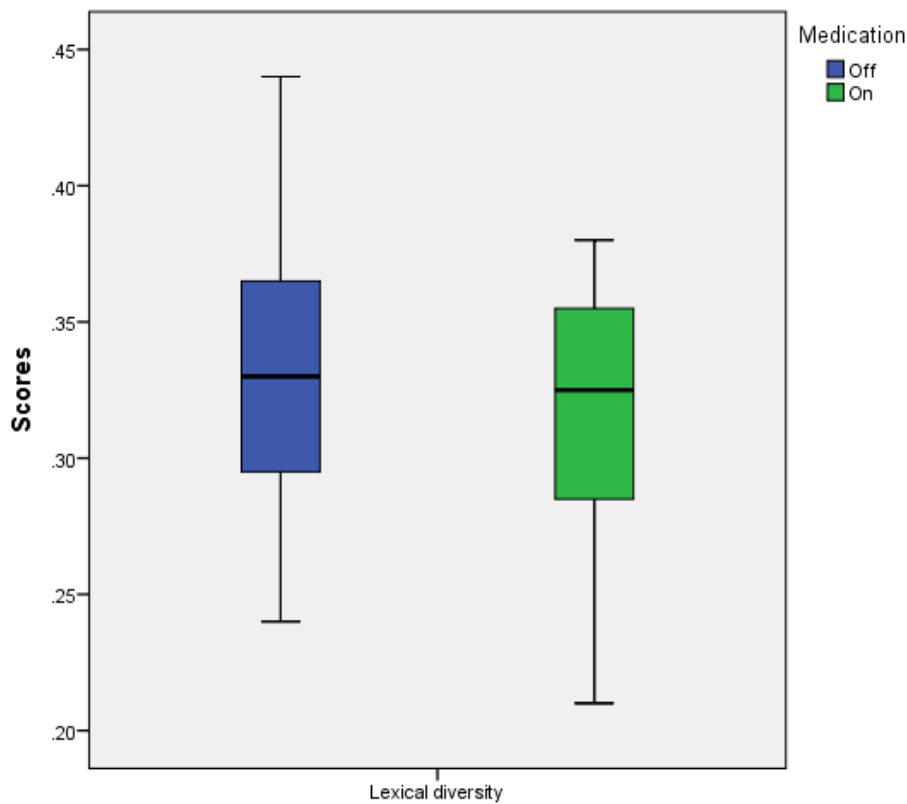
Figure 3.6. Median and interquartile ranges for lexical diversity (TTR), off- and on-medication (n=12).

3.4. Results for macrostructure elements

The second research question asked if there was an effect of medication on *macrostructure* language production elements (introduction, character development, conflict resolution, mental state, referencing, cohesion, coherence and total) during narrative production as measured by NSS (Miller et al., 2003). Figure 3.7 represents the group's results for macrostructure elements off and on medication. Results obtained indicate that MPH-OROS® had a significant effect on certain macrostructure elements of narration (as reported in Table 3.1.). The statistical results obtained for macrostructure elements are represented in Figure 3.7 and will be discussed further according to those NSS components that were significantly affected by the administration of MPH-OROS® and those that did not show a significant difference off- versus on-medication.

Figure 3.7. The effect of MPH-OROS® on macrostructure elements in children with ADHD (n=12).

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3.4.1. Overall narrative performance, conflict resolution and cohesion

Results indicated that MPH-OROS® had a statistically significant effect on 2 of the 7 NSS components, namely conflict resolution and cohesion, as well as overall narrative per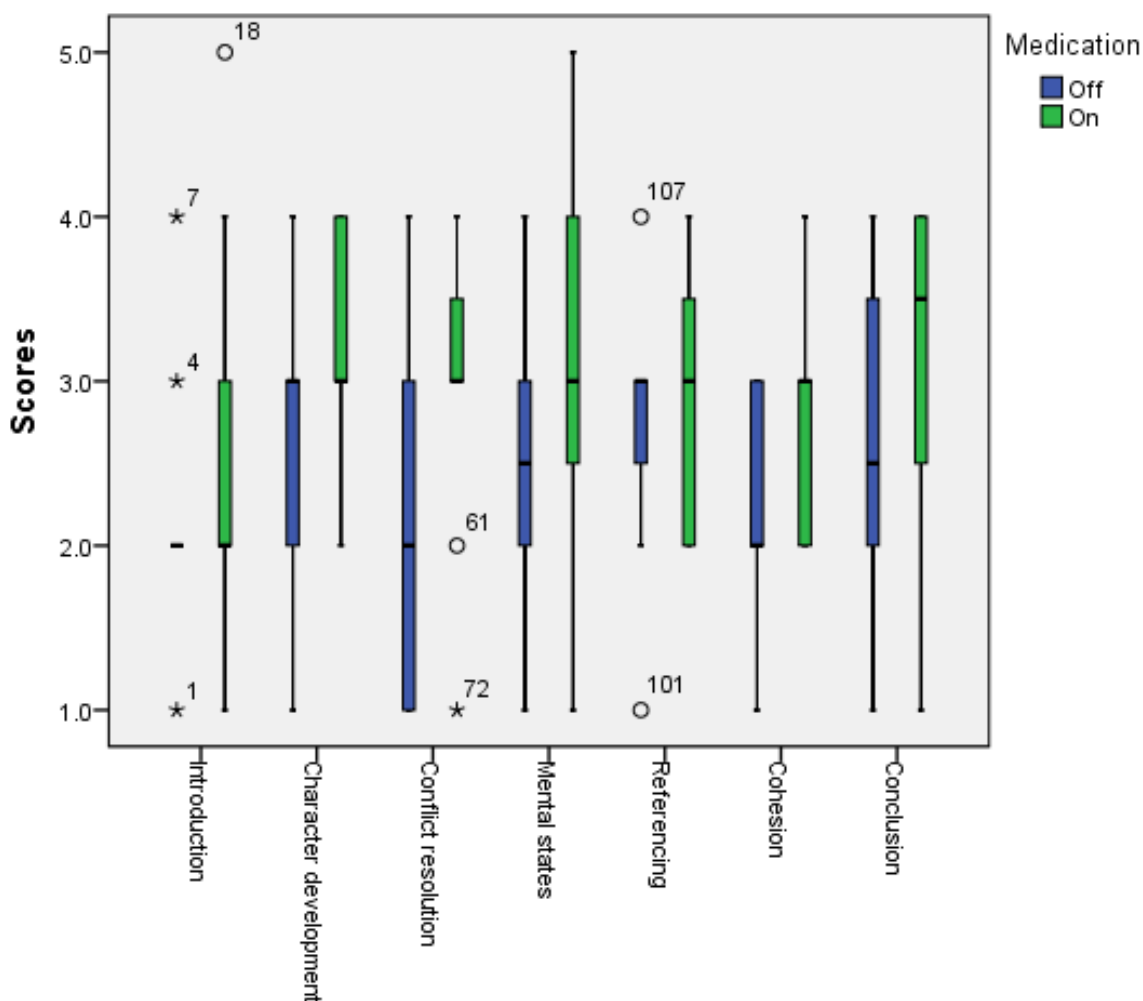formance (as represented by the NSS total score). The results obtained for each participant, as well as group scores, are described below according to each NSS category and overall narrative performance.

Conflict resolution: Figure 3.8 represents the individual results obtained from each participant with regard to conflict resolution during story narration. Results indicated that MPH-OROS® improved the discussion of conflicts and their subsequent resolutions in 7 of the 12 participants. Scores of conflict resolution did not improve in 4 participants, and decreased in 1 participant (participant 3), after the administration of medication. Figure 3.7 represents the results obtained for each macrostructure element, including conflict resolution, after statistical analysis was carried out.The *off medication* median for conflict resolution was 2 (IQR= 2) and *on medication* was 3 (IQR= 0.8) *(p= 0.026)*. The *p-value* of *0.026* for conflict resolution indicates that MPH-OROS® elicited a significant effect on this NSS component (as the p-value was less than 0.05) (See Table 3.1).

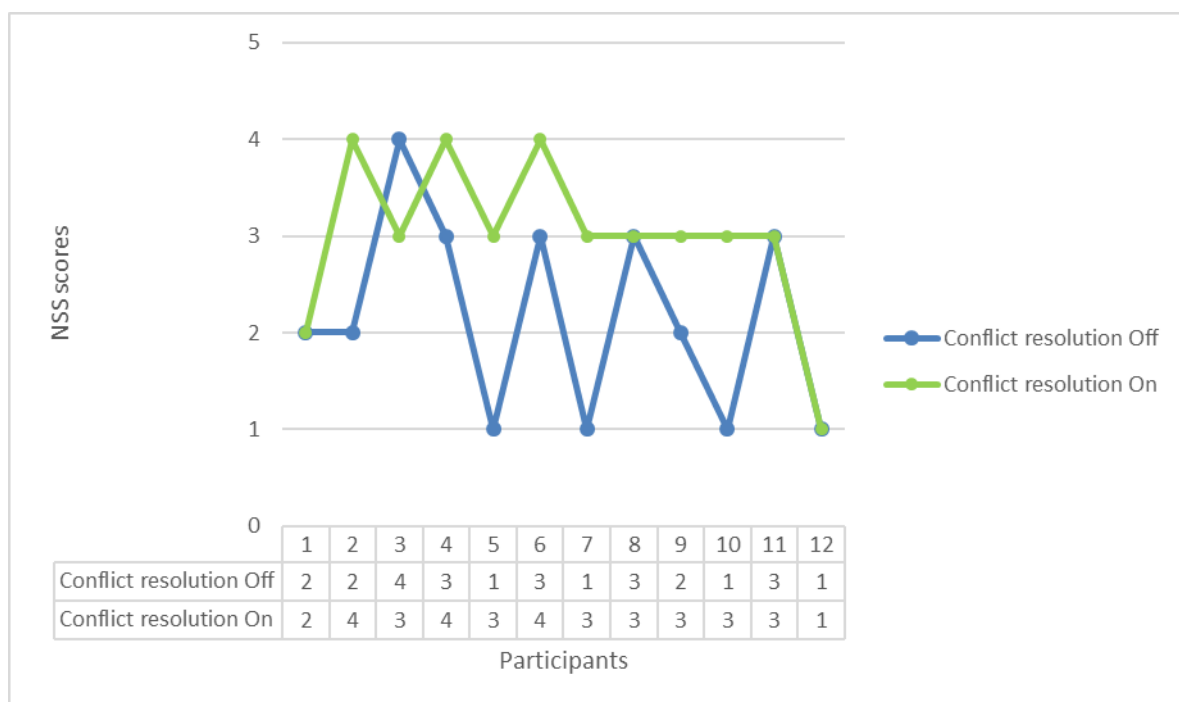|	1	2	3	4	5	6	7	8	9	10	11	12
Conflict resolution Off	2	2	4	3	1	3	1	3	2	1	3	1
Conflict resolution On	2	4	3	4	3	4	3	3	3	3	3	1

Figure 3.8. Individual NSS scores for conflict resolution, off- and on-medication.

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Cohesion: Figure 3.9 represents the individual results obtained from each participant with regard to narrative scores of cohesion. Results indicated that MPH-OROS® improved the sequencing of and transition between story events in 6 of the study participants, with the remaining 6 participants showing no improvement after the administration of medication. As displayed in Figure 3.7, cohesion elements *off medication* had a median of 2 (IQR= 2) and *on medication* 3 (IQR=2), with a *p-value of 0.020* indicating that MPH-OROS® had a statistically significant effect on participants' narrative cohesion.
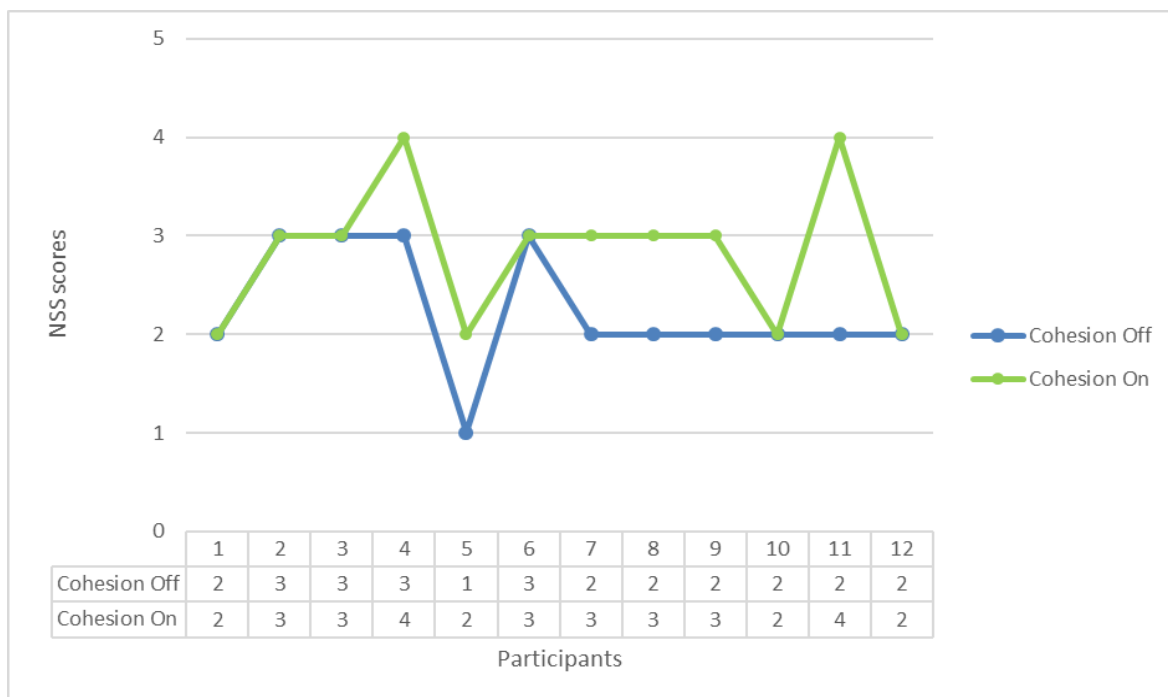
Figure 3.9. Individual NSS scores for cohesion, off- and on-medication.

Overall narrative ability: The scores assigned for each of the 7 NSS components were added together to form the NSS total score, indicative of the participants' overall narrative ability. Results indicated that MPH-OROS® improved overall narrative performance in 10 of the 12 study participants, as represented in Figure 3.10 (the exceptions are participants 3 and 12). As shown in Figure 3.5, the *off medication* median was 16.5 (IQR=4) and *on medication* median was 21 (IQR=5) for overall narrative performance. Results indicate that MPH-OROS® had a statistically significant effect on overall narrative performance of the study participants as represented by the NSS total score off- and on-medication *(p=0.008).*
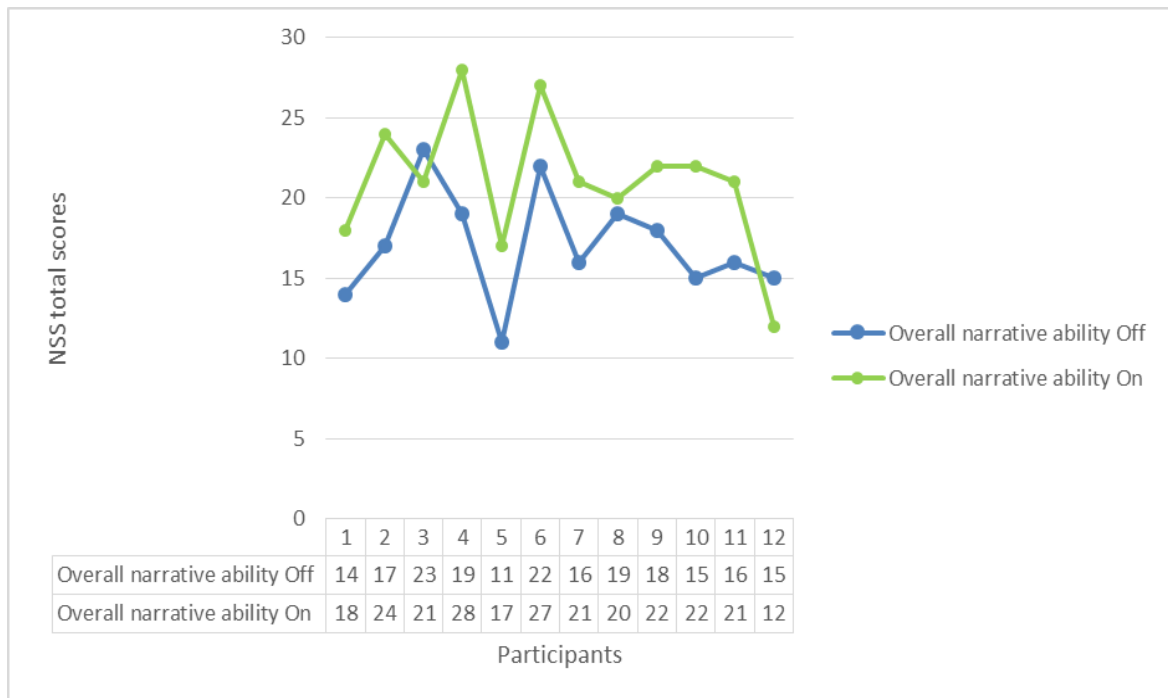
Figure 3.10. Individual scores for overall narrative ability (NSS total score), off- and on-medication.

3.4.2. Introduction, character development, mental states, referencing, and conclusion

The remaining five story grammar categories were not significantly affected after the administration of MPH-OROS®.

Introduction: Figure 3.11 represents the individual scores with regard to the narrative introduction. Scores of introduction remained the same in 6 of the study participants, with 1 participant (participant 12) including less information regarding the story setting, after the administration of medication. Although scores increased in 4 of the 12 participants, results were not significant. As displayed in Figure 3.7, median values for introduction *off medication* was 2.17 (IQR= 0) and *on medication* 2.58 (IQR= 1). Results therefore indicated that MPH-OROS® did not significantly improve participants' description of the story setting, including references to location and time *(p= 0.236)*.
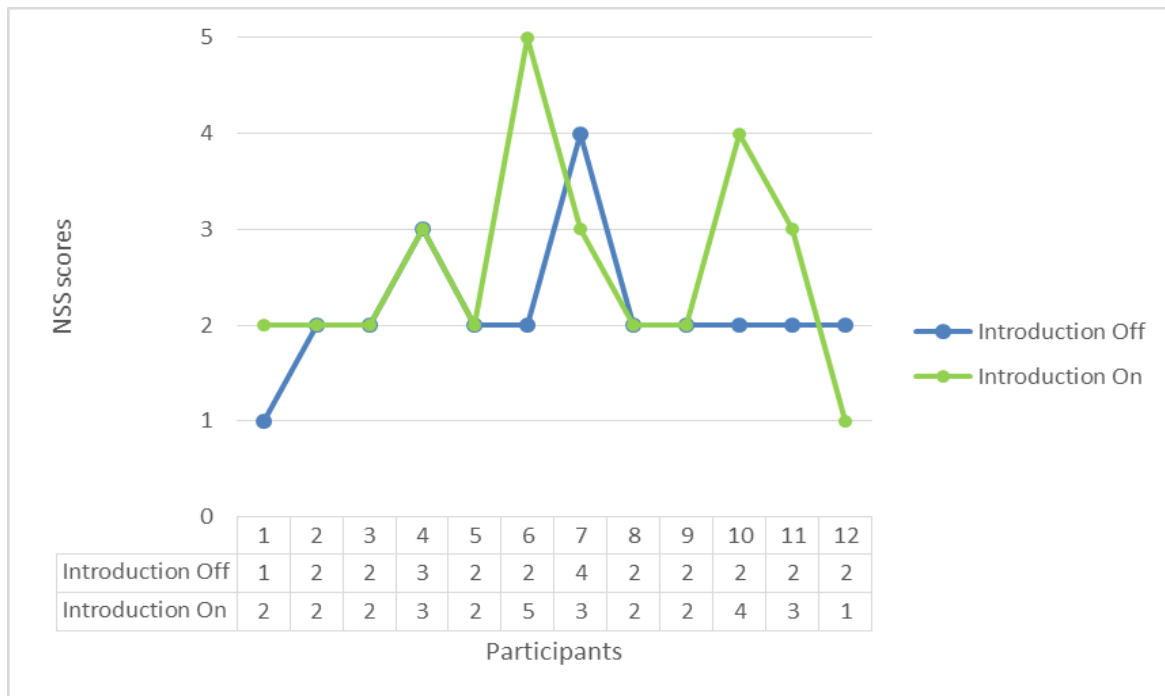
Figure 3.11. Individual NSS scores for introduction, off- and on-medication.

Character development: Figure 3.12 represents the individual raw scores obtained from each participant with regard to character development during narration, off- versus on-medication. Scores of character development improved in 5 participants, 5 of the participants' scores remained the same and 2 participants' scores decreased after the administration of MPH-OROS® (participants 7 and 12). As reported in Figure 3.7, median values for character development were 3 (IQR=1.5) *off medication* and 3.33 (IQR= 1) *on medication*. Results therefore indicated that MPH-OROS® did not significantly affect participants' inclusion of, and discrimination between, main and supporting story characters *(p= 0.121)*.

Mental states: Figure 3.13 represents the individual participants' recognition of mental states, as obtained during narrative production off- versus on-medication. Mental states scores improved in 5 of the 12 participants after the administration of MPH-OROS®, but 5 of the participants' scores remained the same and 2 participants' scores were lower (participants 3 and 11) during *on medication* narration. As depicted in Figure 3.7, median values for mental states *off medication* was 2.5 (IQR= 1) and *on medication* 2 (IQR= 1.8). Results indicated that MPH-OROS® did not significantly affect participants' expression of characters' thought processes and emotions *(p= 0.124)*.

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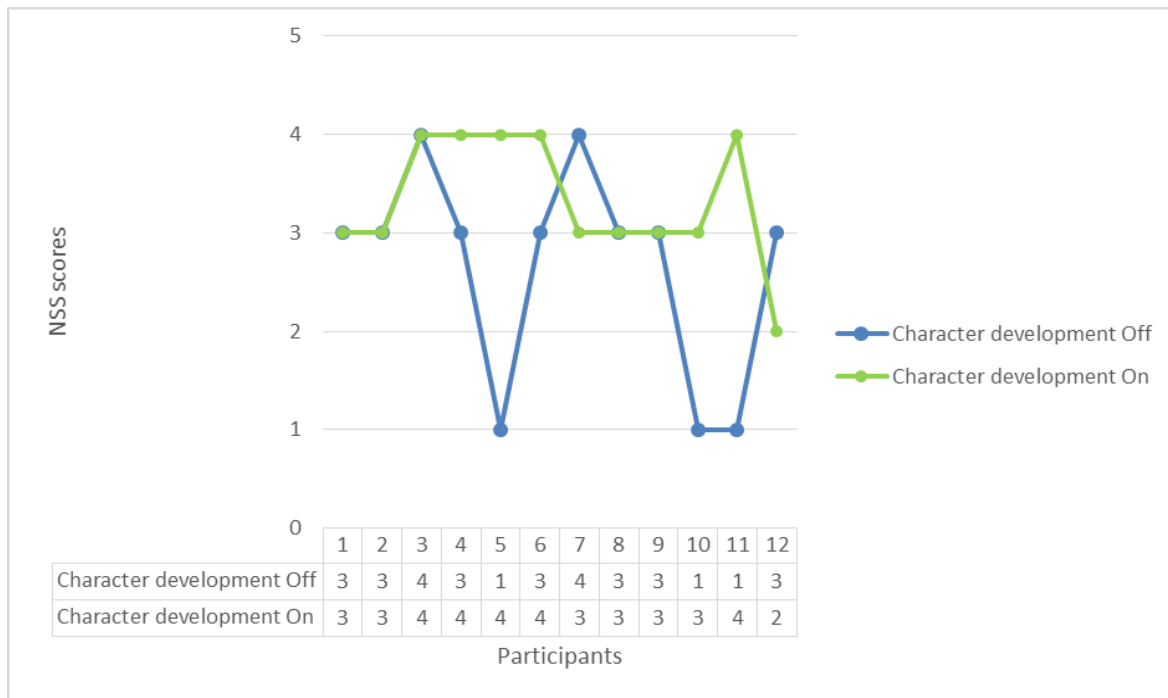
Figure 3.12. Individual NSS scores for character development, off- and on-medication.
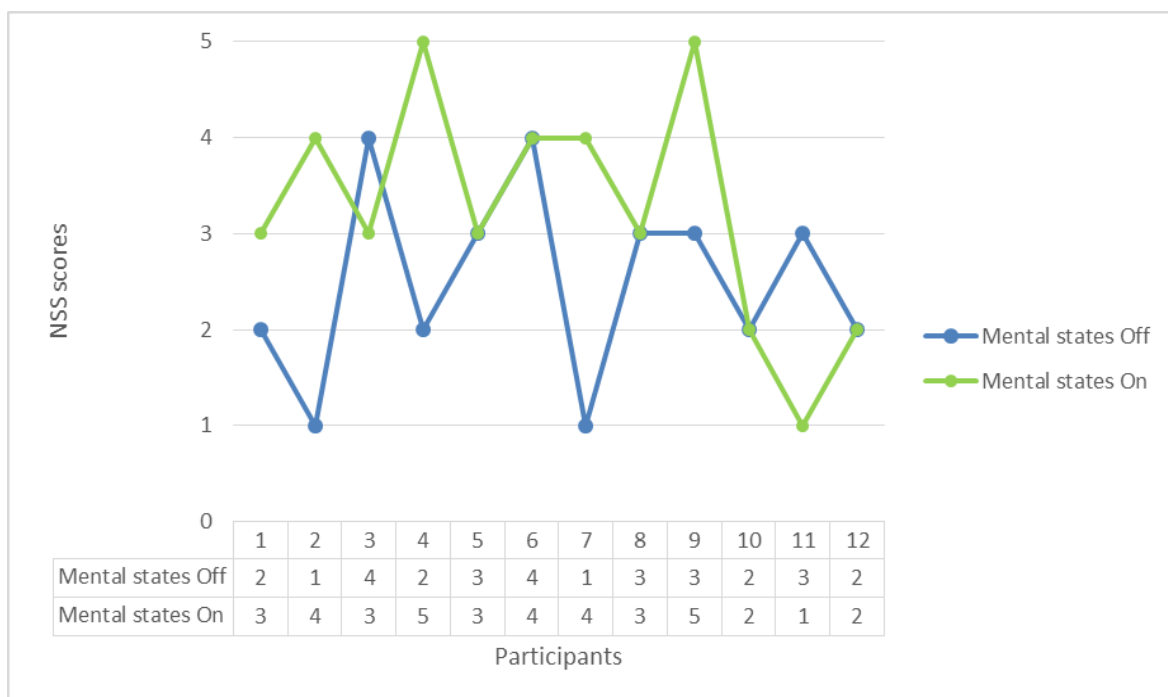
Figure 3.13. Individual NSS scores for mental states, off- and on-medication.

Referencing: Figure 3.14 represents the raw scores for the NSS referencing component, obtained from each participant, off- versus on- medication. Scores for referencing decreased in 4 of the study participants and remained unchanged in 2 participants, after the administration of medication. Although referencing scores

increased in 6 of the 12 participants, results were not significant *(p=0.527)*. As depicted in Figure 3.7, median values (n=12) for referencing were 3 (IQR=0.8) *off medication* and 3 (IQR= 1.8) *on medication*. Results therefore indicated that MPH-OROS® did not significantly affect participants' use of verbal clarifiers during story narration.
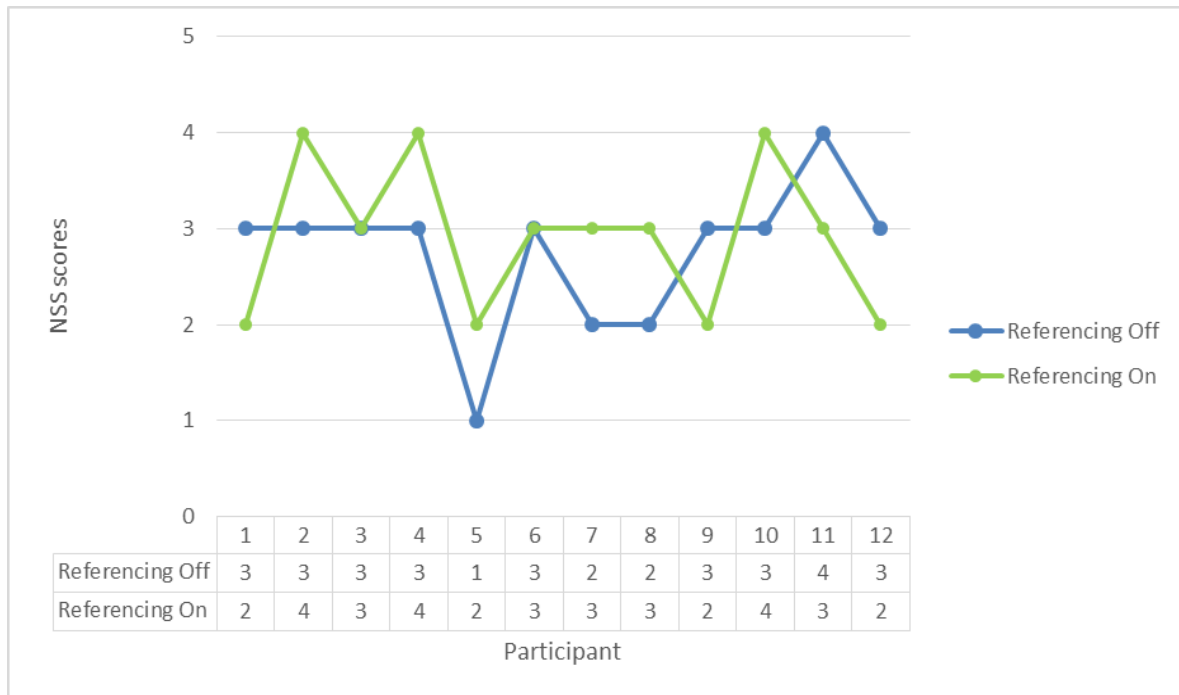
Figure 3.14. Individual NSS scores for referencing, off- and on-medication.

Narrative conclusion: As reported in Figure 3.7, median values for conclusion were 2.5 (IQR= 1.8) *off medication* and 3 (IQR= 1.8) *on medication*. Results indicated that MPH-OROS® did not significantly affect participants' conclusion of the narrative's final event *(p= 0.121)*. Figure 3.15 shows the individual raw scores for narrative conclusion, obtained from each participant, off- versus on-medication. Although conclusion scores improved in 5 of the participants after the administration of MPH-OROS®, 5 of the participants' scores remained the same and 2 participants' scores were lower (participants 5 and 8). MPH-OROS® did not have a significant effect on the participants' use of general concluding statements to bring the story to a close.
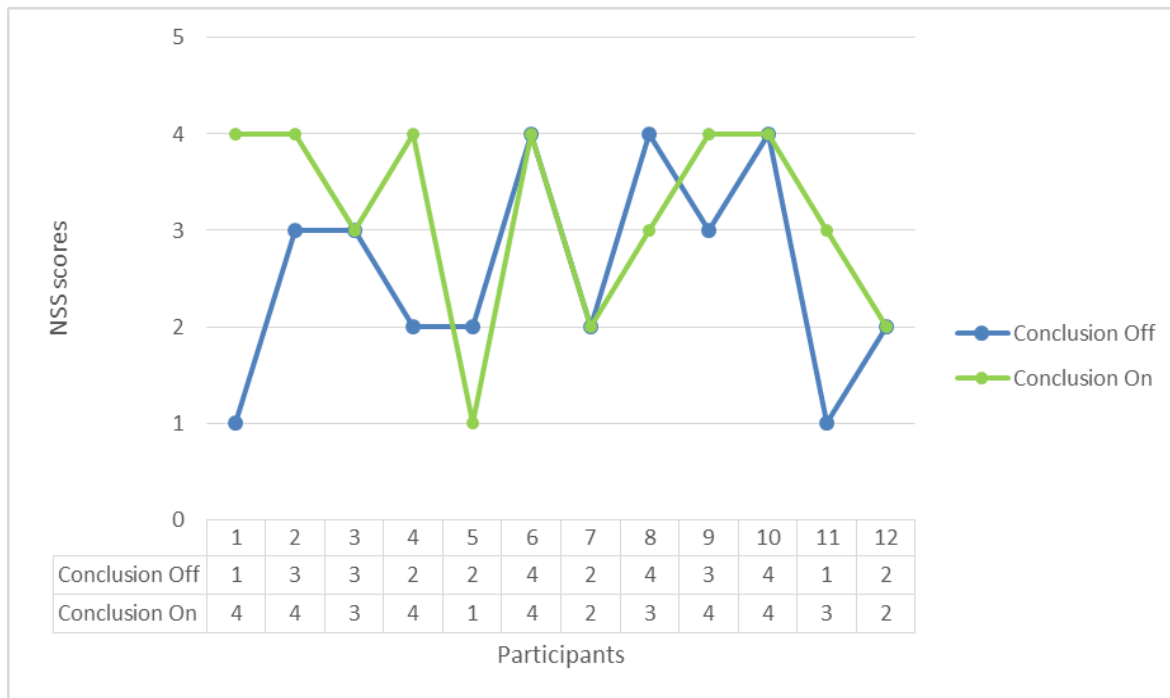
Figure 3.15. Individual NSS scores for conclusion, off- and on-medication.

3.5. Summary:

In this chapter the results of the current study were presented. The results were organized and reported according to micro- and macrostructure elements. Scatter charts and box plots were included to report and summarize the results for each micro- and macrostructure element while allowing a visual comparison of results off-versus on-medication of individual participants and the participants as a group.

CHAPTER 4: DISCUSSION OF RESULTS

4.1. Introduction

The main aim of the current study was to investigate the effect of MPH-OROS® on the narrative ability of children with ADHD. To that end, pre- and post-medication samples of narrative production were elicited from 12 children diagnosed with ADHD, using wordless picture books. The narratives were recorded, transcribed, and analysed according to micro- and macro-structure elements. *Microstructural analysis* included measures of productivity, grammatical complexity, and lexical diversity. Analysis of *macrostructure elements* was carried out using the NSS (Miller et al., 2003) and included analysis of seven story categories namely introduction, character development, referencing, mental states, conflict resolution, cohesion, and conclusion, with an additional composite score representing overall narrative ability. Results were compared within subjects, pre- and post-medication. Improved understanding of the narrative abilities of children with ADHD as well as the effect of stimulant medication on the narrative production of this population could expand evidence-based intervention programs for children with ADHD, facilitating the provision of comprehensive management to those children diagnosed with this highly prevalent and pervasive condition.

Overall, the results obtained from the current study indicate that the administration of MPH-OROS® exerted little effect on microstructure elements while significant improvement was noted in certain macrostructure elements, namely measures of conflict resolution and cohesion. Although the administration of medication did not demonstrate a significant effect on the remaining five macrostructure elements, namely introduction, character development, mental states, referencing, and conclusion, a significant improvement in NSS total score was observed, indicative of a significant improvement in overall narrative ability. A detailed discussion of the findings follows in the remainder of the chapter.

4.2. Effect of MPH-OROS® on microstructure elements

The effect of MPH-OROS® on microstructure elements was investigated in the current study by assessing measures of productivity (number of words per description), grammatical complexity (mean length of utterance/MLU), and lexical diversity (type token ratio/TTR), both off- and post-medication. Results indicated that the administration of MPH-OROS® did not affect microstructure elements as measured during narrative production.

4.2.1. The effect of MPH-OROS® on productivity

For the group, no statistically significant difference in *productivity* was found between pre- and post-medication assessments. Inspection of individual data, however, revealed that this effect varied amongst the individual participants. For the majority of participants, productivity (as measured by the number of words produced per narrative) was greater for post-medication narratives than for pre-medication narratives. For 4 of the participants, however, productivity decreased with the administration of MPH-OROS®. This variable performance in the on-medication condition may illustrate the inattentive nature of children with ADHD. Productivity may have decreased due to an inability to focus on, and a loss of interest in, derivative activities i.e. repetition of narrative production tasks. Alternatively, the variability in measures of production may be due to a difference in language characteristics and response to medication amongst individuals from differing ADHD presentations.

The current study suggests that the noted variability in productivity may have arisen due to the fact that participants were grouped together despite potential differences in ADHD presentations. During pre-medication narrative production certain participants produced short, superficial descriptions of each story event, moving quickly from one page to the next. Conversely, the performance of other participants was characterised by exhaustive descriptions of details with an inability to make judgments between those elements necessary for the progression of the story and superficial details. Results concerning productivity may therefore display disparity between participants related to each participant's performance during pre-medication assessments. In those participants who produced short, superficial narratives, medication may have

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increased productivity through its beneficial effect on attention (Poulton, 2006; Wilens, 2008; Volkow, et al., 2005). Improved attention may have provided participants with an increased ability to focus on story detail, as depicted in the pictures, therefore resulting in greater productivity during narrative production. In those participants who produced exhaustive accounts of story events, medication may have resulted in more focused and therefore shorter narratives post-medication as reflected by decreased number of words. This is in keeping with recent research which has reported that performance on language tasks differs between individuals from different ADHD presentations (Engelhardt et al., 2011; Engelhardt, Veld, Nigg, & Ferreira, 2012). Further research is necessary to establish whether the variability noted in productivity maybe accounted for by ADHD presentations and whether the effects MPH-OROS® might differ across these presentations. Based on the observations made in the current study, it is hypothesised that MPH-OROS® may affect narrative microstructure differently for those individuals with ADHD-PI, ADHD-PH and ADHD-C.

These findings contradict the results reported by Derefinko et al. (2009). Derefinko et al. reported that stimulant medication increased productivity, as measured by number of clauses produced. The results obtained by Derefinko et al. may have differed from the current study due to a variance in study participants. The current study did not differentiate between participants based on ADHD presentation, while Derefinko et al. only included those participants diagnosed as ADHD-C. The observations made in the current study suggest that stimulant medication may affect narrative microstructure differently for individuals with ADHD-PI, ADHD-PH, and ADHD-C, and may account for the discrepancies between studies documenting the effect of medication on productivity.

Derefinko et al.'s (2009) reported increase in verbal productivity subsequent to the administration of stimulant medication is not in keeping with the reported language characteristics of children with ADHD (American Psychiatric Association, 2013). In Tannock's (2005) summary of Fine's (2005) "linguistic manifestation of ADHD symptoms", the language characteristics of children with ADHD were discussed based on the primary symptoms associated with this condition. One characteristic ascribed to children with ADHD is that they demonstrate an excessive speech rate, talking incessantly and speaking in streams of run-on sentences strung together with the

conjunction 'and'. This excessive production of verbal output has been attributed to the hyperactive component of ADHD (American Psychiatric Association). Based on the available evidence, one can surmise that ADHD presentations, more specifically the presence or absence of hyperactivity, may impact on the language production of children with ADHD, particularly with regard to productivity.

4.2.2. The effect of MPH-OROS® on grammatical complexity and lexical diversity

Neither *grammatical complexity* nor *lexical diversity* demonstrated a significant improvement with the administration of MPH-OROS®. These findings provide support for the notion that linguistic impairment persists, despite an improvement in attention. Camarata and Gibson's (1999) discussion of language acquisition in children with ADHD is consistent with this line of thought. Their review of ADHD and its impact on pragmatic skills is based on the transactional model of mother-child interaction (Sameroff & Chandler, 1975). The fundamental premise of the transactional model of mother-child interaction is that language-learning opportunities are viewed as an ongoing transaction between mutually supportive child and parent behaviours. Within this framework of reciprocity, the child's language productions prompt specific responses from the parent, leading to the advancement of the child's language abilities. The resultant improvement in the child's language abilities then in turn prompts more advanced responses from the parent. This pattern of increasing complexity of transactions continues throughout the process of normal language acquisition (Camarata & Yoder, 2002). Based on this model, the language difficulties experienced by children with ADHD can be attributed to the negative impact of inattention, hyperactivity, and impulsivity on early language-learning opportunities in the interaction between parent and infant (Camarata & Gibson, 1999).

A requisite factor for successful functioning of the transaction model is that the child initiates, responds, and maintains an appropriate level of attention necessary to activate the transactional process of language development (Yoder & Warren, 1993). *Inattentive behaviour* can negatively impact the process of language-learning at a variety of levels within these transactions and may upset the supportive context necessary to facilitate successful language acquisition. Inattention may negatively influence a child's ability to register and subsequently respond to the parent's

responses, resulting in a lack of the supportive transactions necessary for language advancements. An example of such behaviour would be observed when a child becomes distracted during the interaction process. The child may initiate a communication interaction but then fail to follow through with a further contribution due to becoming distracted by competing internal or external stimuli. Alternately, due to a lack of attention, the mother's contributions to the interaction may be incorrectly understood or may go unnoticed altogether. When such instances arise, the opportunity for language advancement is lost and the child's language development is subsequently impaired. In addition, the parent's response to inattentive behaviours may further hamper the language-learning process. If the child does not appear to be interested in the activity at hand, the parent may abandon the activity, or abandon the style of interaction in favour of a more directive, rather than interactional, approach (Camarata & Gibson, 1999). This shift in interactive style may prove detrimental to the language development of children with ADHD, as research indicates that those children whose parents adopt a directive approach to interaction demonstrate slower rates of language acquisition (Hart & Risley, 1996). Repeated instances of inattention may lead to a reduction in the number of social interactions between the parent and child, therefore decreasing the opportunities available for the development of effective language behaviour (Camarata & Gibson, 1999).

Similarly, *hyperactivity* and *impulsivity* may be detrimental to the process of language acquisition by impacting on language-learning opportunities in many ways. Symptoms of hyperactivity and impulsivity may impact on the success of parent-child interactions, as these behaviours may result in inappropriate and frequent shifts in topic (American Psychiatric Association, 2013). As a consequence, the parent involved in the transactional process may not have the opportunity to deliver the correct model for the exchange. Alternately, the parent may deliver a response that is no longer appropriate since the child may already have shifted his or her attention to the next activity. The child may interrupt the parent's response, thereby cutting off the language-learning opportunity, or the child may speak over the parent with the parent's response going unnoticed by the child. Consequently, the opportunity for language development is lost and the child's language acquisition is disrupted. After multiple failed interactions, the mother may abandon any further attempts at playing or socially engaging with the child

and future interactions may have the sole focus of managing the child's behaviour (Camarata & Gibson, 1999).

The acquisition of the *pragmatic aspects* of language is particularly vulnerable to disruption in these transactions as a result of inattentive, hyperactive, and impulsive behavioural characteristics of children with ADHD. Furthermore, deficits in grammar and semantics, which arise due to inattention, hyperactivity, and impulsivity, are escalated by pragmatic difficulties during early interactions between parent and infant. Adverse pragmatic behaviours include poor turn taking, poor sustained attention and poor topic maintenance, as well as distractibility. Poor verbal and non-verbal pragmatic abilities negatively influence the child's capability to engage in ongoing transactions between the child and the parent from a young age and may result in cascading language difficulties in later childhood and adolescence (Camarata & Gibson, 1999).

In summary, the results obtained in the current study provide support for the theory that the language difficulties experienced by this population may arise as a result of inattention, hyperactivity, and impulsivity disrupting early social interactions between the infant and parent. Disruption of these early language-learning opportunities, coupled with an inability to attend to and learn from the adult model, leads to the underdevelopment of language abilities. Even with improved attention, due to the administration of MPH-OROS®, children with ADHD may not have developed the requisite language skills to produce a mature narrative in terms of microstructure elements, namely lexical diversity or grammatical complexity.

4.3. Effect of MPH-OROS® on macrostructure elements

The effect of MPH-OROS® on macrostructure elements was assessed using the NSS (Miller et al. 2003). Assessment procedures involved the analysis of seven story categories namely introduction, character development, referencing, mental states, conflict resolution, cohesion, and conclusion, as well as computation of a composite score representative of overall narrative ability. Results of the research project indicated that MPH-OROS® improved certain macrostructure elements as measured by the NSS. Administration of MPH-OROS® resulted in a significant improvement in measures of conflict resolution and cohesion as well as an improvement in NSS total

score, indicative of a significant improvement in overall narrative ability. Although the administration of medication improved scores on conflict resolution, cohesion and overall narrative ability, the remaining five categories, namely introduction, character development, mental states, referencing, and conclusion, did not show a significant difference between on-medication and off-medication conditions.

4.3.1. Effect of MPH-OROS® on conflict resolution and cohesion

The results obtained by the current study indicate that MPH-OROS® improves aspects of narrative macrostructure, namely *conflict resolution* and *cohesion*, during narrative production. As a result of the administration of MPH-OROS® participants were better able to plan and organise their narratives resulting in improved sequencing of, and smoother transitions between, story events. This would be reflected in a better score on the measure of *cohesion*. The administration of MPH-OROS® may have led to improved scores on *conflict resolution* by decreasing impulsive behaviour, subsequently slowing the thought process and providing participants with the opportunity to select information, monitor the outcome of story events, and redirect responses where necessary. Improvement noted in these macrostructure elements, after the administration of MPH-OROS®, may be indicative of the effect of stimulant medication on tasks of executive functions (Aman, Roberts, & Pennington, 1998; Barnett, 2001; Kempton et al., 1999). The improvement noted in these story categories, in the absence of an improvement in the additional five categories of the NSS, may indicate that conflict resolution and cohesion are more reliant upon an individual's executive functions and are perhaps less dependent upon adult modelling of story grammar during earlier language-learning opportunities.

These findings can be further explained by referring to the literature. Research has reported that MPH activates self-control and self-regulatory processes, ameliorating the impulsivity characteristically experienced by children with ADHD, thereby improving *executive functioning* (Berman, Douglas, & Barr, 1999). This improvement in executive functions has been attributed to the effect of MPH on dopamine neurotransmitter levels within the brain. The administration of MPH blocks the re-uptake of dopamine within the brain, subsequently increasing extracellular dopamine levels (Wilens, 2008). An elevated density of dopamine receptors are situated within

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the basal ganglia and prefrontal cortex (Solanto, 1998). CT scans, cerebral blood flow imaging and MRIs have shown both the basal ganglia and prefrontal cortex to be among those locations within the brain which are deficient in individuals diagnosed with ADHD (Emond et al., 2009; Furman, 2005). The improvement noted in executive functioning after the administration of MPH is believed to be due to the increase in dopamine levels within the synaptic clefts of these neural sites (Peterson et al., 1999b). The identified improvement therefore provides support for the theory that the language difficulties experienced by children with ADHD can be attributed to executive dysfunction (Tannock & Schachar, 1996).

The improvement noted in certain macrostructure elements, subsequent to the administration of MPH-OROS®, contradicts the results reported by Derefinko et al. (2009). The variance in results obtained between studies may be attributed to differences in the narrative elicitation protocols employed. In the study by Derefinko et al., online story narration procedures were carried out in order to elicit narrative samples from participants. The current study, however, presented the participants with the wordless picture books prior to narrative production, thereby allowing the participants to preview the storybooks before they were expected to provide their narrative account of story events. This preview of the picture books afforded participants the opportunity to plan their narratives, thereby allowing for story events to be organised in relation to one another. Furthermore, participants were able to tell the narrative while keeping the story's end goal in mind. Consequently, the narrative elicitation procedure employed in the current study may have increased the likelihood that participants would comment on goal-directed behaviour and initiating events. In addition, this may have increased the participants' inclusion of causal chains given that their focus and attention improved during post-medication assessments, as a result of the administration of MPH-OROS®.

4.3.2. The effect of MPH-OROS® on introduction, character development, referencing, mental states and conclusion

The fact that *introduction, character development, referencing, mental states* and *conclusion* did not improve with the administration of MPH-OROS® suggests that these five categories of the NSS may be less rooted in executive functions and are

perhaps more reliant upon previous language-learning experiences, including modelling of appropriate story structure. This provides support for the theory that the language difficulties experienced by children with ADHD can be attributed to an early breakdown in the interaction between the mother and child due to primary symptoms of ADHD, including inattention, hyperactivity, and impulsivity (Camarata & Gibson, 1999; Sameroff & MacKenzie, 2003). These results suggest that children with ADHD would benefit from early communication intervention to minimise the effect of the behavioural symptoms of ADHD on the development of language and communication. Early communication intervention focuses on addressing the communicative skills of children under the age of 3 years within the context of the family system, optimizing language learning opportunities within activities of daily life (Rosetti, 2001:87).This approach may prove effective for children at risk for developing ADHD and language difficulties, since it can address the breakdown in caregiver-child interaction that occurs as a result of inattention, impulsivity, and hyperactivity. If parents are trained to successfully identify and address these breakdowns in early communication interactions, language-learning opportunities will be more successful and the language difficulties experienced by this population may be minimized (American Psychiatric Association, 2013).

As ADHD is usually only diagnosed during the early school years when inattention and/or hyperactivity-impulsivity impairs academic performance, professionals working with the pediatric population need to familiarize themselves with the temperamental, environmental, genetic, and physiological factors associated with the diagnosis of ADHD (American Psychiatric Association, 2013). Knowledge of these risk factors will ensure that children under the age of 3 years who are at risk for developing ADHD and associated language difficulties can be referred for early intervention to address the breakdown in early language-learning opportunities arising from inattention, hyperactive and impulsive behaviours.

The results of the current study demonstrated that the administration MPH-OROS® did not improve the participants' recognition and expression of the characters' emotions and thought processes as measured by the NSS *mental states* category (Miller et al., 2011:272). The fact that interpretation of mental states did not improve in this study is contradictory to the results obtained by Francis et al. (2001). Francis et

al. (2001) reported that the administration of MPH improved participants' recognition and verbal expression of the characters' thoughts, desires, goals, and emotion responses. This improvement was attributed to an increase in the participants' sensitivity to emotional information and actions carried out by the story characters. The inconsistency between the results of the current study and that of Francis et al. (2001) may be attributed to the method of narrative elicitation. Francis et al.'s (2001) results may be indicative of the effect of stimulant medication on receptive language skills, increasing the children's attention to, and subsequent recall of, the emotional information presented in the adult model. As the current study did not include a focus on receptive language, children were not presented with a verbal model of the story but had to rely solely on their interpretation of the events, and the characters' mental states, as they unfold in the wordless picture books.

4.3.3. Effect of MPH-OROS® on overall narrative ability

In addition to improvement in scores for cohesion and conflict resolution, the administration of MPH-OROS® significantly increased the NSS total scores. Although there was not sufficient improvement in each macrostructure element to prove significant, the summation of the seven areas of story grammar resulted in an increase in the NSS total score which is indicative of a significant improvement in the general impression and efficacy of the narratives produced. Therefore, the results of the current study suggest that administration of MPH-OROS® may assist children with ADHD in being better able to express their thoughts and experiences through more effective, richer narratives. This is an invaluable effect of MPH-OROS® on language abilities when considering the importance of narratives abilities in social and academic settings (Coupland & Jaworski, 2003; Paul & Smith, 1993; Peterson, Jesso, & McCabe, 1999a). As a result of improved impression of *overall narrative production*, children with ADHD would be better able to engage socially and build relationships necessary for social-emotional wellbeing (Coupland & Jaworski, 2003). Furthermore, improved narrative ability will improve academic performance by providing children with the decontextualized language skills necessary to share events that are removed from the classroom setting. Decontextualized language skills form a large component of daily classroom activities in which children are required to report on information, not

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in the here-and-now, but rather based on prior personal, social, or classroom experiences (Peterson et al., 1999b).

4.4. Conclusion

The selective improvement in aspects of narrative production found in the current study is consistent with result of previous research examining the effects of stimulant medication on higher-order skills in children with ADHD, during linguistic and non-linguistic tasks (Abikoff et al., 2009; Bailey et al., 2011; Derefinko et al., 2009; Francis et al., 2001; Pelham et al., 1990). Bailey et al. (2011) examined the effect of stimulant medication on recall of story events in children with ADHD. The findings of the study indicated that although the administration of MPH resulted in an increase in the percentage of story events recalled, no improvement was noted in the recall of central story events or the coherence with which the events were recalled. Similarly, in a study by Abikoff et al. (2009), results indicated that although aspects of organisational, planning, and time management skills improved with the administration of stimulant medication, this did not eradicate these difficulties altogether. Pelham et al. (1990) investigated the effect of stimulant medication on performance during baseball games. Although findings reported improved immediate attention during the game, it did not improve their overall performance. The results of these studies, along with those reported by Francis et al. (2001), Derefinko et al. (2009), and the current study, indicate that while stimulant medication improves behaviours of attention and concentration, it cannot fully compensate for the loss of structural and pragmatic language abilities, and the accompanying cascading effects, associated with the primary symptoms of ADHD.

From the results discussed above, it can be deduced that although stimulant medication facilitates improvement in the performance of children diagnosed with ADHD within certain domains, MPH alone does not provide sufficient intervention in order to improve higher-order metacognitive and linguistic skills. Therefore, a combination of treatments is advocated so as to ensure that children with ADHD are successful in reaching their full potential. These interventions may include, but are not limited to, medication, behaviour modification therapy, speech-language therapy,

occupational therapy, and remedial education (Chacko et al., 2001; Chu & Reynolds, 2007; Hill, 2000; Levy et al., 2005; Voeller, 2004).

4.5 Summary

In this chapter the results of the current study were discussed in detail according to the sub-aims. Relevant literature and reports of previous research were taken into consideration to explain the findings. The chapter was brought to a close with a conclusion and suggestions for application of the results.

CHAPTER 5: CONCLUSIONS

5.1. Introduction

Chapter 5 presents the conclusions, clinical implications and critical evaluation, including strengths and limitations, of the current study as well as possible future directions in research. Concluding comments and a summary complete the chapter.

5.2. Conclusions

The main aim of the current study was to determine the effect of MPH-OROS® on the narrative ability of children with ADHD. Based on the results obtained, the following conclusions were drawn:

- MPH-OROS® impacts positively on scores relating to conflict resolution, cohesion and overall narrative ability, supporting narration in children with ADHD.
- The fact that the administration of MPH-OROS, a medication used to address the primary symptoms associated with ADHD, resulted in improved aspects of macrostructure with little change in microstructure indicates that the language difficulties in this population may be a result of two factors:

    1) impaired executive functioning **(**planning, organization and self-monitoring) compounded by the primary symptoms of ADHD (attention, hyperactivity and impulsivity); and

    2) impaired linguistic functioning, reflected in poor vocabulary and grammar. The inadequate development of these microstructure elements is likely to result from the negative impact of inattention, hyperactivity, and impulsivity on a child's ability to learn from the adult model during the early interaction which should provide language learning opportunities.

- The results highlight the possibility that response to stimulant medication may differ between the different ADHD-presentations, depending on the presence or absence of the hyperactive component of ADHD.

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- Although stimulant medication facilitates improvement in the performance of children diagnosed with ADHD within certain domains, it appears that MPH alone does not provide sufficient intervention in order to improve higher-order metacognitive and linguistic skills. Therefore, a combination of treatments is advocated so as to ensure that children with ADHD are successful in reaching their full potential.

5.3. Clinical implications of the study

The results of the current study have important clinical implications.

- *Early communication intervention*, focusing on the development of speech and language, may prove beneficial for children with ADHD. Early intervention may facilitate the development of appropriate language abilities, by minimizing the effect of the behavioural symptoms of ADHD during early language learning opportunities.

- The indicated need for early communication intervention renders it imperative that professionals involved in early management of the pediatric population are aware of the *risk and prognostic factors* associated with the diagnosis of ADHD. Knowledge of these risk factors will assist professionals in making the appropriate referrals of children under the age of 3 years, who are at risk for developing ADHD and associated language difficulties. Referrals should include the SLP who can assess the development of communication skills and provide early intervention services in order to minimise the impact of inattention, hyperactivity, and impulsivity on caregiver-child interaction and early language-learning opportunities.

- In view of to the speech and language difficulties associated with ADHD, which are not entirely ameliorated by the administration of stimulant medication, *ongoing speech-language therapy* is strongly advised.

- Speech-language intervention should include a specific focus on the *organisation* and *cohesion* of narratives in children with ADHD. In addition, intervention should focus on improving *pragmatic competence* in this population due to the documented impact of pragmatic skills on narrative ability and social development.

- Children with ADHD demonstrate poor social and emotional competence, with poor prognosis for social integration later in life. These children therefore need to develop certain *social skills*, including improved recognition and expression of emotional states, as these skills play an important role in successful social-emotional development. Stimulant medication may prove beneficial in developing social and emotional competence as research has shown that children with ADHD who are treated with stimulant medication progress more readily in developing social competence than their un-medicated peers (Semrud-Clikeman & Schafer, 2000).

- In addition to medication and speech-language therapy, behaviour modification therapy should be included in ADHD management to facilitate the development of *executive functions*. Behaviour modification therapy involves the lengthy and intense process of modifying target behaviours with the end goal being the achievement of autonomous self-regulation (Voeller, 2004). Behaviour modification therapy, carried out by mental health workers, requires the support of all team members, including SLPs.

- *Parent guidance* forms an important component of intervention in children with ADHD and should be included in early communication intervention and behaviour modification therapy. Effective early intervention should attempt to modify caregiver-child interactions, rather than focusing on the child's communication alone. This is achieved through family based intervention focusing on training of family members in order to optimise language learning opportunities within activities of daily life. This approach may prove effective for children at risk for developing ADHD and language difficulties, by addressing the breakdown in caregiver-child interaction that occurs as a result of inattention, impulsivity, and hyperactivity. If parents are trained to successfully identify and address these

breakdowns in early communication interactions, language-learning opportunities will be more successful and the language difficulties experienced by this population may be minimised.Parental involvement is paramount to the success of behaviour modification therapy and parents need to maintain high levels of consistency and structure if their child is to succeed in therapy. Parents are guided through the process of developing their child's insights and competence in self-regulation.

- Due to the variability in the symptoms associated with ADHD, as well as numerous conditions that often accompany this diagnosis, treatment requires a multimodal, *holistic approach*. Although medication has been proven effective in improving certain difficulties experienced by children with ADHD (including aspects of narration), optimal management of this condition requires integrated medical, behavioural, and therapeutic intervention.

- From the results of the current study it appears evident that stimulant medication does not spontaneously improve all higher cognitive processing and linguistic skills necessary for social and academic achievement. These findings therefore support the call for a *collaborative approach* between professionals and methods of intervention to ensure effective management of all ADHD associated difficulties.

- *Speech-language intervention*, carried out *in conjunction with pharmacological treatment*, should be considered best practice when addressing the narrative difficulties identified in children with ADHD.

5.4. Critical evaluation

A critical evaluation of a research project is vital so as to interpret the findings of the research within a framework of the study's strengths and limitations.

5.4.1. Strengths of the study

- There is a shortage of research focusing on the effect of stimulant medication on language abilities, including those expressive abilities necessary for narration, in children with ADHD. This research project attempted to address this dearth of information by investigating the effects of MPH-OROS® on narrative ability in children with ADHD through a multiple single-subject pretest-posttest design.

- The research design was carefully constructed, ensuring that the influence of external factors was kept to a minimum. This was achieved by careful consideration of the timing of data gathering procedures as well as the administration of the medication. By carrying out data gathering procedures on a Monday morning, a two day "drug holiday", during which no medication was administered, was possible. This allowed sufficient time for offset of the medication thus ensuring that the off-medication results obtained were truly representative of the participants' narrative abilities without the influence of MPH-OROS® (Liu, et al., 2005). In addition, scheduling data gathering after a weekend allowed for the children to be adequately rested, thereby minimising the influence of the hours of school before the post-medication assessment was carried out. Administering the participants' daily dose of MPH-OROS® immediately after the pre-medication assessment allowed sufficient time for the medication to take effect for post-medication assessments while ensuring that the normal school day routine was not disrupted.

- Careful consideration was also given to the type and dosage of medication. Previous studies have been carried out using a variety of different stimulant medications (Derefinko et al., 2009) or a fixed dosage of medication for all participants (Francis et al., 2001). As different MPH preparations reach effective levels at different times it was important to select a single preparation, namely MPH-OROS® (Liu et al., 2005; Voeller, 2004). Choosing a single medication ensured that all data gathering procedures for post-medication assessments could be carried out at the same time of day, for all participants, once again minimising the effects of additional factors on the results obtained. Dosage of medication

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needs be carefully considered based on the individual's characteristics such as age, weight, and severity of behaviour, if optimal effects are to be observed (Ballard et al., 1997; Labbate et al., 2012: 272-275). In the current study dosage of medication was not fixed. MPH-OROS® was administered to participants at the dosage prescribed to them by their respective medical practitioners, thereby ensuring optimal response to the medication during post-medication assessments.

5.4.2. Limitations of the study

- Due to the strict selection criteria and subsequent small sample size included in the current study, differentiation between ADHD presentations (i.e., ADHD-PI, ADHD-PH and ADHD-C) was not possible. When investigating the effect of MPH-OROS® on narrative ability differentiation between participants based on their individual presentations of ADHD could prove valuable as performance, and effect of medication, may be influenced by the presence or absence of the hyperactive component.

- Due to the nature of the current study it was necessary that the elicitation material, for pre- and post-medication assessments, was similar with regard to theme, number of main characters, structural complexity, and length. Differences among these story elements may exert an effect on the narratives produced, thereby decreasing the reliability of the results obtained (Owens, 2014:292). Obtaining multiple samples per child would have allowed for a more accurate representation of participants' narrative abilities as results would be less affected by intrinsic and extrinsic factors. However, with limited material available to meet these criteria it was only possible to obtain a single pre- and single post-medication sample per participant.

- The current study investigated the effect of MPH-OROS® on grammatical complexity by comparing MLU off- versus on-medication. It should be noted that the reliability of MLU as a measure for grammatical complexity beyond an MLU of 4,0 has been queried by linguists. Although some researchers have shown that MLU is a valuable and reliable measure of general language development through

10 years in children with language impairment (Rice, Redmont & Hoffman, 2006), growth in complexity beyond an MLU of 4,0 includes not only the addition of new structures, but is influenced by the internal reorganization at the utterance level (Owens, 2014:207). The researcher therefore acknowledges the limitations of MLU as a measure of grammatical complexity but a more in-depth investigation was beyond the scope of the current study.

5.5. Future directions

The current study provided some important insights into the effect of stimulant medication on narrative ability in children with ADHD. The results obtained have raised further questions and have created a foundation for future research to investigate a number of aspects related to the language difficulties experienced by children with ADHD and the effect of MPH-OROS® on higher-order skills.

- Further research needs to be conducted by replicating the current study using a larger sample size. This would allow for the differentiation between ADHD presentations, namely ADHD-PI, ADHD-PH, and ADHD-C, as recent studies have noted differences in language production between these groups (Engelhardt et al., 2011; Engelhardt et al., 2012). This may provide further insights into the relationship between ADHD and language impairment as well as the effect of MPH-OROS® on language production.

- Further studies should also be carried out to determine whether the effects of stimulant medication on narrative ability are mediated by attention and/or memory by directly assessing attention, memory, and executive function in this population.

- Future studies in this line of research would benefit from the comparison of language samples elicited in different language sampling contexts (e.g., conversation, expository samples, persuasion), which may be maximally informative in terms of the effects of stimulant medication on the spontaneous expressive language of children with ADHD.

- Additional elicitation materials should be developed to allow multiple narrative samples—or multiple samples from other contexts— to be obtained over time. For example, a series of standardised narrative elicitation materials would allow for repeated measurements without the reliability of narrative production being affected by additional factors such as story length, number of characters, and subject matter. Although six wordless picture books by Mercer Meyer are available, the literature suggests that not all of these books are sufficiently comparable for the elicitation of multiple narratives over time. John et al. (2003) examined children's retelling of narratives using the Strong Narrative Assessment Procedure (SNAP) (Strong, 1998). The SNAP contains the wordless picture books *Frog, Where Are You?* (Mayer, 1969), *A Boy, a Dog and a Frog* (Mayer, 1967), and *One Frog Too Many* (Mayer & Mayer, 1975), as well as *Frog Goes to Dinner* (Mayer, 1974), which is included as practice material. Through the exploration of the equivalency of these stories, John et al.(2003) found that *A Boy, a Dog and a Frog* was retold with greater ease, resulting in inflated scores for story grammar components and inferential comprehension when compared to other two stories. Based on these results, it was recommended that clinicians only administer *Frog, Where Are You?* Or *One Frog Too Many*—the two books utilised in the present study—when assessing progress in narrative production. As a result, the researcher's ability to obtain multiple samples over time is limited.

5.6. Concluding comments

MPH-OROS® impacts positively on the narrative ability of children with ADHD by improving certain macrostructure elements, namely conflict resolution and cohesion, as well as overall narrative ability. Stimulant medication therefore has an important role to play, not only in the behavioural management of ADHD, but also in addressing the narrative inability experienced by this population. Stimulant medication, in conjunction with speech-language intervention, may address many future problems facing this population by addressing inattention, hyperactivity, and impulsivity before they impact negatively on the development of language skills.

Studying the effect of stimulant medication on the narrative ability of children with ADHD provided valuable information that can be used in order to better understand the language difficulties experienced by this population as well as guide treatment planning and future research. The results obtained provided insights into the origin of the language difficulties experienced by children with ADHD, implicating difficulties in executive functions as well as deficits in attention, both of which impact on early language acquisition.

These results, coupled with the important role that narratives play in both academic and social settings, highlight the importance of multifaceted intervention and a team approach to managing the behavioural and linguistic difficulties experienced by youngsters with ADHD. The finding that MPH-OROS® improves aspects of narrative ability in children with ADHD is of value to clinicians, including speech-language pathologists, as this evidence can prove beneficial when guiding parents in decision making processes regarding medication as well as the ongoing necessity of speech-language therapy in this population.

5.7. Summary

In this chapter, the conclusions of this study were presented, illustrating the positive effect of MPH-OROS® on narrative ability while emphasising the important role SLPs have to play in addressing the language difficulties experienced by this population. The clinical implications were discussed and a critical evaluation was presented, outlining the current study's strengths and limitations. Possible future directions for research were highlighted, followed by concluding comments and a summary of the chapter.

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APPENDIX A:

Pharmacological Treatment of ADHD

Pharmacological Treatment of ADHD

Table 1: Benefits and side effects of medications used in the treatment of ADHD

Medication	Benefits	Side Effects
Non-Stimulant Medications: • Atomoxetine (Approved by Food and Drug Administration for treatment in ADHD in children).	- Reduces symptoms of ADHD in those who do not respond to stimulants or experience severe side-effects.	- Brief period of decreased appetite and weight-loss. - Dizziness, fatigue, nausea, vomiting, dyspepsia and mood swings.
• Tricyclic antidepressants (TCAs)	- Effects decrease in ADHD related symptoms.	- Potential for cardiovascular adverse events.
• Bupropion	- Decreases ADHD symptoms although effect size is lower than that of stimulant medication.	- Increased risk for seizures and exaggerations of tic disorders.
• Alpha-2-adrenergic agonists	- Decreases ADHD symptoms although effect size is lower than that of stimulant medication.	- Associated with sedation effect.
Stimulant Medications: • Amphetamines	- Swift and dramatic reduction in symptoms of ADHD.	- Associated with adverse cardiovascular events.
• Dextroamphetamine sulphate	- Longer half-life than other stimulants. - Decreases ADHD symptoms although effect size is lower than that of other stimulant medications.	- Higher incidence of side effects associated with stimulant treatment including decreased appetite, headache or stomach ache, delayed sleep onset.
• Pemoline	- Longer half-life than other stimulants. - Decreases ADHD symptoms although effect size is lower than that of other stimulant medications.	- Takes several weeks before it exerts effects on ADHD symptoms.
• Methylphenidate (MPH) e.g. Concerta, Focalin and Ritalin	- Improves ADHD symptoms by reducing inattention, impulsivity, and hyperactivity. - Increases arousal, alertness and attention span.	- Most common symptoms include decreased appetite, headache, stomach ache, delayed sleep onset and jitteriness but can usually be managed by adjusting dose or time of administration.

Banaschewski, Roessner, Dittman, Santosh and Rothenberger, 2004; Labbate, Fava, Rosenbaum, & Arana, 2012; Lopez, 2006; Popper, 1997; Snider, Busch and Arrowood, 2003.

Non-stimulant medication

The term *non-stimulant medication* is an umbrella term for a wide variety of medications that minimise the symptoms of ADHD, each in their own unique way. Non-stimulant medications available for the treatment of ADHD include atomoxetine, tricyclic antidepressants (TCAs), bupropion, and alpha-2-adrenergic agonists. Atomoxetine is the only non-stimulant medication approved by the United States Food and Drug Administration for the treatment of ADHD in children (Banaschewski, Roessner, Dittman, Santosh, & Rothenberger, 2004; Lopez, 2006; Voeller, 2004).

Stimulant medication

The most common form of management for ADHD is the use of stimulant medication which provides successful management of primary symptoms in 70% to 80% of children diagnosed with this condition (Curatolo et al., 2010; Labbate, Fava, Rosenbaum, & Arana, 2012). Stimulant medications used in the treatment of ADHD include amphetamines, dextroamphetamine sulphate, pemoline and methylphenidate (see Table 1.3) (Goldman, Genel, Bezman, & Slanetz, 1998). Despite the fact that stimulant medications cause side effects including sleep disturbances, loss of appetite, stomach aches and headaches (Barkley, McMurray, Edelbrock, & Robbins, 1990), they provide swift and dramatic reduction in the symptoms of ADHD. Although amphetamines have proven successful in treating the symptoms of ADHD, adverse cardiovascular events and the misuse of amphetamines for weight-loss in the 1960s, have given it a reputation of being controversial (Goldman et al., 1998; Lopez, 2006). Dextroamphetamine and pemoline exert effect for a longer period of time. These medications are rarely prescribed, however, due to the fact that they have been labeled as less effective than MPH (Brown, Hunt, Ebert, Bunney, & Kopin, 1979; Sallee, Stiller, Perel, & Bates, 1985; Pelham et al., 1990). In addition, as explained in Table 1.3, dextroamphetamine is associated with a higher incidence of side effects and pemoline takes several weeks before it exerts effect (Safer & Allen, 1976; Gittelman & Kanner, 1986).

The most frequently prescribed medication for the treatment of ADHD is MPH (for example, Concerta, Focalin and Ritalin) which has been found to effectively treat the

majority of children and adults diagnosed with this condition (Bekker, Kooij, & Buitelaar, 2008:263; Ryan & Trieu, 2013:464). MPH affects neurotransmitter levels within the brain, heightening electrical activity within the central nervous system, and thus increases arousal, alertness, and attention span, as well as decreasing physical activity (Ballard et al., 1997; Poulton, 2006). The result is improved classroom behaviour, academic performance, and interpersonal relationships, as well as decreased oppositional behaviour and anxiety (Elia, Ambrosini, & Rapoport, 1999; Goldman et al., 1998). This effect is achieved by inhibiting the dopamine transporters, regulating catecholamine and subsequently reducing inattention, impulsivity, and hyperactivity (Wilens, 2008; Volkow, Wang, Fowler, & Ding, 2005). Research has shown that MPH improves attention and behaviour in 60% to 90% of individuals with ADHD (Whalen & Henker, 1991). It should be noted, however, that the type of medication and the dosage need to be carefully selected for each individual based on his or her individual characteristics. These characteristics include age, severity of behaviour, anxiety level, potential tics, and physical state (Ballard et al., 1997; Labbate et al., 2012: 272-275).

The degree to which MPH improves ADHD symptoms changes in the period following intake. In standard release MPH, maximum effects on behaviour are obtained approximately 2 hours after ingestion of the medication. MPH's effect wears off after 4 to 5 hours with a complete dissipation immediately after the termination of the medication. This limited duration of effect has called for the development of long acting MPH preparations, for example, Concerta®, Ritalin LA and Adderall XR, eliminating the need for repeated administration of medication throughout the day (Lopez, 2006; Pelham et al., 1987; Solanto & Conners, 1982). MPH-Osmotic Release Oral System (MPH-OROS®), an extended-release MPH, was introduced in 2000 and is well suited to the paediatric population due to the convenience of once-a-day administration (Castle, Aubert, Verbugge, Khalid, & Epstein, 2007). MPH-OROS® exerts an effect for 12 hours, delivering three doses of MPH through an osmotic controlled release delivery system. The MPH-OROS® design is characterised by the pharmacokinetic profile known as the ascending delivery pattern (Labbate et al., 2012:270-271). MPH levels quickly increase over the first two hours after which a slower increase ensues for three to four hours. After 24 hours, baseline blood levels are reached (Liu, Muniz, Minami, & Silva, 2005; Voeller, 2004).

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APPENDIX B:

Letter of Ethical clearance:

Faculty of Humanities Research Proposal and Ethics Committee, University of Pretoria

Our Ref:	Ms P Woest / 24066266
Tel:	012 420 2736
Fax:	012 420 2698
E-mail:	petru.woest@up.ac.za

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Humanities

27 August 2013

Ms TL Rausch
PO Box 72742
LYNNWOOD RIDGE
0040

Dear Ms Rausch

TITLE REGISTRATION: FIELD OF STUDY – MCOMMUNICATION PATHOLOGY

I have pleasure in informing you that the following has been approved:

TITLE: **The effect of Methylphenidate-OROS® on the connected speech of children with ADHD**

SUPERVISOR: **Prof A van der Merwe**

CO-SUPERVISOR: **Mrs U Zsilavecz**

I would like to draw your attention to the following:

1.   **ENROLMENT PERIOD**
   (a)   You must be enrolled as a student for at least one academic year before submission of your dissertation/essay.
   (b)   Your enrolment as a student must be renewed annually before 31 March, until you have complied with all the requirements for the degree. You will only be able to have supervision if you provide a proof of registration to your supervisor.

2.   **APPROVAL FOR SUBMISSION**
   On completion of your dissertation/essay enough copies for each examiner must be submitted to Student Administration, together with the prescribed examination enrolment form signed by you, which includes a statement by your director of studies that he/she approves of the submission of your dissertation/essay.

3.   **NOTIFICATION BEFORE SUBMISSION**
   You are required to notify me at least three months in advance of your intention to submit your dissertation/essay for examination.

4.   **INSTRUCTIONS REGARDING THE PREPARATION OF THE DISSERTATION/ESSAY AND THE SUMMARY APPEAR ON THE REVERSE SIDE OF THIS LETTER.**

Yours sincerely

for **DEAN: FACULTY OF HUMANITIES**

APPENDIX C:

Letter of Consent:
Janssen Pharmaceutica Ethics Committee

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Humanities
Department of Communication Pathology

December 2012

Dr. Abida Williams
Director of Medical and Technological Affairs
Janssen Pharmaceutica
P.O. Box 785939
Sandton
Johannesburg
2146

Dear Dr. Abida Williams,

Towards the fulfillment of the requirements for the degree Master's in Communication Pathology at the University of Pretoria, I am conducting a research project that aims to determine the effect of methylphenidate on the expressive language abilities of children with ADHD as portrayed during connected speech. This study will provide insight into whether stimulant medication aids in improving the connected speech of children with ADHD, in addition to the already known benefits it has on behavior and concentration.

The study will require that I identify 20 children with ADHD, ranging from 7-12 years, who are currently receiving speech-language therapy for language difficulties and who are receiving intervention for ADHD through the use of stimulant medication, namely methylphenidate. Once identified, the participant's consent, as well as the consent of their parents, will be obtained prior to their inclusion in the research project. Special arrangements will be made to insure that there is minimal disruption to the participants' school day.

During the assessment sessions, the researcher will request that each child engage in a variety of expressive communication tasks early in the day, before taking their

medication, and then again, two hours later after the medication has taken effect. The assessments will be carried out on a Monday so as to allow for offset of the medication during the weekend. The assessment will take the form of an informal play-based session, in order to avoid unnecessary stress for the child. No child will be forced to participate in the study and their informed consent will be obtained prior to the commencement of the assessment sessions.

The children's right to privacy will honoured and insured, with no names or personal details being disseminated. The children may withdraw from the study at any time and there will be no negative consequences should a parent, or the child, decide against their inclusion in this study.

The study will be conducted at Pretoria Preparatory School, a private remedial school in Pretoria. This school specifically caters for children with normal IQs who are experiencing learning difficulties. Of those learners in attendance at this school, a large majority are experiencing these difficulties due to ADHD. During a recent survey, Concerta was identified as the most popular ADHD medication prescribed to the learners at this particular school. Therefore, in order to ensure relevance of the study as well as provide a suitable group of participants, Concerta has been selected as the methylphenidate preparation to be used in this study.

Due to the fact that all forms of methylphenidate differ in their delivery systems, it will be necessary to specify which preparation was administered to the participants during the study. I therefore request that you grant permission for this study to be conducted and that I may provide information regarding which preparation was administered. In addition I ask that I may be allowed to share the results of the study through a scientific article that will be published in an international journal of speech-language pathology. This will allow for the results to be used by professionals across the world.
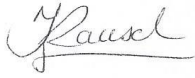
The results of this study may indicate which aspects of language benefit from the administration of Concerta and which aspects do not spontaneously improve, thus requiring intervention through speech-language therapy.

Please find attached the letter of consent, which you are requested to complete in order to grant me permission to conduct the study using Concerta. Your permission to conduct the study will be greatly appreciated.

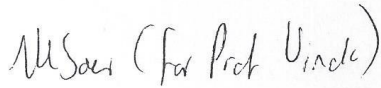Should you require any further information, you are encouraged to contact me on 0833799495.

Yours sincerely,

Tessa Rausch
MCommunication Pathology student

Prof Anita van der Merwe
Study supervisor

Prof B Vinck
Head: Department of Communication Pathology
University of Pretoria

1. **Title of the study:** The effect of methylphenidate on the expressive language abilities of children with ADHD as portrayed during connected speech.

2. **Purpose of the study:** This study aims to obtain information regarding the effect of stimulant medication on the connected speech of children with ADHD during a variety of language tasks.

3. **Procedures:** Each of the twenty children will be assessed twice on a single day through the presentation of a set of elicitation stimuli. Once prior to receiving their daily dose of medication and once after the medication has taken effect. Two children will be assessed per day per examiner. The first participant will be assessed at 7:00 (pre medication) and 11:15 (post medication), and the second being assessed at 7:15 (pre medication) and 11:30 (post medication). Immediately after their pre medication assessment, the children will receive their prescribed daily dose of methylphenidate from the respective teachers. This will therefore allow for the four hours needed for methylphenidate to reach an effective level for performance. Their responses will be recorded using a Dictaphone and analyzed according to aspects of connected speech.

4. **Risk and discomfort:** Participation in this research project poses no major risk to the participants. Only those individuals already using stimulant medication will be included in the study and they will continue to receive their medication at school as usual. Parents sign a medication administration form at the beginning of each school year or after an adjustment is made to their prescription. This provides the school with the necessary consent in order to administer the child's medication at school. The way in which the study has been designed requires a disruption in the administration of the children's medication over the weekend preceding the assessment. This will be carefully explained to the parents of the participants in their letter of consent. It should be noted that most parents do not administer their children's stimulant medication over weekends and during holidays. Therefore, for most participants, this will cause no disruption to the normal administration of their medication. The assessment will take the form of an informal play-based session, so as to avoid unnecessary stress for the child. No child will be forced to participate in the study and their informed consent will be verbally obtained by the researcher, prior to the commencement of each of the assessment sessions. The child's right to privacy will be honoured and no names or personal details of the participants will be made available to the public. A child may withdraw from the study at any time, with no negative consequences or repercussions. In addition, the same will apply should a parent decide against their child's inclusion in this study.

5. **Benefits:** There are no known benefits associated with participation in this study.

6. **Participants' rights:** Participation in this study is voluntary and the subjects and their parents retain the right to withdraw from this study at any time, without any negative consequences.

7. **Confidentiality:** Confidentiality of participant information will be maintained throughout the study and the names of the participants will only be known to the researcher. No names will be mentioned in any written report. All data will be destroyed should a participant withdraw at any stage during the research project. The data of the participants has to be stored in electronic format in the Department of Communication Pathology for a period of 15 years.

Should have any further questions or concerns, please feel free to contact me on 0833799495.

I _Aberla Williams_ have read the above information and give Tessa Rausch (researcher) permission to use Concerta in her research project to determine the effects of methylphenidate on the language abilities of children with ADHD. I do this with a full understanding of what the study entails and how it will be conducted.

Junia 19/2/2013 .
Represenative of Janssen Pharmaceutica

5 December 2012 .
Date

Tessa Rausch
Researcher

Ursula Zsilavecz
Co-Supervisor

Prof. Anita van der Merwe
Supervisor

UK Sou (for Prof Vinck)
Prof. Bart Vinck
HEAD OF DEPARTMENT

APPENDIX D:

Letter of Informed Consent:
Parents of Participants

September 2013

Dear Parent,

**PARTICIPATION IN RESEARCH PROJECT: The effect of Methylphenidate-
OROS® (Concerta®) on story tell of children with ADHD.**

Towards the fulfillment of the requirements for the degree Master's in
Communication Pathology at the University of Pretoria, I am conducting a
research project that aims to determine the effect of Concerta® on the story tell
of children with ADHD. The study will focus on children who are currently
receiving speech-language therapy for language difficulties and who are
receiving intervention for ADHD through the use of Concerta®. This study will
provide insight into the effect of stimulant medication on specific aspects of the
narrative abilities of children with ADHD. The pharmaceutical company and the
Headmaster of our school have granted permission for this study to go ahead.
This is a request to allow your child to take part in my study.

Each participating child will be assessed twice – once before administration of the daily dose and once four hours later after the medication has taken effect. The time of administration of the medication will remain as usual. The assessments will be carried out on a Monday so as to allow sufficient time for the offset of the medication during the weekend. During the assessment sessions narrative speech will be elicited from the child using wordless picture books. The assessment will take the form of an informal play-based session, in order to avoid unnecessary stress for the child. No child will be forced to participate in the study and their informed consent will be obtained prior to the commencement of the assessment sessions. For further detail, see the attached information sheet.

In order to successfully identify appropriate participants, it is necessary that I have access to their school files. This will allow me the chance to gain important information such as diagnosis, IQ scores and their PPS Medication Administration Forms. The child's right to privacy will be honoured and insured, with no names or personal details being disseminated. The children may withdraw from the study at any time and there will be no negative consequences should you, or your child, decide against inclusion in this study.

The results of this study may indicate which aspects of language benefit from the administration of Concerta® and which aspects do not spontaneously improve, thus requiring intervention through speech-language therapy. The results will be taken up in a master's dissertation and in a scientific article to be published in an international journal of speech language therapy allowing the results to be used by professionals across the world.

As in accordance with the research policy of the University of Pretoria, the data obtained during the study will be stored in electronic format in the Department of Communication Pathology for a period of 15 years.

Please find attached the letter of consent, which you are requested to complete in order to grant me permission to include your child in my research project. Your permission to include your child in this study would be greatly appreciated.

Should you require any further information, you are encouraged to contact me on 0833799495.
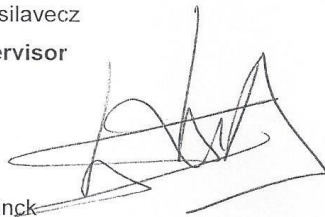

Yours sincerely,

Tessa Rausch
MCommunication Pathology student

Prof Anita van der Merwe
Study supervisor

Ursula Zsilavecz
Co-supervisor

Prof B Vinck
Head: Department of Communication Pathology

Information regarding research:

1. **Title of the study:** The effect of methylphenidate-OROS® (Concerta®) on the story tell of children with ADHD.

2. **Purpose of the study:** This study aims to obtain information regarding the effect of stimulant medication on the narrative abilities of children with ADHD during a story tell procedures.

3. **Procedures:** Each of the ten children will be assessed twice on a single day through the presentation of wordless picture books. Once prior to receiving their daily dose of medication and once after the medication has taken effect. Two children will be assessed per day per examiner. The first participant will be assessed at 7:00 (pre medication) and 11:15 (post medication), and the second being assessed at 7:15 (pre medication) and 11:30 (post medication). Immediately after their pre medication assessment, the children will receive their prescribed daily dose of methylphenidate from the respective teachers. This will therefore allow for the four hours needed for methylphenidate to reach an effective level for performance. Their responses will be recorded using a Dictaphone and analyzed according to aspects of connected speech.

4. **Risk and discomfort:** Participation in this research project poses no major risk to the participants. Only those individuals already using Concerta® will be included in the study and they will continue to receive their medication at school as usual. Parents sign a medication administration form at the beginning of each school year or after an adjustment is made to their prescription. This provides the school with the necessary consent in order to administer the child's medication at school. The way in which the study has been designed requires a disruption in the administration of the children's medication over the weekend preceding the assessment. This will be carefully explained to the parents of the participants in their letter of consent. It was noted that most parents do not administer their children's stimulant medication over weekends and during holidays. Therefore, for most participants, this will cause no disruption to the normal administration of their medication. The assessment will take the form of an informal play-based session, so as to avoid unnecessary stress for the child. No child will be forced to participate in the study and their informed consent will be verbally obtained by the researcher, prior to the commencement of each of the assessment sessions.

The child's right to privacy will be honoured and no names or personal details of the participants will be made available to the public. A child may withdraw from the study at any time, with no negative consequences or repercussions. In addition, the same will apply should a parent decide against their child's inclusion in this study.

5. **Benefits:** There are no benefits associated with participation in this study.

6. **Participants' rights:** Participation in this study is voluntary and the subjects and their parents retain the right to withdraw from this study at any time, without any negative consequences.

7. **Confidentiality:** Confidentiality of participant information will be maintained throughout the study and the names of the participants will only be known to the researcher. No names will be mentioned in any written report. All data will be destroyed should a participant withdraw at any stage during the research project. The data of the participants has to be stored in electronic format in the Department of Communication Pathology for a period of 15 years.

Should you have any further questions or concerns, please feel free to contact me on 083 379 9495.

INFORMED CONSENT:

I _____ have read the above information and understand my child's rights as a participant in this study. I hereby agree to their inclusion in this study, with a full understanding of what the study entails and how it will be conducted. Furthermore, I give Tessa Rausch permission to view my child's school file in order to obtain the data necessary for the selection of suitable participants.

_____   _____

Parent's signature   Date

APPENDIX E:

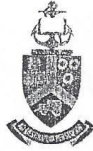# Pictures for Obtaining Assent from Participants

- **Consent:**

- **Reject:**

APPENDIX F:

Letter of Consent:
Principal of Pretoria Preparatory School

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Humanities
Department of Communication Pathology

December 2012

Mrs. P. Cheesman
Pretoria Preparatory School
262 Murray Street
Pretoria

Dear Mrs. Cheesman,

Towards the fulfillment of the requirements for the degree Master's in Communication Pathology at the University of Pretoria, I am conducting a research project that aims to determine the effect of methylphenidate (stimulant medication) on the expressive language abilities of children with ADHD as portrayed during connected speech. This study will provide insight into whether stimulant medication aids in improving the connected speech of children with ADHD.

So as to provide you with a detailed understanding of the study, you will find an information sheet attached. This will provide you with more in-depth information regarding the research to be carried out and the necessary details associated with inclusion in this study.

The study will require that I identify 20 children with ADHD, ranging from seven to 12 years, who are currently receiving speech-language therapy for language difficulties and

University of Pretoria
PRETORIA 0002
Republic of South Africa

Tel: 012 420 5762
Fax: 012 420 3517

anita.vandermerwe@up.ac.za
www.up.ac.za

who are receiving intervention for ADHD through the use of stimulant medication, namely methylphenidate. Once identified, the participant's consent, as well as the consent of their parents, will be obtained prior to their inclusion in the research project. Special arrangements will be made to insure that there is minimal disruption to the participants' school day. Janssen Pharmaceutica has been contacted in order to obtain permission to conduct the study using a methylphenidate-based medication produced by their company, namely Concerta.

In order to successfully identify appropriate participants, it is necessary that I have access to their school files. This will allow me the chance to gain important information such as diagnosis, IQ scores and their PPS Medication Administration Forms.

During the assessment sessions, connected speech will be elicited from the participants with a set of stimuli. Speech samples obtained from a variety of elicitation stimuli are likely to be more representative of an individual's everyday connected speech. Therefore, the following set of stimuli will be used. Action pictures, sequence cards, requests for personal information and requests for procedural information. The set of stimuli will be presented early in the day, before taking their medication, and then again, two hours later after the medication has taken effect. The assessments will be carried out on a Monday so as to allow for offset of the medication during the weekend. The assessment will take the form of an informal play-based session, in order to avoid unnecessary stress for the child. No child will be forced to participate in the study and their informed consent will be obtained prior to the commencement of the assessment sessions.

The children's right to privacy will honoured and insured, with no names or personal details being disseminated. The children may withdraw from the study at any time and there will be no negative consequences should a parent, or child, decide against their inclusion in this study.

The results of this study will aid in decision making regarding the treatment of children with ADHD through the use of stimulant medication. Furthermore it will provide speech language therapists with necessary information that will aid in the provision of optimal
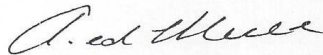
intervention for children with ADHD who are experiencing language difficulties. It will also provide valuable information for parents of children with ADHD who need to make important decisions regarding intervention. A scientific article focusing on this research project will be published in an international journal of speech-language pathology allowing the results to be used by professionals across the world.

Please find attached the letter of consent, which you are requested to complete in order to grant me permission to conduct my research project at Pretoria Preparatory School. Your permission to conduct the study will be greatly appreciated.
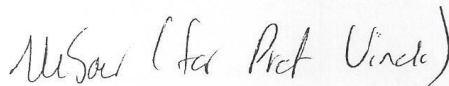
Should you require any further information, you are encouraged to contact me on 0833799495.

Yours sincerely,

Tessa Rausch
MCommunication Pathology student
University of Pretoria

Prof Anita van der Merwe
Study supervisor

Prof B Vinck
Head: Department of Communication Pathology

1. **Title of the study:** The effect of methylphenidate on the expressive language abilities of children with ADHD as portrayed during connected speech.
2. **Purpose of the study:** This study aims to obtain information regarding the effect of stimulant medication on the connected speech of children with ADHD during a variety of during a variety of language tasks.
3. **Procedures:** Each of the twenty children will be assessed twice on a single day through the presentation of a set of elicitation stimuli. Once prior to receiving their daily dose of medication and once after the medication has taken effect. Two children will be assessed per day per examiner. The first participant will be assessed at 7:00 (pre medication) and 9:15 (post medication), and the second being assessed at 7:15 (pre medication) and 9:30 (post medication). Immediately after their pre medication assessment, the children will receive their prescribed daily dose of methylphenidate from the respective teachers. This will therefore allow for the two hours needed for methylphenidate to reach an effective level for performance. Their responses will be recorded using a Dictaphone and analyzed according to aspects of connected speech.
4. **Risk and discomfort:** Participation in this research project poses no major risk to the participants. Only those individuals already using stimulant medication will be included in the study and they will continue to receive their medication at school as usual. Parents sign a medication administration form at the beginning of each school year or after an adjustment is made to their prescription. This provides the school with the necessary consent in order to administer the child's medication at school. The way in which the study has been designed requires a disruption in the administration of the children's medication over the weekend preceding the assessment. This will be carefully explained to the parents of the participants in their letter of consent. It was noted that most parents at P.P.S. choose not to administer their children's stimulant medication over weekends and during holidays. Therefore, for most participants, this will cause no disruption to the normal administration of their medication. The assessment will take the form of an informal play-based session, so as to avoid unnecessary stress for the child. No child will be forced to participate in the study and their informed consent will be verbally obtained by the researcher, prior to the commencement of each of the assessment sessions. The child's right to privacy will be honoured and no names or personal details of the participants will be made available to the public. A child may withdraw from the study at any time, with no negative consequences or repercussions. In addition, the same will apply should a parent decide against their child's inclusion in this study.
5. **Benefits:** There are no known benefits associated with participation in this study.
6. **Participants' rights:** Participation in this study is voluntary and the subjects and their parents retain the right to withdraw from this study at any time, without any negative consequences.
7. **Confidentiality:** Confidentiality of participant information will be maintained throughout the study and the names of the participants will only be known to the researcher. No names will be mentioned in any written report. All data will be destroyed should a participant withdraw at any stage during the research project. The data of the participants has to be stored in electronic format in the Department of Communication Pathology for a period of 15 years.

Pretoria Preparatory School

262 Murray Street Brooklyn 0181
Phone: (012) 362-0308
Fax: (012) 362-0366

P.O. Box 36214
Menlo Park
0102

Should you have any further questions or concerns, please feel free to contact me on 0833799495.

I _Pamela Cheesman_ have read the above information and give Tessa Rausch (researcher) permission to conduct her research project at Pretoria Preparatory School. In addition, I consent to her having access to the children's school files in order to obtain the necessary information regarding diagnosis, IQ and medication. I do this with a full understanding of what the study entails and how it will be conducted.

Principal's signature

5 December 2012
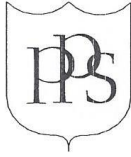Date

Tessa Rausch
Researcher

Ursula Zsilavecz
Co-Supervisor

Prof. Anita van der Merwe
Supervisor

Prof. Bart Vinck
HEAD OF DEPARTMENT

APPENDIX G:

Pretoria Preparatory School
Medication Administration Form

Pretoria
Preparatory School

(Incorporated Association not for gain)
Ref No 011-666/20677

SPECIALISING IN REMEDIAL EDUCATION

262 Murray Street
Brooklyn
0181
Phone: (012) 362-0308
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E-Mail: principal@pretoriaprep.co.za

P.O. Box 36214
Menlo Park
0102

2013

We have been advised by ISASA (Independent Schools Association of South Africa) that, according to the Medicines and Related Substances Amendment Act, 2002, if the school administers medication of any sort, we must receive in writing, explicit consent from each parent to do so.

PLEASE WILL PARENTS WHO WISH TEACHERS TO ADMINISTER MEDICATION COMPLETE THE FOLLOWING:

MEDICATION ADMINISTRATION FORM
(To be completed in capital letters)

DATE: _____

NAME OF CHILD: _____ GRADE:
_____

MEDICATION TO BE ADMINISTERED:
_____
_____
_____

DOSAGE:
_____

TIMES:
_____
—

MEDICATING DOCTOR:
_____

SIGNATURE OF PARENT/GUARDIAN:
_____

PARENT'S/GUARDIAN'S FULL NAMES:
_____

APPENDIX H:

Proof of Accepted Title Change

Our Ref: 24066266

29 September 2014

Ms T Rausch
PO Box 727242
LYNNWOOD RIDGE
0040

Dear Ms Rausch

TITLE REGISTRATION: FIELD OF STUDY – MCOMMUNICATION PATHOLOGY

I have pleasure in informing you that the following has been approved:

TITLE:	**The effect of Methylphenidate-OROS® on the narrative ability of children with ADHD**
SUPERVISOR:	**Prof A van der Merwe**
CO-SUPERVISOR:	**Prof D Kendall** **Mrs U Zsilavecz**

I would like to draw your attention to the following:

1. **ENROLMENT PERIOD**
   (a) You must be enrolled as a student for at least one academic year before submission of your dissertation/essay.
   (b) Your enrolment as a student must be renewed annually before 31 March, until you have complied with all the requirements for the degree. You will only be able to have supervision if you provide a proof of registration to your supervisor.

2. **APPROVAL FOR SUBMISSION**
   On completion of your dissertation/essay enough copies for each examiner must be submitted to Student Administration, together with the prescribed examination enrolment form signed by you, which includes a statement by your director of studies that he/she approves of the submission of your dissertation/essay.

3. **NOTIFICATION BEFORE SUBMISSION**
   You are required to notify me at least three months in advance of your intention to submit your dissertation/essay for examination.

4. **INSTRUCTIONS REGARDING THE PREPARATION OF THE DISSERTATION/ESSAY AND THE SUMMARY APPEAR ON THE REVERSE SIDE OF THIS LETTER.**

Yours sincerely

for **DEAN: FACULTY OF HUMANITIES**

APPENDIX I:

Transcripts of Participants' Narratives

$ Child, Examiner
+ Language: English
+ Name: Participant 1 Pre-Ax
+ Context: Nar
+ Subgroup: FWAY
- 0:03

C The dog is (w*) watch/ing the frog with the boy.
C When the boy is sleep/ing, the frog get/3s out of the jar and run/3s away.
C When the boy and the dog wake/3s[EW:wake] up they see that the frog is/n't there.
C The boy/'s look/ing in his shoe/s (if he/'s if there/'s) if the frog is there [EU].
C and the dog is look/ing in the jar.
C (the they) The boy is call/ing the (s*) frog.
C The dog jump/3s out of the glass[EW:window].
C and the glass break/3s.
C Then the boy is angry because he broke the (gr*) glass.
C Now they/'re shout/ing for (the f*) for the frog.
C Now he/'s look/ing in the hole (uh).
C and the dog/'s look/ing in the beehive.
C An animal come/3s out of the hole.
C (and the) and the bee/s come out of the hive.
C (The dog r* the dog the) the beehive fell.
C The boy/'s look/ing in the tree.
C The boy (f* f*) fell when the owl came out.
C The dog is run/ing away from the bee/s.
C The owl is chase/ing the boy.
C The boy is (s*) sit/ing on a rock call/ing for the frog.
C The dog is scare/ed.
C The boy found the animal.
C The animal chase/3s them.
C and they fell in the water at the bottom.
C (The boy) The dog is sit/ing on the boy/z head.
C (They look behind) They/'re gonna look behind the log.
C and they find the frog.
C The boy is climb/ing over to see the baby frog/s.
C The boy is play/ing with the frog/s.
C Okay.
- 2:51

+ Introduction: 1
+ CharacterDev: 3
+ MentalStates: 2
+ Referencing: 3
+ ConflictRes: 2
+ Cohesion: 2
+ Conclusion: 1

+ Language: English
+ Name: Participant 1 Post-Ax
+ Context: Nar
+ Subgroup: OFTM
- 0:08

C Um, a boy/'s got a present.
C He open/ed the present.
C And all his animal/s look/ed inside.
C And he took out another frog.
C (The) the boy/'s tak/ing it to (the) his other animal/s.
C The boy want/3s them all to play together.
C The boy get/3s a fright because (the) the one frog bit the other.
C The boy took one of the frog/s and shout/ed at the other one.
C The frog/s are on the turtle/z back.
C (The boy/'s walk/ing) he/'s walk/ing to the river.
C The one frog kick/3s the other frog off.
C The boy shout/3s at the frog who kick/ed the other frog off.
C One frog get/3s angry.
C Then the other animal/s go on a log[EW:raft].
C The frog jump/3s back.
C The boy is point/ing forward.
C The other (uh) frog kick/ed the frog off.
C The frog is stick/ing out tongue to the other frog [EU].
C The frog is smil/ing.
C The boy is angry.
C Now they look/ing for the frog.
C They did/n't find the frog so they went back home.
C The boy was cry/ing.
C The boy was cry/ing.
C And (the turtle was) the tortoise was scare/ed.
C The boy hear/3s something.
C The frog jump/3s back in.
C They were all happy.
C And then they were all friend/s.
E Well done.
E Nice.

- 2:57

+ Introduction: 2
+ CharacterDev: 3
+ MentalStates: 3
+ Referencing: 2
+ ConflictRes: 2
+ Cohesion: 2
+ Conclusion: 4

$ Child, Examiner
+ Language: English
+ Name: Participant 2 Pre-Ax
+ Context: Nar
+ Subgroup: FWAY

- 0:07
C (There um) there was a boy look/ing (in the jar) at the jar.
C and *he said to the dog that there/'s a new member in the family.
C (The frog) the boy fell asleep.
C and the frog crept out at night.
C In the morning, the boy look/ed at the jar.
C And his frog was miss/ing.
C The boy was look/ing (and his sh*) in his shoe.
C And the dog was look/ing in the jar.
C The boy was shout/ing out the window for his frog.
; 0:04
C The dog fell out the window.
C (The boy pick/ed up the dog and ja) the boy pick/ed up the dog.
C The boy was look/ing in his garden for his (uh) frog.
C The boy was look/ing in a hole.
C and the (bee was ((no not the bee)) the fro*) dog was (loo* um) bark/ing at the hive.
C The squirrel poke/3s at the boy/z nose.
C The beehive fell off the tree.
C and (and) the boy was look/ing in the tree.
C An owl push/ed him.
C And he fell on the floor.
C and the beehive[EW:swarm] was chas/ing the dog.
C The owl was attack/ing the boy.
C The boy was shout/ing from a high rock.
C (and th* and ja) and then the owl was watch/ing him.
C The boy (um) fell on (the an*) the buck/z head.
C and (the deer) the buck ran.
C the buck threw the boy (off the) off the (cl* um) the small cliff.
C The boy land/ed in the water.
C And then the boy could hear something.
C Then the boy told the dog to be quiet.
C Then he look/ed over the log.
C And he saw two frog/s together.
; 0:04
C The boy saw (a l* little um) small frog/s near the two parent/s.
C The boy took one of the frog/s and said goodbye to the parent/s.

- 3:20
+ Introduction: 2
+ CharacterDev: 3
+ MentalStates: 1
+ Referencing: 3
+ ConflictRes: 2

+ Cohesion: 3
+ Conclusion: 3

$ Child, Examiner
+ Language: English
+ Name: Participant 2 Post-Ax
+ Context: Nar
+ Subgroup: OFTM
- 0:06

C Ok.
C (Um) there was a boy who got a present.
C He open/ed the present.
C (and) {laughs} and he saw a little frog inside.
C He pick/ed up the frog.
C The boy put the little frog with the other/s to play.
C The other frog got jealous (of) of the little frog.
; 0:04
C The (f*) big frog bit the little frog/z leg.
C and the boy (was) got frighten/ed.
C The boy pick/ed up the little frog and told the big frog not to do that.
; 0:03
C The big frog was/n't comfortable share/ing the turtle with the little frog.
C So the big frog kick/ed the little frog off.
C The little frog was cry/ing.
C and the boy was (um) say/ing no to the big frog.
C The boy told the big frog to stay behind.
C The boy was (um) was get/ing hot.
C and he wipe/ed his head.
C And then jump/ed the frog onto the boat [EU].
C The frog was grin/ing at the little frog.
C And the boy was point/ing straight (ja).
C The big frog kick/ed the little frog off the boat.
C and then he stuck out his tongue.
C The the big frog was smile/ing.
C and then the boy was (s* like s*) spying on them.
C The boy (g*) got frighten/ed.
C (and he) and the dog was moan/ing.
C The turtle was eye ball/ing the big frog.
C The big frog was look/ing for the little frog and the turtle was also [EU].
C The boy was very sad.
C The boy was cry/ing when he could/n't find the the little frog.
C And the dog was very angry at the big frog.
C (The the little boy ju* ju*) the little boy (went uh) got on his bed and start/ed to cry.
C (The dog thought the uh) the dog and the boy thought they heard something.
C (The the) {laughs} the little (f*) frog jump/ed from out of nowhere and land/ed on the big frog/z head.
C Then the boy was happy.
C (and) and (the frog) the little frog and the big frog were friend/s.

-3:17
+ Introduction: 2

+ CharacterDev: 3
+ MentalStates: 4
+ Referencing: 4
+ ConflictRes: 4
+ Cohesion: 3
+ Conclusion: 4

$ Child, Examiner
+ Language: English
+ Name: Participant 3 Pre-Ax
+ Context: Nar
+ Subgroup: OFTM
- 0:06

C Okay.
C Um, this little boy got a present.
C And now all the (amin*) animal/s are interest/ed on[EW:in] what he got.
C So he open/3s the box.
C and this frog over here does/n't look very happy.
C And this other frog jump/3s out.
C and this frog get/3s jealous because everyone is make/ing a big scene about him.
C So (he) the little boy want/3s to introduce them to his other pet/s.
C And now this little frog ((you know)) just want/3s to be friend/s or something.
C But this frog does/n't like him.
C So he start/3s fight/ing with the frog.
C And the little boy pick/3s up the little baby frog.
C *he start/3s shout/ing at the other frog for hurt/ing his other pet.
C And (um) now they *are go/ing for a boat ride.
C And the tortoise is take/ing them to the place cos|because they are on his shell.
C And (um he kick/3s the little fro*) the big frog kick/3s the little frog off.
C And (the other little fr*) the little frog who got kick/ed off start/3s crying.
C So the little boy shout/3s at the big frog for kick/ing off the little one.
C So (say) he say/3s to the big frog "you/'re not come/ing with us anymore"!
C "you/'re gonna to stay here".
C So as they were (g* um) swimming[EW:sailing] away on their little boat the big frog jump/ed on.
C And just sat there for a while.
C (Um) then eventually he kick/3s the little baby frog (off into the water) off the boat into the water.
C And (um) the tortoise tell/3s the little boy what happen/3s[EW:happened].
C And now all these animal/s are upset with the frog.
C And the little boy is busy cry/ing.
C So he tell/3s him to start look/ing for the little baby frog.
C And they can/'t find him.
C so the little boy is upset and start/3s crying.
C The (l*) big frog get/3s left behind.
C And (um then he/'s on hi*) he go/3s home now.
C And he/'s on his bed busy cry/ing.
C And (the other do*) the dog and tortoise is[EW:are] try/ing to make him feel better.
C And then all of a sudden the little baby frog jump/ed through the window onto the big frog/z head.
C And then they were happy.
C And they were friend/s.

-2:17

+ Introduction: 2
+ CharacterDev: 4
+ MentalStates: 4
+ Referencing: 3
+ ConflictRes: 4
+ Cohesion: 3
+ Conclusion: 3

$ Child, Examiner
+ Language: English
+ Name: Participant 3 Post-Ax
+ Context: Nar
+ Subgroup: FWAY
- 0:07

C Okay.
C Now this little boy obvious/ly caught a frog and put it in a jar.
C And (like) now the dog/'s try/ing to see what it is and what/'s going on.
C And this little boy is just admire/ing (um) what he/'s caught.
C and he/'s happy.
C And (like) it/'s bedtime.
C so he/'s[EW:he] go/3s to bed now.
C And he leave/3s the jar open cos|because he (c*) did/n't think the frog (wou* c*) could jump out.
C So the frog got out that night.
C And that morning, when the little boy woke, up he notice/ed that the jar was complete/ly empty.
C So he quick/ly got dress/ed.
C And while he was get/ing dress/ed the little dog was just have/ing a look.
C "Okay, is it really gone"?
C or smell/ing it.
C or whatever.
C ((I/'m not really sure)).
C And then (the dog um sorry) the little boy went to his window and open/ed it and start/3s[EW:started] shout/ing for the little frog.
C And the little dog (um) also the same but (um) except not shout/ing.
C And fell out the window.
C And (um) the jar was still on his head (um) because it got stuck.
C And as he fell the jar broke.
C So the little boy (c* uh) ran outside and pick/ed up the dog and look/3s[EW:looked] very angry because the dog was/n't supposed to do that.
C or something.
C So they start go/ing for (a w* like) a search and shout/ing for him and call/ing him.
C And this little dog just notice/3s all these bee/s (um) lead/ing to a honey queen place.
C whatever.
C {laughs}.
C (Um) then (he) this little boy look/3s through a hole and shout/ing[EW:shouts] to see if his frog/'s in there.
C but he was/n't.
C it was a mouse.
C So it probably bit his nose (cos ja).
C And this little dog/'s just bark/ing at the beehive (and um) and bark/ing_bark/ing.
C And then eventually the beehive fell out of the tree and broke.
C All the bee/s (um) were now get/ing all angry and start/ed chase/ing the little dog.
C And while that was happen/ing the little boy was look/ing in a hole in a tree.
C (um) see/ing if the frog might be in there.
C but it was an owl.

C So (um) the dog push/ed this little boy over (uh) because the bee/s were chase/ing him.
C and this owl just jump/ed out of his hole in the tree.
C And (um) then (um) the owl chase/ed him to a (r*) huge rock.
C and he climb/ed the rock and thought that the horn/s of this animal were (um) branch/s.
C And start/ed leaning on them.
E mhm.
C and then (it uh) the animal move/ed.
C and he fell on the animal/z face.
C and the (deer or) deer start/3s run/ing.
C and this little dog is chase/ing (him) the deer.
C and then he stop/3s quick/ly.
C and they fall into a dam.
C and (um) now this (um little boy is now) he can hear the little frog/s ((or something)) and tell/3s his dog to be quiet and look/3s over the log.
C and there was a mommy and a daddy and all the little children.
C And so he took his little frog that escape/ed and went back home.
C And that was it.

- 3:45
+ Introduction: 2
+ CharacterDev: 4
+ MentalStates: 3
+ Referencing: 3
+ ConflictRes: 3
+ Cohesion: 3
+ Conclusion: 3

$ Child, Examiner
+ Language: English
+ Name: Participant 4 Pre-Ax
+ Context: Nar
+ Subgroup: FWAY
- 0:05

C Once_upon_a_time there was a boy who got a frog.
C And (he put it in a glass) he got it in a glass.
; 0:06
C When it was night time, the frog jump/ed out of the glass when the boy went to bed.
C The boy heard the frog disappear.
C So he woke up to see where was the frog [WO].
; 0:05
C The little boy look/ed all over his room, look/ed even in his boot/s [WO].
C The dog look/ed in the glass again.
C Then they knew (that) that he was/n't in the room.
C So they look/ed outside.
; 0:05
C (The boy) the dog fell out of the window.
C And the glass broke in piece/s.
C The boy pick/ed him up.
C They went outside to the woods to look for (his frog) his new frog.
C He look/ed in the hole.
C And the dog look/ed in the beehive.
C But when the boy was look/ing in the hole, a little rat bit his nose.
; 0:06
C The boy bump/ed the beehive off.
C And the bee/s were chas/ing him.
C And the boy was look/ing in the tree.
C Then an owl bit him on the nose.
C And he fell off on the ground.
C And the bee/s were chase/ing the dog.
C The owl was irritate/ing the boy while he was look/ing for his frog.
C Then the owl left.
C And then he call/ed his frog again.
; 0:09
C When he was look/ing over the rock (a deer) he land/ed on a deer/z head.
C Then (the d*) the deer did/n't (see) see what was on his head.
C (so then) so (he) he ran to the end of a cliff and push/ed the boy off his head.
C The boy fell with his dog and into the river [WO].
; 0:15
C The boy heard the frog.
C (and the dog) and the dog heard the frog.
C The boy said %shhh to the (d*) dog so he could see where his frog was.
C And then he>
; 0:06
C He saw his frog (with a) with another frog.
C and he had some friend/s.

C But he took (the frog h*) one of the frog/s home and said bye to the other/s.
C The end.

- 3:32

+ Introduction: 3
+ CharacterDev: 3
+ MentalStates: 2
+ Referencing: 3
+ ConflictRes: 3
+ Cohesion: 3
+ Conclusion: 2

$ Child, Examiner
+ Language: English
+ Name: Participant 4 Post-Ax
+ Context: Nar
+ Subgroup: OFTM
- 0:05

C Once_upon_a_time (a little) it was the boy/z birthday.
C He got a present from his mom and dad.
C He open/ed the present.
C And a little baby frog jump/ed out.
C The big frog was jealous.
C The little boy put the baby frog down.
C The big frog did/n't like him at all.
C But the dog and the turtle (like/ed him) thought he was okay.
C The little boy said "You guy/s better make friend/s or one of you are go/ing".
C But all of a suddenly[EW:sudden] big frog bite/3s baby frog/z leg.
C And baby frog cry/3s.
C (Then) then the boy pick/3s up (the fr*) the baby frog and say/3s "naughty big frog, that/'s not very nice".
C So a bit later they decide/ed to go for a trip.
C So the turtle took the two frog/s.
C Baby sat at the back.
C And big sat (at the) at the front, on the turtle/z back.
C And the dog walk/ed in front of them and the boy [WO].
C Just before they goed[EO:went], big frog kick/ed baby frog off like it was a joke.
C But turtle didn't know.
C Then baby frog start/ed to cry.
C And they all yell[EW:yelled] and got mad.
; 0:07
C Big frog was told to stay at the back (so he) because he was be/ing naughty.
C And they went off.
C Big frog said to himself "I/'m not stay/ing here, I/'m go/ing on the trip".
C So he jump/ed onto the thing.
C and he look/ed at baby frog.
C and he kicked little frog off.
C and he stuck *out his tongue.
C Turtle saw.
; 0:08
C Turtle told on.
C And the boy look/ed.
C He was so angry (with) with (b*) big frog, he shout/ed at him.
C They went off look/ing.
C (Big frog was very ups* he was very sa* kn*) big frog knew he/'s[EW:he'd] done something wrong.
C They look/ed in the river.
C They look/ed in the log/s.
C They look/ed even in the grass [WO].
; 0:04

C They could/n't find baby frog.
C So they went home.
C But the boy said to the big frog "You better stay here, I/'m very sad".
C The boy laid on his bed and cry/ed all day.
C But frog went home.
C The turtle was scare/ed of frog.
C And the dog felt sorry for his owner.
C All of a suddenly[EW:sudden] they hear a noise.
C Baby frog jump/3s from nowhere.
C And the boy is so happy.
C The dog get/3s a fright.
C But who got a big/er fright?
C The frog.
C And baby frog jump/ed on top of him.
C And everyone thought it was funny besides the big frog.
C And (then) then big frog said sorry.
C And baby frog forgived[EO:forgave] him.
C The End.

- 03:26

+ Introduction: 3
+ CharacterDev: 4
+ MentalStates: 5
+ Referencing: 4
+ ConflictRes: 4
+ Cohesion: 4
+ Conclusion: 4

$ Child, Examiner
+ Language: English
+ Name: Particpant 5 Pre-Ax
+ Context: Nar
+ Subgroup: OFTM
- 0:16

C The XX this present from his dad.
C And it[EW:there] was a frog in it.
C And he look/ed.
C There was a frog.
C Then they was[EW:were] all happy.
C but the little frog was/n't.
C Then there/'s a small frog.
C And it/'s a big frog.
C And all of them was[EW:were] happy to see them.
; 0:04
C Then no.
E And then what?
: 0:04
C He ate his foot.
C and said "no".
C And off they went.
C (And say/3s he f* she) that nother[EW:other] frog fall off there.
C and he say/3s "no".
C And he has to wait there.
C Then all of them swim/s[EW:sail].
; :04
C (They) he was look/ing the boat.
C he was wait/ing.
C and he was>
C and she climb/ed.
C and then he/'s naughty.
C Then he throw/ed[EO:threw] him off.
C (Then he) then he show/ed him the tongue.
C (And then and then this is) the turtle say and then>
E Tell me more.
C uh, and she was happy.
C she was sad sad_sad.
C (And they wa*) these[EW:they] was[EW:were] cross with him.
C um, so she has to put[EW:stay] there.
C And>
; :04
C She did/n't look for them.
C So the dog growl/ed.
C And he was cry/ing.
C He was sad.
; :05
C And the turtle was sleep/ing.

C She was sad.
C And he was sad.
C Then the dog lick/ed the person.
C And then he waked[EO:woke] up.
C (Sh*) She>
C And off the frog jump/ed.
C (And the*) the frog was happy.
C Everybody was happy.
; :04
C And all of they was friend/s.

- 3:39
+ Introduction: 2
+ CharacterDev: 1
+ MentalStates: 3
+ Referencing: 1
+ ConflictRes: 1
+ Cohesion: 1
+ Conclusion: 2

$ Child, Examiner
+ Language: English
+ Name: Participant 5 Post-Ax
+ Context: Nar
+ Subgroup: FWAY
- 0:12

C Last day[EW:night] they look/ed at the frog.
C and they were so happy.
C And the boy went to sleep.
C and the dog [EU].
C and he just go/ed[EO:went] out.
C And they said "huh, where/'s the frog"?
C And the dog went in there.
C And he look/ed in the shoe/s.
C And he *call/ed "frog, frog"!
C and the dog fall/ed[EO:fell] down.
C (and and) and he was cross.
C and the dog lick/ed him.
C And he said "frog"!
C And the dog was smell/ing bee/s.
C And they look/ed in there.
C Then the dog try/ed to catch[EW:get] the honey.
C And said "ewe".
C The dog bark/ed.
C And (then the b*) then that went out [EU].
C and the bee/s came/ed[EO:came].
C and he was sit/ing on the tree there.
C And he fall/ed[EO:fell] off with the owl.
C And the dog run/ed[EO:ran] because there was[EW:were] bee/s.
C And the owl>
C And he was walk/ing there.
C And he say/3s "frog, frog"!
C and the dog was there.
C and there was a reindeer.
C (and) and he climb/ed on her.
C and he went there.
C and the dog bark/ed.
C and then he was still on.
C and the reindeer let him fall.
C and the dog fall/ed[EO:fell].
C (and they) and the person fall[EW:fell] in the water.
C and the dog.
C (um uh) and he %shhh [EU].
C and they look.
C (and) and they saw them in love [EU].
C then they have[EW:had] some kid/s.
C a lot of kid/s.
C and then they was[were] watch/ing.

C (then was one) one was here.
C and the one was by him.

- 2:58
+ Introduction: 2
+ CharacterDev: 4
+ MentalStates: 3
+ Referencing: 2
+ ConflictRes: 3
+ Cohesion: 2
+ Conclusion: 1

$ Child, Examiner
+ Language: English
+ Name: Participant 6 Pre-Ax
+ Context: Nar
+ Subgroup: OFTM
- 0:05

C One frog too many by Mercer and Marianna Meyer.
; 0:05
C A boy receive/s a gift.
C And all his pet/s wonder what he got.
C The boy open/3s the gift box.
C (And then the dog and the) the dog see/3s that it/'s a new frog.
C A baby frog.
C And the turtle/'s struggle/ing to see.
C But his frog, the big/er frog, is not happy to see another frog.
C The boy take/3s (the frog out) the little frog out.
C (The dog see/3s he*) the dog is happy.
C And turtle is happy but the big frog is grumpy.
; 0:05
C the boy introduce/3s the little frog to all his pet/s.
C (the fr*) the big frog, the turtle and the dog.
C The little boy (watch/3s) see/3s the little frog sit/ing down.
C and the big/er frog is be/ing mean.
C and the turtle is about to go into his shell.
C and the dog is just watch/ing all of them.
C The big/er frog bite/3s (the little) the baby frog.
C (the turtle turtle was like) the turtle is surprise/ed.
C the dog is also surprise/ed.
C and the boy was most/ly surprise/ed.
C The boy pick/ed up the little frog.
C and he was angry.
C The turtle was angry.
C And the dog was angry.
C and the big frog was just grumpy.
C the turtle decide/ed to give the big frog and the little frog (a l*) a ride to the lake.
C and the dog walk/3s behind the boy.
C and the boy/'s walking in front.
C the big frog kick/3s the little frog off the turtle/z back.
C and the little frog was a bit hurt.
C and the big frog was sad.
C and the turtle was also angry and the dog [EU].
C and the boy shout/ed at the (big turtle) ((I mean)) big frog.
C the the boy said that the big frog stay/ed behind.
C And the boy told him to stay behind because everyone was very disappoint/ed.
C (As as the) as the animal/s are/n't look/ing (the little frog) the little frog at the back see/3s the big/er frog jump/ing onto the raft.
C the (litt*) big frog look/3s at the little frog (in a) in a serious way.
C and the boy does/n't realise it.

C the big frog kick/3s the little frog off the raft.
C and (the) the tortoise see/3s it.
C (and the big) and the big boy still does/n't realise it.
C The big frog (take/3s) stick/3s it/z tongue out.
C And the turtle was suprise/ed again *at what the big frog had done (to the little turtle, I mean) to the little frog.
C the big frog is happy.
C the turtle is try/ing to call the big boy.
C And the big boy is wonder/ing what is going on.
C and also the dog.
C (everyone every*) the big boy gasp/3s.
C (the little the big) the dog is surpise/ed.
C and the little turtle is angry.
C and the (big t) big (uh) frog is also surprise/ed *at what he did.
C the big frog wonder/3s away because (he see/3s that he/'s not wante* allo* wa*) he see/3s that he/'s not special to him anymore.
C The dog and the turtle and the boy start look/ing for the little frog.
; 0:04
C (The big boy s*) the big boy (uh) walk/3s sad/ly, cry/ing home.
C and the turtle and the dog.
C The dog (is angry) is growl/ing at the frog.
C And the turtle does/n't want to look at the frog.
; 0:04
C The big boy is cry/ing on his bed.
C The dog is lick/ing him.
C And the turtle is hide/ing inside his shell.
C and the big frog is also disappoint/ed.
C (All all of) three of the animal/s and the boy hear a noise.
C (and they supri*) and they wonder what it is.
C sudden/ly out of nowhere the little frog jump/3s out of the window.
C and the boy/'s happy to see him.
C the dog is frighten/ed.
C but the turtle is happy.
C and it/'s jump/ing out of the window.
C (the boy) the boy was busy laugh/ing.
C the dog was happy.
C and the turtle was also happy because the little frog jump/ed on the big frog/z head.
C And from then the big frog and the little frog became friend/s.

- 04:49
+ Introduction: 2
+ CharacterDev: 3
+ MentalStates: 4
+ Referencing: 3
+ ConflictRes: 3
+ Cohesion: 3
+ Conclusion: 4

$ Child, Examiner
+ Language: English
+ Name: Participant 6 Post-Ax
+ Context: Nar
+ Subgroup: FWAY
- 0:04

C Frog where are you by Mercer Meyer.
C One night the boy and the dog are look/ing at the frog in the jar.
C (And) and when the boy and the dog woke up in the morning, they saw that the frog was/n't in the jar anymore.
C The boy look/ed everywhere, in his shoe/s.
C and the dog look/ed into the jar.
C The boy shout/ed out loud his name[EU].
C and then (the dog o* the dog) the dog still had the jar on his head.
C (The dog jump/ed and then the) the dog jump/ed.
C and then the jar (s*) broke.
C and the boy was wonder/ing where the frog is[EW:was].
C the boy was angry because he broke the jar.
; 0:05
C The boy walk/ed away and walk/ed into the forest and call/ed out the frog/'s name.
C and the dog was busy look/ing at the swarm of bee/s.
C The boy look/3s into the hole and wonder/3s if his frog is in there.
C (while the dog) while the dog is try/ing to get down (the bee n*) the beehive [EU].
C The boy look/3s down.
C and then a little (thing uh) meerkat come/3s out of the hole and bite/3s his nose.
C While but the dog is still try/ing to get that nest down.
C The dog finally get/3s the nest down but (the swarm) the nest broke.
C and now the swarm of bee/s are about to go after him.
C The boy climb/3s up the tree and look/3s if his frog is in the hole.
; 0:07
C (The) when the boy was look/ing in the hole the owl pop/ed out of nowhere.
C and then the boy (f*) the boy fell on the ground.
C And while the boy fell on the ground, all the swarm of bee/s where chase/ing after his dog.
C (uh an* the owl f* kept on follow/ing the b*) the owl follow/ed the bird.
C and the owl follow/ed the bird.
C (and then he) and then the owl went on to the tree.
C (The) the boy went try/ed to climb up the rock.
C and when he climb/ed on the rock the owl was busy watch/ing him.
C but the boy was try/ing to call out for his frog.
C (The eye/s) the owl/z eye/s were close/ed.
C (but the boy th*) when the boy climb/ed the rock, he try/ed to go over the stick but oh it was/n't a stick.
C (it was a rein* um) it was a reindeer/z horn.
C (The reindeer has the the boy) the boy is on the reindeer/z head.
C and it/'s busy chase/ing the dog and the boy away.
C The reindeer stop/3s.
C and then the boy (uh) let/3s go.

C and the dog go/3s over the cliff.
C and they/'re both about to land into the lake.
; 0:04
C Both the dog and the boy land/ed in the lake.
C and the reindeer was happy.
C (The boy and) the boy was happy.
C but the dog was a bit scare/ed of the water.
C (The boy sai*) the boy said to the dog "shhh".
C and then he was wonder/ing what/'s on the other side.
C The boy and the dog (qui* climb over or) start creep/ing over the log.
C When the boy creep/3s over the log he see/3s that (the fr*) the man frog and the woman frog are there.
C and when (he) the boy start/s sitting on the log, the man frog and the woman frog/z children are also over there.
C and the boy/z frog is there.
C the boy take/3s his frog away.
C and he say/3s thank you to the man frog and the woman frog.

- 4:19

+ Introduction: 5
+ CharacterDev: 4
+ MentalStates: 4
+ Referencing: 3
+ ConflictRes: 4
+ Cohesion: 3
+ Conclusion: 4

$ Child, Examiner
+ Language: English
+ Name: Participant 7 Pre-Ax
+ Context: Nar
+ Subgroup: FWAY
- 0:04

C Froggy is in the jar.
; 0:04
C *at night time.
E The frog is in the jar at night time.
C At night they went to sleep.
C and the frog went out the jar.
C (The dog and) and when it was morning the dog and boy look/ed.
C but the frog was not there.
C The (the) dog look/ed in the jar.
C and the boy/'s looking everywhere for the frog.
C And then they said "where are you froggy".
; 0:04
C Oh, and then the dog (fell down) fall[EW:fell] down.
C And then the boy catch/ed[OE:caught] him with (uh and the glow glow) ((what is those lights again)) <> a jar.
E <hmm>?
E mhm.
C (the) the boy catch/ed[OE:caught] him with boot/s.
C (and) and then the dog lick/ed him.
C (the dog) the boy and the dog said "where are you froggy".
C we>
C Ooo!
C the dog saw bee/s.
C "Where are you froggy"?
C "Are you in here" the boy said.
C XXX.
C XX "No I/'m not the (fl*) froggy".
E {laughs}.
C The bee/s were angry and (like) mad that the dog drop/ed him[EW:them].
C then (the the) the boy said "where are you froggie".
C " %Woo_hoo_hoo, I/'m not a froggy" <> owl said.
E <laughs>.
C {bzzzz} the bee/s were buzz/ing to sting the dog.
: 0:04
E mhm.
C Where are you froggy?
C (The) the owl was fly/ing (uh) everywhere.
E mhm.
C and the boy said "where are you froggy".
C and the doggy was behind those rock/s.
E mhm.
C (m*) moose>

C where are you moggy[EW:froggy]?
C then the boy>
C I/'m not froggy.
C He/'s chase/ing the dog down.
E mhm.
C and then he fell.
E mhm.
C (and) and then he said "where are you froggy".
C and then went into *the pond.
C and then he smile/ed.
C and the dog smile/ed.
C and {laughs} %shh.
C the boy look/ed there.
C (t* m* m* a mother frog and) a mother and a father frog (l*) and a (lay* lu*)>
C (uh) then the boy took (the) the little froggy.
C The end.

- 4:17

+ Introduction: 4
+ CharacterDev: 4
+ MentalStates: 1
+ Referencing: 2
+ ConflictRes: 1
+ Cohesion: 2
+ Conclusion:2

$ Child, Examiner
+ Language: English
+ Name: Participant 7 Post-Ax
+ Context: Nar
+ Subgroup: OFTM
- 0:14

C The boy got a present.
; 0:04
C Inside the present was a (little right there a) little frog.
C the boy saw inside the present.
C And when he open/ed (it) it, they were surprise/ed.
C except the big one.
C he was cross.
C It was a little (frog) frog.
C The boy was happy.
C and all of (the th*) the pet/s, the dog and the turtle, except (the froggy) the other frog.
C And then the boy laid the little frog on the ground.
C And the frog just (tell/ed[EW:told] him) tell/3s (the) the other something.
C And the pet/s were happy.
C And then (it bit it/z leg and the) the frog bit it/z leg.
C (and fell) and (the) the frog fell.
C The turtle and the dog were sad.
C They were sad.
C and then someone was surprise/ed.
C They were angry at that froggy.
C (N* n* n*) Then (they were at with a pirate they found) the boy found a pirate hat with a sword (ord).
C (uh and uh) the frog and a little frog are on the turtle/z back.
C and (the uh dog was) they were (worki*) walk/ing.
C and the frog kick/ed the little frog off the turtle.
C and then they look/ed at the other (fr*) frog.
C not the little frog.
C They were serious at that frog.
C Then the (frog that was) frog was serious.
C and that one is tell/ing (him) the frog to go on that (wooden) big (wood) piece of wood (ood).
C They *are pretend/ing it/'s a ship.
C They are sail/ing.
C That one is being mean to the other little frog.
C (They are th*) the boy is point/ing at something.
C until (the little frog they) the frog kick/ed the little frog into the water.
C and (the) the turtle was sad.
C and (the) the boy was (smirming uh smiri*) stir/ing the stream try/ing (uh) until the do*>
C the frog was (put/ing) stick/ing its tongue out.
C and (tha*) the turtle was (ser*) surprise/ed.
C and then the boy look/3s.
C (um the) the turtle just (bong*) touch/ed it/z hand/s.

C and the dog look/ed.
C and (the) saw (this) what surprise/ed (the) the frog.
C (uh the the) They *are look/ing for that little frog.
C and the (frog that was) frog was sad.
C and (that was) all of them were mad.
C (and to) and the dog want/ed to X the kiss/s.
C and (uh) the hat is on there.
C and (he saw the someth*) they saw (st* some*) the little frog with the hat.
C and the frog jump/ed out[EW:through] the window.
C and then they were happy.
C and (that one was) the other frog was surprise/ed.
C and then til|until the little one jump/ed onto (the o* went onto it/z) the other frog/z head.
C and the dog and the turtle and the boy look/ed (se* uh) happy.
C they were.
C and the boy was wear/ing (a) the hat.
C And the dog was happy.
C And everyone was happy.
C The end.

- 5:12

+ Introduction: 3
+ CharacterDev: 3
+ MentalStates: 4
+ Referencing: 3
+ ConflictRes: 3
+ Cohesion: 3
+ Conclusion: 2

$ Child, Examiner
+ Language: English
+ Name: Participant 8 Pre-Ax
+ Context: Nar
+ Subgroup: OFTM
- 0:04

C Okay.
C This (this this) boy here got a present.
C There was a bad frog.
C But inside the box there was a good frog.
C When he took the box out his dog was so happy to see that there was a nice frog.
C he start/ed lick/ing it.
C and the tortoise was happy too.
C and he was happy.
C Then (this) he got the small/er frog to meet the big ugly frog.
C Then the dog and the tortoise were watch/ing the new frog.
C And not give/ing any attention to this frog.
C This frog did the splits.
C and this one just watch/ed.
C And these one/s were sad for him.
C and he was cross at him.
C Then (the he got) he said stop stop_stop cos|because that frog was bite/ing this frog/z leg.
C And these one/s got a big fright.
C So they all said, and the dog was %grrrr, "go away"!
C And he said "at once go away"!
C And the tortoise was just stand/ing there looking all cross.
C and he was hold/ing the frog in his>
C then the big frog sat on the tortoise back, in the front, and the small frog behind.
C And the tortoise walk/ed.
C And the dog, he was follow/ing (his) his owner (who had a) who had a (m*) hat made out of paper.
C and a sword made out of wood.
C Then (the) the big/er frog kick/ed the small/er frog off the back of the tortoise and onto the floor.
C Then (this) this guy was shout/ing at (the) the big/er frog.
C And the small/er frog was get/ing hurt.
C And these one/s are cross at him.
; 0:05
C Then he said "Stay there on the bank"!
C "we *are go/ing to fish".
C "You can come back (n*) next time".
C "okay, stay"!
C Then they went.
C But he did/n't listen.
C He hop/ed onto the boat again.
C He sat there.
C He was tell/ing this other frog here.

C and this guy here was actually look/ing in the distance.
C and his dog was sit/ing there enjoy/ing the ride.
C Then this guy said to this guy "You are go/ing to be kick/ed off this boat".
C While the tortoise is sleep/ing, (the dog is lick/ing) his tongue is out.
C He/'s thirsty.
C And this guy with the stick is steer/ing and gaze/ing into the distance.
C Then he kick/ed him.
C And then the tortoise realise/ed.
C He look/ed at him.
C But the guy did/n't realise yet.
C Then he kick/ed him (in) into the water %psh.
C Then this frog pull/ed a tongue at him.
C And the tortoise said "hu".
C And then this guy was quite cross cos|because he was look/ing like this while this tortoise was tap/ing him.
C Then this dog was look/ing also backwards[EU].
C (Then then they were all) then he went "hu, oh no"!
C And then the dog was bark/ing {bar rar}.
C The tortoise was mo*>
C and the dog was standing on the tortoise/z shell.
C And they were get/ing cross at the big frog.
C (Then) and then they could/n't find him at all.
C The (the) other frog just went and sat on the edge.
C But he was hide/ing in the reed/s over here.
C Then they were busy sit/ing and looking under everything.
C But they could/n't find him.
C So then they all said "stay behind".
C He was cry/ing cos he was sad.
C His new present had gone.
C Then the tortoise was follow/ing.
C and the dog was very cross.
C He was growl/ing.
C Then when they were at home the dog was lick/ing him while he was sad.
C The tortoise was in his shell.
C and this frog was mad *about what he did.
C Then he got happy.
C And the dog got happy.
C And the tortoise got happy.
C And he got cross.
C Because frog jump/ed back!
C He was so happy.
C They were all happy.
C But he was like this %hah.
C Then the frog jump/ed (on his) on big frog/z head and almost kill/ed him.
C Then they said "That/'s what you get for be/ing mean to me".
C Then they were friend/s for ever.
C (And they) and this dog was pull/ing a tongue at him.
C And this one was laugh/ing.
C And he was happy.

C Then end.

- 4:57

+ Introduction: 2
+ CharacterDev: 3
+ MentalStates: 3
+ Referencing: 2
+ ConflictRes: 3
+ Cohesion: 2
+ Conclusion: 4

$ Child, Examiner
+ Language: English
+ Name: Participant 8 Post-Ax
+ Context: Nar
+ Subgroup: FWAY
- 0:04

C (That this) this little frog was in a jar (that they) that they left open.
C but the jar was quite (um small to get) thin.
C and the dog was look/ing inside.
C and the boy was watch/ing the frog.
C Then the boy and dog went to sleep on their bed.
C and the frog squish/ed himself out.
C then they woke up.
C and they saw that (he) the frog was gone.
C So they were afraid.
C Then they were look/ing in all these clothe/s and everything.
C And the dog even put his head in the bowl[EW:jar] and could/n't get his head out.
C Then they were look/ing out the window.
C (and his dog s*) and his dog had the the bucket[EW:jar] still on his head[EU].
C And (he he was) he start/ed to fall.
C And they were call/ing for the frog.
C Then he fell down, out of the window.
C and the boy said "oh".
C Then he went and fetch/ed his dog.
C and he was cross.
C but the dog was lick/ing him.
C (Then they) then the dog saw some bee/s.
C and it lead to a beehive.
C and the man was still call/ing (them) him.
C Then he was look/ing down this one hole.
C while the dog was bark/ing at the bee/s.
C Then (uh a a like) a rat came out and bit him on his nose.
C then the dog was push/ing the tree and barking at the bee/s.
C Then he push/ed the tree so much that the beehive fell.
C and that little rat was sit/ing out of his thing.
C and the boy was look/ing in a tree for his frog.
C Then a[EW:an] owl pop/ed out and knock/ed the boy over.
C and the dog gave the boy a fright cos|because he was run/ing away from the bee/s that want/ed to sting him.
C Then the boy (um) was scare/ed.
C so he try/ed to block himself.
C while the dog was stung by a whole lot of bee/s.
C Then the boy stood on a rock.
C and the owl was in the tree.
C and he was call/ing for his frog.
C while the dog was walk/ing back (with) cos|because he was so stung that he could/n't walk proper/ly.
C Then while he was on the rock (a) a reindeer stood up.

C And the dog was dig/ing in the rock/s.
C And then the reindeer start/ed to run.
C And then the dog start/ed to bark at the reindeer.
C And there was a edge.
C And then the reindeer threw the boy and *the dog off the edge.
C (into and they were) they were going to fall into the water.
C and splash!
C they fell in the water.
C then (they) they saw a log.
C so they swam up to it.
C The boy told the dog to be quiet.
C Then they peek/ed over.
C and they saw two frog/s.
C and (the) it was a mommy and a daddy.
C then they saw baby frog/s.
C The one jump/ing (was the one that the) was the one of his[EU].
C Then he took his frog.
C and he said goodbye to them.
C and his dog was happy.
C but the mother and father and the {counts} 6 frog/s did/n't notice, but only one frog notice/ed that (one one of his brother/s or and sister/s) one of his brother/s had fell[EW:fallen] down.
C Then end.

-3:42

+ Introduction: 2
+ CharacterDev: 3
+ MentalStates: 3
+ Referencing: 3
+ ConflictRes: 3
+ Cohesion: 3
+ Conclusion: 3

$ Child, Examiner
+ Language: English
+ Name: Participant 9 Pre-Ax
+ Context: Nar
+ Subgroup: FWAY
- 0:11

C (On*) One day there was a boy who was sit/ing all alone (with his) with his dog.
C and his frog that was in a bottle ((I think)).
C Then when the boy went to sleep (the frog jump/ed out the dog jump/ed out the) the frog jump/ed out.
C And then when the boy woke up the frog was gone.
C and the boy was very sad.
C So the boy start/ed look/ing for his little frog.
C and he could/n't find him in the room.
C (then the do*) then the boy scream/ed out to the frog.
C and the frog did/n't answer.
C and the (dog) dog was just sit/ing there.
C (Then the frog) then the dog fell out of the window {laughs}.
C and (the boy wa* the boy) ((I think)) the boy was a little bit angry and sad.
C and (uh wa*) then the boy was very angry that the dog fell out.
C And then (the boy o*) the boy scream/ed out again.
C (and the dog did/n't and the word/s and the dog did/n't) and the frog did/n't answer.
C (And the b*) then the b*>
C ((wait oh wait I skipped a page)).
C Then the boy look/ed into a mole hole.
C and the mole (bit the boy/z the boy/z uh) bit the boy/z nose.
C And the dog was bark/ing at the beehive.
C (Then the) then the dog let[EW:made] the beehive fall.
C and all the bee/s are angry.
C And the boy look/ed (into an) into a tree that had a hole[EU].
C And there was an owl that scare/ed him.
C (And the owl f*) and the owl let[EW:made] him fall down.
C (swarm and) and the dog ran away.
C the boy was hide/ing from the owl.
C and the owl lost him.
C and the boy climb/ed (up and onto and) up the rock.
C and he climb/ed onto a deer/z head.
C And the deer was run/ing and run/ing.
C and then (the deer stop/ed) the deer stop/ed.
C and the boy fell down off the (hill) tall hill (into a pond with) into the pond.
C and (the deer) the deer was just look/ing.
C And the boy was smile/ing.
C and the dog was on his head cos|because he heard the frog.
C so the boy said "be quiet" to the dog.
C and (he look/ed behind) he look/ed there.
C and he saw the frog (with s* with some) with his wife and little baby frog/s.
C (So the fro*) so the boy said bye (to his lit*) to his big frog.
C and the frog gave him a little baby frog.

C There.

- 3:54

+ Introduction: 2
+ CharacterDev: 3
+ MentalStates: 3
+ Referencing: 3
+ ConflictRes: 2
+ Cohesion: 2
+ Conclusion: 3

$ Child, Examiner
+ Language: English
+ Name: Participant 9 Post
+ Context: Nar
+ Subgroup: OFTM
- 0:09

C (One d*) one day the little boy got a very big present (from s*) from someone.
C (The boy) the boy open/ed the present and was very happy to see what was inside.
C but the frog was very angry.
E Mhm.
C (The the f*) the little boy (pick/ed up the pick/ed up something) pick/ed up a little frog.
C (and) and the tortoise and the dog were very happy and the boy[EU].
C but the big frog was very jealous.
C (The boy the boy try/ed to) the boy put down the frog.
C (and try/ed to and) and the big frog (was very) did/n't like the small frog.
C (And the and the big fro*) and the big frog was very angry and want/ed to do something to the little frog.
C (but the boy was) and also the boy was very happy.
C Then the big frog (bit) bit the little frog/z leg.
C and the boy was shock/ed.
C and the tortoise and the dog (was very) was[EW:were] also shock/ed.
C So the boy took the little frog and told the big frog "do not bite his leg".
C And the dog was growl/ing.
C And the tortoise was very angry.
C (Th* then th*) then they went for a walk.
C (when and the) and the little boy was dress/ed as a pirate.
C The dog was walk/ing behind him.
C (and the and the) and the big frog was on the tortoise.
C and (the) also the little frog.
C but the big frog was also still jealous and angry.
C but then the big frog (kick/ed) kick/ed the little frog (off the tortoise and) off the tortoise.
C and the little frog was very sad.
C (and the) and the little boy was shout/ing at the big frog to tell him " do not kick the little frog".
C and the tortoise was very angry.
C and the dog was also very angry.
C the little boy told the big frog to stay there cos|because he was very naughty and will hurt the little frog.
C (the little) the tortoise was angry.
C and the dog was angry.
C but the little was frog was (s* s*) smil/ing.
C the boy went out on his little boat.
C but then the big frog jump/ed on the boat.
C and the little frog was very sad then.
C and the tortoise was watch/ing him.
C (the the big frog just) the big frog (w* was l*) was look/ing at the little frog.

C going to do something to him[EU].
C and the tortoise ((i think)) alseep.
C (Then the big frog) then the big frog kick/ed the little frog off the boat.
C and the tortoise was watch/ing.
C the tortoise saw what happen/ed.
C and the tortoise was shock/ed.
C and the big frog (wa*) pull/ed his tongue out to[EW:at] the little frog.
C the tortoise tap/ed the little boy to say (what) to just look.
C and the big frog was smile/ing.
C the little boy was very sad and shock/ed to see that the little frog was no more on the boat[EU].
C but the big frog was there.
C so the dog (how*) was howl/ing (to s*) to hear him here.
C (and the) and the tortoise was just look/ing at the frog.
C (The boy look/ed under) the dog look/ed in the bush/s.
C The boy look/ed under the the lily pad/s.
C And the tortoise look/ed in a barrell.
C And (the frog was) the big frog was also look/ing for the (tortoise) frog.
C The boy was (very sad and very) very sad and very scare/ed at what happen/ed.
C And the tortoise was very angry.
C (and the) and the dog was also very very angry.
C (and the little) and the big frog just sat there watch/ing them.
C The little boy was lie/ing in bed feel/ing so sad that his little frog was gone.
C And the dog was lick/ing him (to) to say that everything/'s okay.
C and the tortoise was in his shell disappoint/ed at the big frog.
C (Then then then they all heard something) then they heard something (that that was very) that nearly sound/ed like the little frog.
C Then the little frog just jump/ed through the window.
C and they were all very happy.
C (also) and also the frog and the tortoise.
C and (the little frog ju*) the little frog land/ed on the big frog/'s head.
C and they all laugh/ed.
C then the big frog and the small frog became friend/s.
C and they are all happy.

- 5:32

+ Introduction: 2
+ CharacterDev: 3
+ MentalStates: 5
+ Referencing: 2
+ ConflictRes: 3
+ Cohesion: 3
+ Conclusion: 4

$ Child, Examiner
+ Language: English
+ Name: Participant 10 Pre-Ax
+ Context: Nar
+ Subgroup: OFTM
- 0:05

C Once upon a time a boy got a birthday present on his birthday.
C he open/ed it up with all his animal/s.
C and then they saw a little baby frog.
C The big frog did/n't like this frog at all.
C but the child was very happy (with the two) with all the animal/s.
C The one frog was so jealous, he actually bit the other baby frog.
C The child said "no, stop".
C and the frog was very cross.
C as the children[EW:child] walk/ed away with the two frog/s on the tortoise, the one kick/ed the other one off.
C the other one cry/ed.
C (w* th*) the child said "no".
C he told (the) the frog to stay at the edge as they were take/ing a trip.
C Just then the frog leap/ed back onto the boat.
C And they all went.
C Then the big frog kick/ed the little frog off.
C Very happy now[EU].
C The child was look/ing all over for the place but he could not find it.
C He was search/ing and search/ing.
C They still could not find it.
C The child ran home cry/ing.
C (and the b*) and the big frog came with.
C as the child was cry/ing something knock/ed on the door.
C the baby (do*) frog leap/ed through the the window and land/ed straight on the big frog.
C and then they all live/ed happily ever after.

- 1:45

+ Introduction: 2
+ CharacterDev: 1
+ MentalStates: 2
+ Referencing: 3
+ ConflictRes: 1
+ Cohesion: 2
+ Conclusion: 4

$ Child, Examiner
+ Language: English
+ Name: Participant 10 Post-Ax
+ Context: Nar
+ Subgroup: FWAY
- 0:04

C Once upon a time there was a little boy and his dog.
C and they had a pet frog.
C The frog love/ed to play (in a box oh) in a bowl[EW:jar].
C One night (when the fro*) when the (ch*) child was sleep/ing with his dog, the frog climb/ed out of the bowl[EW:jar].
C and he ran away.
C The boy and the dog search/ed everywhere.
C but they could not find his pet frog.
C as they were look/ing out the window (the d*) the dog fell (and he f*) and he broke the glass.
C The child was very mad.
C but the dog was very happy.
C They ran to the wood/s to (try look for) try look for the frog.
C but they could not find it.
C {coughs}.
C (the*) they look/ed through a hole.
C The dog was play/ing with a couple of bee/s.
C They did not find the frog anywhere.
E Tell me more.
C And (the boy) a beaver jump/ed out of a hole and hit the boy/z nose.
C The boy climb/ed up a tree try/ing to look (for) for the frog.
C and as the boy was climbing up a branch snapp/ed by the dog.
C and (the bee/s) the beehive broke.
C and the bee/s chase/ed (the frog uh) the dog.
C An owl jump/ed out of the hole.
C The boy fell on his back.
C and the bee/s were still chase/ing the dog.
C The boy (o* c*) try/ed to hide behind a rock.
C The owl flew away.
C The dog got hurt.
C and they were still look/ing for the frog.
C As the boy (was climb/ing w*) was climb/ing over the rock, a deer jump/ed up look/ing[EU].
C the boy was hang/ing (w*) on his horn/s.
C the the dog was bark/ing.
C and the deer was run/ing away.
C The deer stop/ed at a cliff.
C the boy and the dog fell into the river.
C They made a big splash.
C And they still was look/ing for the frog/s[EU].
C They heard something.
C The boy told the dog to keep quiet.

C The dog try/ed to swim to the edge.
C And he got it.
C They look/ed over the rock.
C and there his frog was with a female frog and their little children.
C (The) the boy was play/ing with the frog/s.
C and the other frog/s were play/ing with.
C and they live/ed happily ever after.

- 2:41

+ Introduction: 4
+ CharacterDev: 3
+ MentalStates: 2
+ Referencing: 4
+ ConflictRes: 3
+ Cohesion: 2
+ Conclusion: 4

$ Child, Examiner
+ Language: English
+ Name: Participant 11 Pre-Ax
+ Context: Nar
+ Subgroup: OFTM
- 0:09

C There was a boy who got a present.
C So he open/ed it.
C Then he saw (a frog) a small/er frog.
C so (th*) then the other frog was jealous.
C so he put the frog on the floor to get along with the other animal/s.
C but the jealous frog bit (the other frog) the new frog.
C so everybody was angry at him.
C and the boy pick/ed the frog up.
C (They went to the) they were walk/ing to the pond.
C (w*) and the frog/s were on the (turtoise t* t*) turtle.
C both of them.
C so then the frog kick/ed (the oth*) the new frog off the tortoise[EW:tortoise/'s] back.
C so they (left hi* the uh the jealous frog uh) left the jealous frog while (the oth*) the other/s go on the raft ((sorry)).
C while when the other>
C the frog jump/ed on the raft with with them.
C (Then he the jealous frog w*) the then the jealous frog kick/ed (kick/ed) the new frog off the raft and (stuck the hi*) stuck his tongue out at him.
C Then the tortoise call/ed the the boy.
C and they were all shock/ed (wh*) of[EW:at] what he had done.
C so they look/ed for the little frog.
C ((oh here/'s the frog I just noticed now)).
C They *were look/ing for the frog but they could/n't find him.
C They coud/n't find him so they left[EW:went] home.
C and (while) the (uh) the boy was cry/ing.
C so they went on the board[EW:bed].
C (he get/ing sad he) and they were sad.
C so then the (uh) the new frog (jump/ed ou* ou* jump/ed inside) jump/ed (ou*) from[EW:through] the window and land/ed on the frog.
C and look/ed at him.
C ((I don't know how what is it angrily or something)).

- 2:14

+ Introduction: 2
+ CharacterDev: 1
+ MentalStates: 3
+ Referencing: 4
+ ConflictRes: 3
+ Cohesion: 2
+ Conclusion: 1

$ Child, Examiner
+ Language: English
+ Name: Participant 11 Post-Ax
+ Context: Nar
+ Subgroup: FWAY
- 0:05

C the child put his frog inside the jar.
C (uh) then they (f*) fell asleep.
C so then (they were) the frog came out of the jar.
C (w*) when they woke up the next day they found the frog was/n't there.
C They look/ed everywhere.
C (s*) and (they) they could/n't find it.
C so (they went) they shout/ed outside.
C (and) and they could/n't find the frog.
C then (the) the dog fell outside the window by mistake.
C so the boy went down and pick/ed him up.
C (they still co*) they went outside and (outside) inside the wood/s.
C and (call/ed out) they (call/ed out for the call) call/ed the frog.
C but still no answer.
C (so they) so then they went off to look for it.
C the boy look/ed inside the hole.
C (a*) after that the (the) animal jump/ed out and hurt his nose.
C (w*) while the dog (hit) kick/ed the (the) tree so the (the) beehive fell on the floor.
C and a bunch of bee/s came out.
C The boy look/ed inside the tree.
C (and a w*) and a[EW:an] owl jump/ed out and hit him.
C and he fell on the floor.
C while (the the dog) his dog was run/ing because the (the) bee/s were chase/ing him.
C (the w*) the wasp/s[EW:bee/s] were still chase/ing him from when he hit him at the tree (th*) off [EU].
C Then he (s*) was (look/ing) still shout/ing out.
C look/ing for the frog.
C (uh th* uh) suddenly (the a) a deer came out and (jum*) pop/ed out so (so) he land/ed on the deer/z head.
C and then the deer was run/ing.
C and he push/ed him (in) into the (wa*) pond.
C and so they fell inside the pond.
C and they heard the frog croak/ing.
C (so he so th*) so he go/3s and look/3s (look/3s) to (t*) get a close/er look.
C and he see/3s that (it was) it/'s (a fro* it/'s the frog/s with the famil*) a family of frog/s.
C then he took his frog and said goodbye to the frog family.

- 2:21

+ Introduction: 3
+ CharacterDev: 4
+ MentalStates: 1

+ Referencing: 3
+ ConflictRes: 3
+ Cohesion: 4
+ Conclusion: 3

$ Child, Examiner
+ Language: English
+ Name: Participant 12 Pre-Ax
+ Context: Nar
+ Subgroup: OFTM
- 0:07

C The frog was hide/ing inside the hat.
C And now the boy (get/3s a) get/3s the little frog for his present.
C Then you open your present.
C then they see the little frog.
C and now they *are take/ing him out.
; 0:06
C and now the little frog is be/ing nice to the little boy (and the) and these two pet/s instead of that one[EU].
C and now this pet is be/ing nasty.
; 0:07
C and now the frog is bite/ing him on the leg.
C (and now the frog) and now the the boy and the other pet/s are say/ing "no" to the frog.
; 0:05
C and now they *go off to (uh w* uh) walk to the pond to build a boat to sail.
C and now the frog (kick/3s the) kick/3s the little frog off.
C and now the little frog/'s cry/ing because of the big frog.
C and now the pet/s are angry.
C the tortoise and the dog and the boy.
; 0:05
C (now this frog has to stay because uh th*) now (the the) this frog has to go only because of the other frog[EU].
C and now they are sail/ing and sail/ing_and_sail/ing.
C and now (the the the) the big frog is manage/ing to jump onto the boat to kick the little frog off.
C now he was (uh) over here.
C he/'s about to kick the little frog off.
; 0:12
C and now he kick/ed the little frog off into the pond.
C and now the frog (jum*) make/3s a big splash.
C and then the big frog is just X the frog.
C and now they>
; 0:04
C and now this frog is happy.
C but then the tortoise has to tell the little boy and the dog.
E Mhm.
C (and) and now they are fight/ing (with the) with the big frog.
; 0:07
C (and now the big) but the big frog is actually a mother.
C and now the big frog/'s being sad about the little frog.
C and now the boy/'s finding the frog dead under the leaf.
C and now the tortoise is going for a little swim.

C and now the boy is go/ing home cry/ing and cry/ing_and_cry/ing.
C and now the dog is growl/ing to the big frog.
; 0:11
C now he/'s lie/ing on his bed cry/ing.
C and now the dog (fou* fou*) just heard a noise about (the dog make/ing a sound) ((I mean)) the frog make/ing a sound.
C and now the boy heard the little frog.
C and now (the dog) the dog told the little boy that the frog was jump/ing into the room.
C onto the bed.
C and now the frog jump/ed into the big frog.
C and now ((oops)) >
; 0:10
C and now the big frog has a son.
C that/'s all.

- 4:55

+ Introduction: 2
+ CharacterDev:3
+ MentalStates: 2
+ Referencing: 3
+ ConflictRes: 1
+ Cohesion: 2
+ Conclusion: 2

$ Child, Examiner
+ Language: English
+ Name: Participant 12 Post-Ax
+ Context: Nar
+ Subgroup: FWAY
- 0:06

C They are take/ing care of a (fro*) frog over there.
; 0:04
C and then he go/3s to bed.
C and then the frog is sneak/ing out of the thing.
C and now (they) they *are look/ing for the frog.
C but they did/n't see it in the jar.
; 0:06
C and now he/'s look/ing in his boot/s.
C and he/'s look/ing outside.
C the dog/'s head is stuck into[EW:in] the jar {laughs}.
C and now there the dog fall/3s onto {laughs} the ground.
C and now the boy took off the>
C now it broke.
C now the boy took off the jar.
C and now they are yell/ing to call the frog.
; 0:06
C and now they are look/ing in that hole where the rat live/3s.
C and then they are look/ing in the beehive.
C and now the rat is very nasty.
C and the bee/s are fly/ing out for the dog.
C and now the boy is (is) climb/ing the tree and then search/ing in that hole.
C and now he saw an owl.
C then he fell.
C and now the bee/s are chas/ing the dog.
C and now they are search/ing for the frog in the rock.
C and the thing poop/3s on him.
C the bird.
C and now the owl is on another tree.
C and then he yell/ed.
; 0:04
C he yell/ed again to the frog.
E Mhm.
C and now he/'s on the deer.
C and now the deer/'s walk/ing (to the to) to the pond.
C and now the deer/'s go/ing to drop him into the pond.
C and now it/'s>
C look, they/'re fall/ing off the mountain into the pond.
C Mhm.
C and now they jump/ed into the pond.
C and then they *are wet.
C and now the boy (hear/3s) hear/3s the frog/s and the dog.
C and now he/'s like %shhh.

C now he/'s go/ing to look inside the log.
C and here he/'s look/ing in the log.
C and now he find/3s the two frog/s.
C and (then they are) there they are.
C and now the boy was so happy that>
; 0:09
C and now they are tak/ing the little frog home.
; 0:05
C because they found him.
C and there/'s a family of frog/s.

- 3:20

+ Introduction: 1
+ CharacterDev: 2
+ MentalStates:2
+ Referencing: 2
+ ConflictRes:1
+ Cohesion: 2
+ Conclusion: 2

5. CONCEPT ARTICLE SUBMITTED FOR REVIEW:

The results of the sub-aims of the current study were compiled and presented in an article titled "Methylphenidate-OROS® impacts narrative macrostructure of children with attention-deficit hyperactivity disorder".

Methylphenidate-OROS® impacts narrative macrostructure of children with attention-deficit hyperactivity disorder

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ABSTRACT

Purpose: Children with attention deficit hyperactivity disorder (ADHD) experience difficulty with expressive language including form (e.g., grammatical construction) and content (e.g., coherence). The study aimed to investigate the effect of Methylphenidate-OROS® (MPH-OROS®) on the narrative ability of children with ADHD and language impairment, through the analysis of microstructure and macrostructure narrative elements.

Method: In a single group off-on-medication test design, narratives were obtained from 12 children with ADHD, aged 7 to 13 years, using wordless picture books. For microstructure, number of words, type-token ratio and mean length of utterance were derived from narrative samples using Systematic Analysis of Language Transcripts (SALT) conventions. For macrostructure, the narratives were coded according to the Narrative Scoring Scheme (NSS), which includes 7 narrative characteristics, as well as a composite score reflecting the child's overall narrative ability.

Results: The administration of MPH-OROS® resulted in a significant difference in certain aspects of language macrostructure, namely conflict resolution and cohesion, as well as overall narrative ability. Little effect was noted in microstructure elements.

Conclusions: The improvement in conflict resolution and coherence, without change in microstructure elements, provides support for the theory that certain language characteristics of individuals with ADHD may be attributed to executive dysfunction.

INTRODUCTION

Attention-deficit hyperactivity disorder (ADHD) is a frequently occurring psychiatric condition in school-aged children with estimates of prevalence ranging from 3% to 5% (National Institutes of Health [NIH] Consensus Development Panel, 2000; Westby & Watson, 2004). As outlined in the Diagnostic and Statistical Manual of Mental Disorders, 5th edition (DSM-V, American Psychiatric Association, 2013), ADHD refers to a heterogeneous group of individuals who display a persistent pattern of inattention, with or without hyperactivity and impulsivity, that disrupts functioning or development. Based on the presentation of these

difficulties, individuals may be considered to belong to one of three sub-types: ADHD primarily inattentive (ADHD-PI), ADHD primarily hyperactive/impulsive (ADHD-PH), or ADHD combined type (ADHD-C). The symptoms of ADHD are pervasive and negatively impact performance across a variety of settings throughout the individual's life. Although widespread agreement exists regarding the validity of ADHD as a diagnosis, there is not a single neurological or physiological test to objectively diagnose the disorder. Furthermore, no definite neurological, genetic or biological etiology exists (NIH Consensus Development Panel, 2000; Furman, 2005).

Theories regarding the etiology of ADHD implicate neuroanatomical, neurochemical and neurophysiological mechanisms. In particular, the dopaminergic neurotransmitter system (e.g. catecholamines) has been shown to regulate cognitive behaviors such as attention, inhibition and motivation (Ballard, Bolan, Burton, Snyder, Pasterczyk-Seabolt &Martin, 1997). Though the exact effect of the catecholamines on behavior remains unresolved, support for their involvement can be found by improved performance of children with ADHD across a range of behavioral measures and cognitive tasks, including those of attention and memory, following stimulant medication (Berridge & Waterhouse, 2003; Pelham et al., 1990a; Schachar et al., 2008).

In addition to impaired attention and inhibition, children with ADHD frequently present with speech/language difficulties. Although most results range between 20% and 60% (Oram, Fine, Okamoto & Tannock, 1999), reports vary depending on whether the samples were clinically referred or enlisted from the community (Engelhardt, Ferreira & Nigg, 2011). Children with ADHD demonstrate impairments in language processes that have been noted in verbal production (Oram et al., 1999; Purvis & Tannock, 1997), comprehension (McInnes, Humphries, Hogg-Johnson & Tannock, 2003) and reading (Baker & Cantwell, 1992). Prior work documenting disorders in language processing in this population has focused almost entirely on the modality of expressive language, documenting impaired sentence formulation and organization, coherence and self-monitoring (Purvis & Tannock, 1997; Francis, Fine & Tannock, 2001), poor topic maintenance (Tannock, 2005; Westby & Watson, 2004) and

increased grammatical errors and dysfluency due to false starts, repetitions and hesitations (Tannock, 2005). Furthermore, children with ADHD are prone to speak for longer stretches (excessive talk) with many short pauses during speech production (Breznitz, 2003). These characteristics are likely due to verbal retrieval problems resulting in increased use of non-specific terms (Tannock, 2005). In summary, children with ADHD are at risk of having expressive language abilities that are characterized by weaknesses in both form (e.g., grammatical construction) and content (e.g., coherence).

Theoretical Accounts for the Association between ADHD and Language Impairment

The co-occurrence of attention disorders and language impairment is not arbitrary; however, there continues to be dispute regarding the specific cognitive-linguistic mechanisms responsible for language impairments in this population. Theories ranging from general developmental delays to executive function impairments to attention deficits have been proposed.

One explanation for the documented concomitance between these deficits is that both are rooted in general developmental delays, as indicated by studies that have focused on the relationship between the development of attention, cognition and language (Redmond 2004). For example, Tallal, Dukette and Curtiss (1989) found high correlations between language, attention and motor functioning; suggesting that attention deficits identified in children with language disorders may be related to neurodevelopmental delays in perceptual and motor functioning. Boucher (2000) suggested that developmental disorders associated with language difficulties, such as ADHD, may reflect a disruption in the development of underlying "time parsing mechanisms" (referring to a continuum of perceptual and cognitive processes implicated in the segmentation and analysis of information, including linguistic material). The continuum of perceptual and cognitive processes described by Boucher (2000) could allow for the variation observed in attentional, cognitive, and linguistic symptoms associated with ADHD.

Alternatively, the notion that language acquisition may be hampered by existing deficits in attention has been proposed (Camarata & Gibson, 1999; Sameroff & Chandler, 1975).

Camarata and Gibson (1999) discuss the effects of ADHD on language acquisition through the transactional model of mother-child interaction, which focuses on the interaction between child and adult behavior, responsible for the development of a child's language (Sameroff & Chandler, 1975; Yoder & Warren, 1993). Based on this model, the authors suggest that inattention, hyperactivity and impulsivity negatively influence a child's ability to engage in language learning opportunities, upsetting these interactions and therefore disrupting the process of language-learning. Although these disruptions occur early in life, they presumably continue through childhood, with cascading effects on more advanced language forms and uses.

In addition to general developmental delays and attention deficits, executive dysfunction, which refers to those cognitive, self-regulatory behaviors necessary for the selection and maintenance of actions, guiding one's behavior within a rule governed context, is also observed in this population (Barkley, 1997; Westby & Watson, 2004). Some propose that deficits in executive function are responsible for core behavioral symptoms of ADHD as well as language difficulties (Tannock & Schachar, 1996) and diminished working memory (Barkley, 1997). Furthermore, Tannock and Schachar (1996) suggest that this executive dysfunction may create a profile of language difficulties that is unique to children with ADHD. Support for this theory can be found in the work of Tannock (2005) and Westby and Watson (2004), which showed that language characteristics of children with ADHD include a lack in ability to initiate or plan an intended message. This results in difficulty shifting between, and organization of, their thoughts, while maintaining the necessary sequence of behaviors or events. The presence of these deficits could contribute to weaknesses in narration in children with ADHD, as these are the skills required to generate a rich and cohesive narrative (Moonsamy, Jordaan & Greenop, 2009).

Narrative Production in Children with ADHD

Given the symptoms of ADHD and the underlying mechanisms thereof, the cognitive profiles associated with ADHD can be mapped onto the requisite skills of narration, which include sustained attention and topic maintenance, as well as complex syntax and an

organizational structure based on temporal and causal chains (Owens, 2001). Given this overlap, it is evident that narrative production, in particular, would be informative to study with respect to the effects of medication on children with ADHD. The importance of investigating narratives has been highlighted in the literature for a number of reasons, perhaps foremost, due to the close correlation between narrative performance and academic success in children with language impairment. Research has indicated that pre-school children with poorly developed narrative abilities are at risk for later academic and language difficulties (Paul & Smith, 1993). In addition, narrative skills are fundamental to social communication. Oral narratives enable individuals to develop social relationships through the sharing of experiences, allowing one to engage emotionally with others (Coupland & Jaworski, 2003). Furthermore, due to the decontextualized nature of narratives, individuals are able to share events that are removed from the here-and-now (Peterson, Jesso & McCabe, 1999). That is, the core behavioral difficulties and language impairments associated with ADHD could impact narrative production ability, with implications for academic and social outcomes.

The idea that medication could positively influence language production in narratives in children with ADHD has been documented in only a few studies. One such study is that by Francis et al. (2001), in which fifty children with ADHD, ages 7 to 12 years, were presented with an audiotaped story accompanied by a wordless picture book during a randomized, placebo controlled crossover trial with both 10 and 20 mg doses of standard-release Methylphenidate (MPH). MPH is a stimulant medication used in the treatment of the behavioral symptoms of ADHD through its effect on neurotransmitter levels within the brain (Ballard et al., 1997; Poulton, 2006). Participants were required to retell the story as well as answer comprehension questions. The narratives were analyzed according to story grammar, length and errors. Results indicated that MPH increased the participants' recognition of the character's internal responses and attempts (i.e., aspects of narrative macrostructure), but showed no effect on retelling errors, story length or story comprehension. Based on the design of the study, however, it is evident that participants'

understanding of the narrative was supported by their comprehension of the audiotaped story prior to their narrative retell. Because any difficulties with comprehension of the narrative may have limited the narrative they produced, results from the analyzed narratives would therefore be a reflection of the effect of MPH on the summation of receptive and expressive language abilities.

In a similar study to that of Francis et al. (2001), Derefinko, Bailey, Milich, Lorch and Riley (2009) investigated the effects of stimulant medication on the narrative production of 17 children with ADHD, ages 9 to 13 years, using an online story narration task. Online narration allows for the investigation of narratives and story processing, while decreasing demands on memory and receptive language abilities. In this case, narrative elicitation involved telling a story from a wordless picture book, without first listening to a recording of the story or previewing the picture book ahead of time. Derefinko et al. compared the narrative abilities on and off medication for children with ADHD who were taking a variety of medications, rather than a single stimulant across all participants. Narratives were evaluated with a focus on goal-based attempts and outcomes (i.e., goal-based story events), using story grammar categories that included overall goal, subsequent subgoal, attempts and outcomes as well as resolution of the overall goal. Furthermore, within clause, whole clause and repetition errors were noted. For children with ADHD, results indicated that stimulant medication did not improve goal-based story production skills. Although children on medication included more clauses in their narratives (increased length of narratives), no other significant effects were evident. Thus, in contrast to Francis et al., Derefinko et al. identified an effect of medication on microstructure (i.e., on productivity in terms of narrative length) — but not macrostructure — of narrative production in children with ADHD. The differing findings between these two studies may have been a result of methodological differences in elicitation of narratives or the particular outcome measures examined.

The purpose of the current study was to extend prior work on the effects of a single medication, namely MPH-Osmotic Release Oral System (MPH-OROS®), on language production processes in children with ADHD. In the current study, so as to circumvent the

effect of comprehension skills on narrative production, an elicitation procedure was utilized that was less likely to result in performance that varies on the basis of memory or receptive language ability. Narrative elicitation did not involve listening to the story in advance, but rather previewing the wordless picture book prior to narrative production, allowing the processing of the entire story before planning and organizing story components into a cohesive narrative. The current study sought to comprehensively measure microstructure and macrostructure elements of narration, employing a sensitive and specific scale of narrative production that rates the degree of development of story grammar elements rather than the mere presence or absence thereof (Narrative Scoring Scheme)(NSS) (Miller, Adriacchi & Nockerts, 2011).To that end, in a group of 12 children with a diagnosis of ADHD and developmental language impairment, the following two questions were addressed:

1. Is there an effect of MPH-OROS® medication on *microstructure* language production elements during story narration, as measured by productivity, grammatical complexity and lexical diversity?

2. Is there an effect of MPH-OROS® medication on *macrostructure* language production elements (introduction, character development, conflict resolution, mental state, referencing, cohesion and coherence) during story narration, as measured by NSS?

METHOD

Participants

In the context of a single group off-on-medication test design, 12 children with ADHD (3 females, 9 males), ranging between the ages of 7 and 13 years (mean age of 11.23 with a standard deviation of 2.28) with average or above average intelligence (mean of 96.42 with a standard deviation 10.05), were selected from a private remedial school. See Table 1 for a summary of participant characteristics. Written consent was obtained from parents prior to commencement of the study and verbal assent obtained from the children prior to each data gathering session. A university-based ethics committee granted permission for the study to be performed.

Table 1: Demographics of study participants.

		Mean	SD	Range (min; max)
Age		11.23	2.28	6.6 (7.3; 13.9)
IQ (Van Eeden, 1997)		96.42	10.05	32 (82; 114)
Clinical Evaluation of Language Fundemantals (CELF) (Semel, Wiig & Secord, 2003)	Formulated sentences	7.5	3.06	12 (1; 13)
	Understanding spoken paragraphs	8.08	3.8	12 (1; 13)
	Familiar sequences	7.91	2.6	10 (1; 11)
Test of Auditory Processing Skills (TAPS) (Martin & Brownell, 2005)	Word discrimination	11	1.35	4 (9, 13)
	Phonological blending	10.17	3.76	14 (1; 15)
	Number memory forward	9.84	2.29	8 (7; 15)
	Number memory reversed	8.17	2.98	10 (11; 1)
	Word memory	10.5	3.15	14 (5; 19)
	Sentence memory	9.25	2.67	8 (5; 13)
	Auditory comprehension	8.58	2.5	9 (5; 14)
	Auditory reasoning	8.75	1.66	5 (6; 11)
Peabody Picture Vocabulary Test (PPVT) (Dunn & Dunn, 2007)		8.89	2.39	7.5 (4.7; 12.2)

*Notes: Norms for the TACL are only available up to the age of 10 years and available scores for participants, aged 7 to 10 years, are therefore not reflected in the table. Similarly, scores for the CELF subtest Concepts and Following Directions have been omitted due to a lack of norms for participants above the age of 12 years.
**CELF and TAPS scores are represented by standard scores. For standard scores mean is 10.
***PPVT scores represent age equivalents.

Inclusion. Only those children who had been diagnosed with ADHD by a qualified child neurologist or child psychiatrist, using the *Diagnostic and Statistical Manual of Mental Disorders-IV (DSM-IV),* were included in this study. In addition, participants held a current prescription for MPH-OROS® for a minimum of three months prior to the commencement of the study with consent from parents to administer medication at school. Participants had a diagnosis of language impairment, as defined by at least one standard deviation below the mean for standard scores on any of the following test batteries: Clinical Evaluation of Language Fundamentals (CELF-4) (Semel, Wiig & Secord, 2003), Test of Auditory

Processing Skills (TAPS-3) (Martin & Brownell, 2005), the Peabody Picture Vocabulary Test (PPVT- 4) (Dunn & Dunn, 2007) and the Test of Auditory Comprehension of Language (TACL) (Carrow-Woolfolk, 1998). See Table 1 for performance data on these tests. Finally, study participants were currently receiving intervention for language difficulties by a speech-language therapist, during the course of the school day.

Exclusion. Individuals were excluded if they demonstrated below average intelligence based on the Senior South African Individual Scale - Revised (SSAIS) (Van Eeden, 1997) and also if they spoke English as a second language.

Procedure

Two examiners, the first author and a second speech-language therapist, carried out data collection in a quiet environment. To assess behavior without the influence of medication, all participants were assessed following a two-day "drug holiday". The assumption for this time period is that after 24 hours, normal blood level baselines would be reached (Liu, Muniz, Minami & Silva, 2005). Participants were assessed twice on a single day: once prior to receiving their daily dose of medication and again four hours later (after the medication had taken effect).

Narrative Task and Outcome Measures

Narrative stimuli. The research questions were answered by the administration and subsequent scoring of language production elicited by narrative production procedures. The wordless picture books *Frog, Where Are You* (Mayer, 1969), and *One Frog too Many* (Mayer & Mayer, 1975) were used to elicit narratives, based on evidence of their comparability (John, Lui & Tannock, 2003). Order of presentation of the books was randomized between pre- and post-medication sessions. *Frog Goes to Dinner* (Mayer, 1974) was used for warm up, prior to the pre-medication session, and the narrative obtained was recorded but discarded without analysis. These stories are similar with regard to theme, structural complexity, number of main characters, and length (John et al., 2003; Petersen, Gillam & Gillam, 2008; Strong, 1998) and have been used extensively to assess children's narrative

abilities (Berman & Slobin, 1994) with both typical and atypical populations (Losh & Capps, 2003).

Narrative production procedure.   The book was placed on the table in front of the child. The instructions given to the participants were pre-formulated in order to avoid any additional influence on their performance: *"Here is a picture book that tells a story. This book has no words. I want you to look through the book from start to finish. Then we will go through the book together and I want you to tell me the story for each picture."* If the child was quiet for prolonged periods of time, the prompt *"Tell me more"* was used once. No further prompts to produce language were given. The examiner gave no feedback regarding performance, but provided occasional social continuants such as head nods and *"uh-huh"*. Participant language samples, and all prompts from the examiner, were digitally recorded in a quiet environment using an Olympus VN-713PC Dictaphone to allow for later playback and analysis.

Transcription and outcome measure scoring. The first author orthographically transcribed the audio recordings into C-units using the Systematic Analysis of Language Transcripts (SALT) guidelines and software (Miller et al., 2011). For microstructure elements, the number of words, type-token ratio and mean length of utterance in words (MLU), of complete and intelligible utterances, were determined using SALT standard measures. For the analysis of macrostructure, the transcripts were coded according to the NSS (Miller et al., 2011). The NSS includes instructions on how to code story grammar and cohesion according to a 0 to 5 point Likert-type scale. The NSS focuses on the following aspects of narratives, each described further below: introduction, character development, mental states, referencing, conflict resolution, cohesion, and conclusion. Each category was assigned a score ranging from 5 (proficient), 3 (emerging), 1 (minimal/immature). Scores of 2 and 4 were assigned if performance fell somewhere between the major anchors (Bajaj, 2007). A score of zero is assigned when performance cannot be judged due to a variety of child errors including unintelligibility, task abandonment or refusal to complete the task at hand, conversing with the examiner and narration of the incorrect story (Miller et al., 2011). The

scores from the seven categories were then combined to provide a composite score reflecting the child's overall narrative ability as described by Miller et al.

Outcome measure description. Microstructure and macrostructure language elements were quantified. Microstructure was defined as productivity (number of words produced), lexical diversity (type-token ratio) and grammatical complexity (MLU). Macrostructure was defined using the NSS as introduction (provides the setting for the story and introduces main characters), character development (ability to use metalinguistic verbs, differentiate between characters and talk in first person to depict story characters), mental states (ability to use metacognitive verbs to describe thoughts and feelings), referencing (referential cohesion through the use of pronouns and antecedents), conflict resolution (highlights major conflicts and resolutions), cohesion (refers to lexical and conjunctive aspects which include ordering, emphasis and transition between story events) and conclusion (story is wrapped up using concluding statements) (Miller et al., 2011).

Transcription agreement and NSS scoring reliability. Intra- and inter-rater agreement and reliability procedures were performed by the first author and an unbiased speech language pathologist on all micro- and macro-structure elements on 20% of the data. Five of the 12 participants were randomly selected, from which one of the narratives (either pre- or post-) was randomly chosen for agreement and reliability scoring. Narratives were re-transcribed in SALT and re-analyzed using NSS both by the original transcriber as well as by the second transcriber.

Inter- and (intra-) rater agreements for the SALT micro structure transcript elements were determined using Pearson correlations. The results showed the following correlation coefficients: 1.00 (1.00) for number of words, 0.997 (1.00) for length of t-unit, 0.987 (0.996) for type-token ratio.

Krippendorff's alpha values were calculated with ordinal scaling to determine inter-rater reliability of the NSS scores using 0.67 (acceptable) and 0.80 (adequate) benchmarks (Hayes and Krippendorff, 2007). This reliability metric was chosen because it has been used extensively with NSS scoring (Heilmann, Miller & Nockerts, 2010; Finestack, Palmer &

Abbeduto, 2012). The resultant alpha values for each NSS component are represented in the table below.

Table 2: Krippendorff's alpha values obtained for NSS scoring reliability.

NSS component	Alpha value
Introduction	0.25
Character development	0.99
Conflict resolution	0.64
Mental states	0.79
Referencing	0.79
Cohesion	1.00
Conclusion	1.00
Total macro elements	0.73

*Notes: Benchmarks - 0.67 (acceptable) and 0.80 (adequate) (Hayes & Krippendorff, 2007).

RESULTS

Based on the small sample size and the skewed distribution of the differences between the on- and off-medication measurements, non-parametric tests were used. Inferential statistics were employed to determine the significance of results at a 5% level of significance. The Wilcoxon Paired Signed Ranks Test, a non-parametric equivalent of the paired t-test, was selected in order to determine the effectiveness of MPH-OROS® on improving micro- and macrostructure elements during narration. Multiple testing was done to evaluate the effect of medication on each of the independent micro- and macrostructure language production elements separately. See Table 3 for descriptive and test results. The median (*me*) and interquartile range (*IQR*), the difference between the third quartile and the first quartile, have been reported due to the skewed distribution of the data. These descriptive measures are more robust than averages and standard deviations as they are not influenced by outliers.

Table 3: Effects of MPH-OROS® on the narrative production of children with Attention Deficit Hyperactivity Disorder.

		Off medication		On medication		Effect of medication	
		Median	IQR	Median	IQR	Z	p-value
Microstructure	Productivity (Number of words)	301.5 (*m*=361.25)	166.5	389 (*m*= 410)	216	- 1.138	0.255
	Lexical diversity (Type token ratio)	0.33 (*m*= 0.33)	0.08	0.32 (*m*= 0.32)	0.09	-0.747	0.455
	Grammatical complexity (Mean length of c-unit)	7.93 (*m*= 7.73)	1.3	7.78 (*m*= 7.67)	1.93	-0.118	0.906
Macrostructure Scored range of 5 – 1 (per Heilmann 2010)	Introduction	2.17 (*m*= 2.17)	0	2.58 (*m*= 2.58)	1	-1.186	0.236
	Character development	3 (*m*= 2.67)	1.5	3.33 (*m*= 3.33)	1	-1.522	0.121
	Conflict resolution	2 (*m*= 2.17)	2	3 (*m*= 3)	0.8	-2.226	0.026
	Mental states	2.5 (*m*= 2.5)	1	2 (*m*= 3.25)	1.8	-1.538	0.124
	Referencing	3 (*m*= 2.75)	0.8	3 (*m*= 2.92)	1.8	-0.632	0.527
	Cohesion	2 (*m*= 2.25)	2	3 (*m*= 2.83)	2	-2.333	0.020
	Conclusion	2.5 (*m*= 2.58)	1.8	3.5 (*m*= 3.16)	1.8	-1.552	0.121
	NSS total score	16.5 (*m*= 17.08)	4	21 (*m*= 21.08)	5	-2.673	0.008

*Notes: Z-value represents results for the Wilcoxon Signed Ranks Test for the difference between performance on- and off- medication.
** *m* values represent mean (averages).

Results for the first research question (effect of medication on *microstructure* language production elements during narrative production) were not significant (all p-values in the table were not less than the level of significance of 5%).
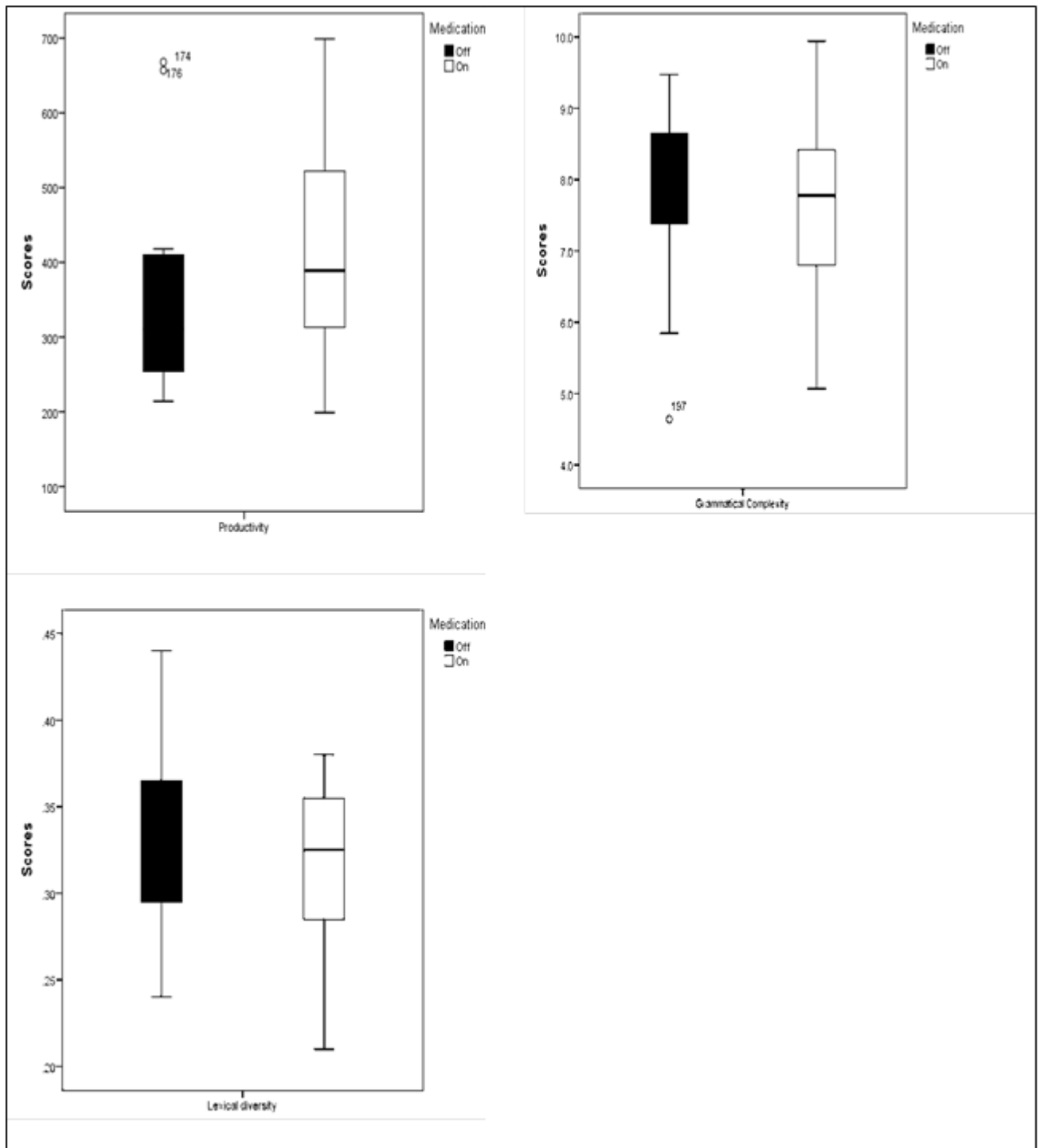
Figure 1: Boxplots representing the median and interquartile ranges for microstructure elements, off and on medication for productivity (number of words), grammatical complexity (mean length of utterance) and lexical diversity (type-token ratio).

The second research question asked if there was an effect of medication on *macrostructure* language production elements (introduction, character development, conflict resolution, mental state, referencing, cohesion, coherence and total) during narrative production as measured by NSS. The p-value of 0.008, which is less than 0.05, indicates that MPH-OROS® elicited a statistically significant effect on the overall narrative performance (NSS total score). Results showed that the medication has a significant influence on two of the seven independent *macrostructure* language production elements: conflict resolution and cohesion. The p-value for conflict resolution was 0.026 and for cohesion was 0.020, indicating that MPH-OROS® elicited a significant effect on these components (as the p-values were less than 0.05). The remaining five story grammar variables independently shown that the medication has no significant influence on them.
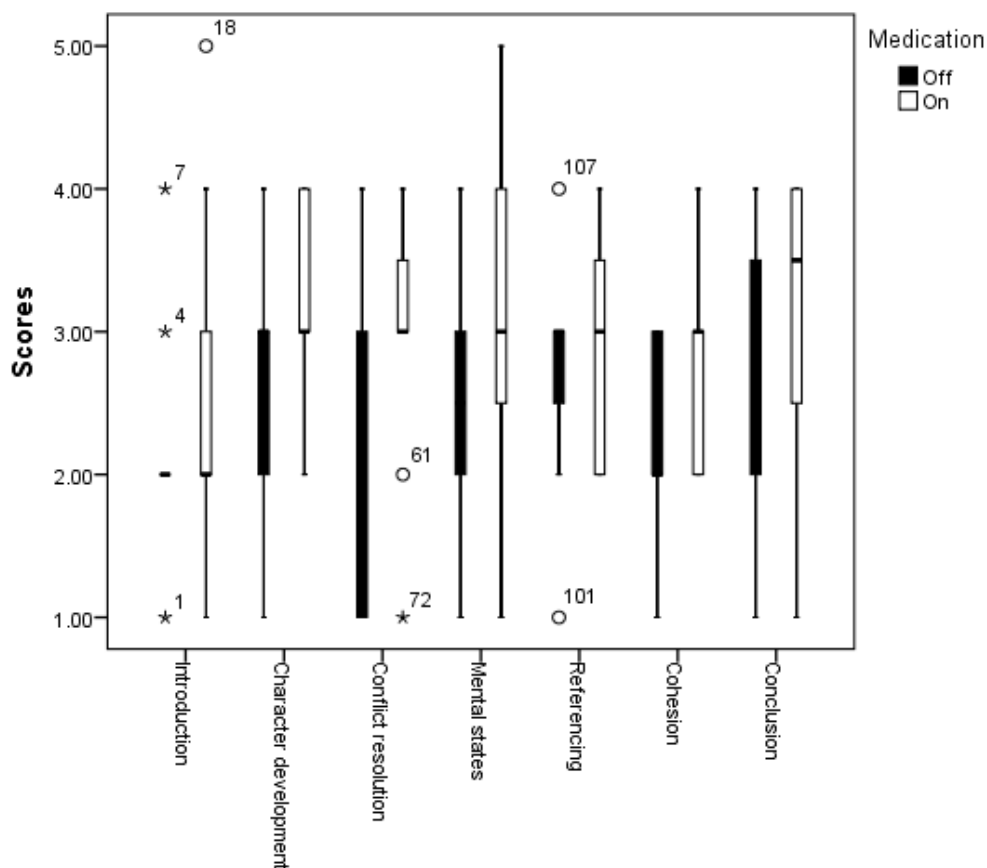

Figure 2: Boxplots indicating median and interquartile ranges for macrostructure elements, off and on medication.

DISCUSSION

The purpose of this study was to investigate the effect of MPH-OROS® on micro- and macrostructure elements of language in children with ADHD and concomitant language impairment. Overall, independent results indicate that MPH-OROS® positively impacts aspects of language macrostructure in this population, namely conflict resolution and cohesion as well as the overall narrative, although little effect (not significant) was noted in microstructure elements. Details regarding each of the questions will be discussed in detail below.

Microstructure. The first research question addressed the effect of medication on microstructure language production elements during story narration as measured by productivity, grammatical complexity and lexical diversity. Results indicated that MPH-OROS® did not impact microstructure elements. These findings are in line with the results obtained by Francis et al. (2001) but contrary to Derefinko et al. (2009). These results may be attributed to the notions that: 1) the group participants included those with various ADHD subtypes and 2) linguistic impairments persist despite improved attention during a circumscribed narrative production task.

In the current study, measures of productivity did not improve; however, Derefinko et al. (2009) showed that stimulant medication increased productivity (as measured by number of clauses produced). Derefinko et al.'s (2009) results are not in keeping with the reported language characteristics of children with ADHD. Based on Tannock's (2005) summary of Fine's (2005) "linguistic manifestation of ADHD symptoms," children with ADHD have an excessive rate of speech, talking excessively and speaking in run-on sentences that are strung together with the conjunction 'and'. This excessive language output is attributed to the hyperactive component of ADHD. Therefore, the results obtained by Derefinko et al. (2009) may have been due to the fact that they included only participants with ADHD-C. One can deduce that ADHD subtypes, namely the presence or absence of the hyperactive component, might impact the language production of children, particularly with regard to productivity.

The current study lacked the statistical power to differentiate between ADHD subtypes. However, research has shown that performance on language tasks differs between individuals from different ADHD subtypes (Engelhardt et al., 2011; Engelhardt, Veld & Nigg, 2012). One notable feature of the performance of children with ADHD in the current sample was the wide variability among individuals. Future research will be necessary to establish whether this variability might be accounted for by ADHD subtype and whether effects of medication differ across ADHD subtypes for the measures examined. It is hypothesized that medication may impact narrative microstructure differently for those with ADHD-PI and ADHD-C, such that improved attention may slow down narrative performance and increase productivity in former case and may result in more focused and therefore shorter narratives in the latter case.

Grammatical complexity and lexical diversity did not improve with the administration of MPH-OROS®. These results could provide support for the idea that, despite improved attention, linguistic impairment persists. Camarata and Gibson's (1999) discussion of language acquisition in children with ADHD is congruent with this line of thinking. Through their review of ADHD and its impact on pragmatic skills, based on the transactional model of mother-child interactions (Sameroff & Chandler, 1975, Yoder & Warren, 1993), they suggest that it is this aspect of language that is particularly vulnerable to disruption due to inattentive, hyperactive and impulsive behavioral characteristics. They continue further by attributing deficits in grammar and semantics to pragmatic difficulties, such as poor sustained attention, or topic maintenance, as well as distractibility and poor turn taking, during early interactions between mother and infant. These pragmatic deficits negatively influence the child's ability to engage in language learning opportunities from a young age and may lead to cascading impairments in language ability in childhood and adolescence. Even with improved attention during a particular task due to the administration of MPH-OROS®, children with ADHD may not have the requisite language skills to produce a more mature narrative in terms of increased lexical diversity or grammatical complexity.

Macrostructure. The second research question addressed the effect of medication on macrostructure language production elements during story narration as measured by NSS. An overall improvement in NSS total score was observed following MPH-OROS®. Various categories of the NSS were differentially affected. Two macrostructure elements were improved (i.e., conflict resolution and cohesion) while 5 were not (i.e. introduction, character development, mental states, referencing and conclusion). The improvement noted in conflict resolution and cohesion may be indicative of the effect of MPH-OROS® on executive functions as these elements may be more deeply rooted in one's present ability to relate and organize events in relation to one another and perhaps less reliant on the modeling of story structure during previous language learning opportunities.

Although speculative, one possibility for the improvement in conflict resolution may be that MPH-OROS® decreases impulsive behavior, slowing the thought process and allowing one to tap into executive functions. Participants would therefore be able to select information, monitor the outcome of story events and redirect responses where necessary. As predicted, MPH-OROS® showed a positive effect on the cohesion of narratives, supporting the theory that the language characteristics of individuals with ADHD can be attributed to executive dysfunction (Tannock & Schachar, 1996). The improvements may be indicative of the documented effect of stimulant medications on some tasks of executive functions (Aman, Roberts & Pennington, 1998), thus allowing participants to better plan and organize their narratives, improved sequencing, and smoother transitions between story events.

The results of the current study indicated improvement in aspects of narrative ability that were not identified by Derefinko et al. (2009) which may be due to differences in the method of elicitation. Derefinko et al. (2009) made use of online story narration whereas the current study provided participants with the opportunity to preview the storybook prior to narrative production. As a result, participants were given the chance to plan and organize their story components in relation to one another, as well as to tell the story with the end goal in mind. The elicitation protocol in the current study may have increased the chance that participants,

given their increased focus and attention due to the administration of MPH-OROS®, would include causal chains and make comments regarding goal directed behavior and initiating events.

In addition to conflict resolution and cohesion, the administration of MPH-OROS® significantly impacted the NNS total score, indicating meaningful improvement in the overall impression and efficacy of a narrative. Therefore, results suggest that children with ADHD, who are treated with MPH-OROS®, may be better able to express their thoughts and experiences through more effective, richer narratives. The fact that mental states did not improve in this study is contradictory to the results obtained by Francis et al. (2001). In that study, MPH improved the recognition and verbal expression of internal responses. Internal responses refer to the emotional responses, thoughts and desires of characters (referred to in the current study as mental states). Francis et al. (2001) attributed this improvement to an increase in sensitivity to emotional information and the actions of others.

The fact that MPH-OROS® did not improve performance on all aspects of narrative production is consistent with previous work focusing on the effects of stimulant medication on higher-order skills in children with ADHD, both on language and non-language tasks. Bailey, Derefinko, Milich, Lorch and Metze (2011) investigated the effect of MPH on free recall of story events in children with ADHD. Results indicated that although stimulant medication improved the percentage of story events that were recalled, there was no improvement in the recall of events that were central to the story. Abikoff et al. (2009) investigated the effect of stimulant medication on organizational skills, planning and time management and found that although aspects improved, medication did not eliminate difficulties altogether. Similarly, Pelham et al. (1990b) found that although stimulant medication improved immediate attention during baseball games it did not improve their overall performance. These studies, along with the results for those of Derefinko et al. (2009), Francis et al. (2001) and the current study suggest that although stimulant medication improves attention and concentration, it cannot make up for the loss of structural and pragmatic language abilities that may be associated with—or downstream effects of—

the primary symptoms of ADHD. Therefore, although stimulant medication improves performance of individuals with ADHD in some domains, it is not sufficient intervention to improve higher-order metacognitive and linguistic skills. A combination of treatments is therefore necessary to ensure that individuals with ADHD are able to reach their full potential. These interventions could include, but may not be limited to, medication, behavior modification therapy, speech-language therapy, occupational therapy and remedial education.

Limitations

The strict selection criteria and resultant small sample size of the current study did not allow for the differentiation between presentation sub-types of ADHD (i.e., ADHD-PI vs. –PH vs. –C). Differentiation between ADHD sub-types would prove valuable as the effect of MPH-OROS® on narrative ability may be influenced by the presence or absence of the hyperactive component.

In addition, obtaining multiple narrative samples per participant would allow for a more accurate representation of an individual's abilities as results would be less affected by external and internal factors. However, due to the nature of this study it was necessary that material be similar with regard to theme, structural complexity, number of main characters, and length so as to not exert an influence on the narratives produced. With limited material available to meet these criteria it was only possible to obtain a single on- and single off-medication narrative sample.

Although reliability appeared low for the introduction component on the NSS, it is important to note that raw scores never differed by more than a single point (e.g. 2 [intermediate between immature and emergent] vs. 3 [emergent]). Scores within one point are considered consistent, given that the scale was constructed with clear anchors of 1, 3 and 5 (with intermediate scores of 2 and 4) and is reliant upon the subjective judgment of scorers. In addition, the low scores can in part be attributed to the very small number of reliability transcripts. Rescoring twenty percent of the data translated into only 5 language samples, leaving little margin for error. With regard to the difference in points between

scorers, no trends could be noted between transcriptions with regard to participant characteristics for the 2 transcripts with a scoring discrepancy. Transcripts were both 100% intelligible and the book used to elicit the narratives differed between transcripts as did the presence or absence of medication. Reliability for conflict resolution was also low; however, again, scores never differed by more than a single point and scores were identical for 4 of 5 transcripts.

One possibility for differences between scorers may be based on the scorers' interpretation of the descriptions of the criteria. For example, an emergent score (3 points) under the introduction category requires that 1) Setting: "*states general setting but provides no detail*", "*descriptions or elements of setting are given intermittently through story*" and *"may provide description of specific element of setting (e,g, the frog is in the jar)*" and that 2) Characters: "*characters of story are mentioned with no detail/description".* The immature (1 points) requires that the speaker "*Launches into the story with no attempt to provide setting*" (Miller et al., 2011). It is therefore clear whether or not to assign a score of 1, but far more challenging to determine whether the performance meets all the descriptors to warrant a score of 3. For example, the interpretation of descriptions given "intermittently" throughout the story may differ between scorers. Should a scorer's best judgment be that not all descriptions were met; a 2 should be awarded instead. Similar discrepancies were reported in Petersen et al.'s (2008) summary and evaluation of measures of narration, which included the NSS, noting particular discrepancies with the coding of mental states and cohesion (Petersen et al. 2008).

Future directions

The current study should be replicated using a larger sample size. This would allow for the differentiation between ADHD subtypes, namely ADHD-PI, ADHD-PH and ADHD-C, as recent studies have noted differences in language production between these groups (Engelhardt et al., 2011; Engelhardt et al., 2012). This may provide further insights into the relationship between ADHD and language impairment as well as the effect of MPH-OROS® on language production. Further studies should also be carried out to determine whether the

effects of stimulant medication on narrative ability are mediated by attention and/or memory by directly assessing attention, memory, and executive function.

Future studies in this line of research would benefit from the comparison of language samples elicited in different language sampling contexts (e.g., conversation, expository samples, persuasion), which may be maximally informative in terms of the effects of stimulant medication on the spontaneous expressive language of children with ADHD. In order to support research in this area, additional elicitation materials should be developed to allow multiple narrative samples—or multiple samples from other contexts— to be obtained over time. For example, a series of standardized narrative elicitation materials would allow for repeated measurements without the reliability of narrative production being affected by additional factors such as story length, number of characters and subject matter. Although there are six wordless picture books available by Mercer Meyer, the literature suggests that these books may not all be sufficiently comparable for the elicitation of multiple narratives over time. John et al. (2003) examined children's retelling of narratives were examined using the Strong Narrative Assessment Procedure (SNAP) (Strong, 1998). The SNAP contains the wordless picture books *Frog, Where Are You?*, *A Boy, a Dog and a Frog* (Mayer, 1967), and *One Frog Too Many*, as well as *Frog Goes to Dinner*, which is included as practice material. Through the exploration of the equivalency of the stories, John et al. found that *A Boy, a Dog and a Frog* was retold with greater ease, resulting in inflated scores for story grammar components and inferential comprehension when compared to other two stories. Based on these results, it was recommended that clinicians only administer *Frog, Where Are You?* or *One Frog Too Many*—the two books utilized in the present study—when assessing progress in narrative production. As a result, one's ability to obtain multiple samples over time is limited.

Clinical Significance

The findings of this study have important implications, both academically and socially. Children with ADHD are at risk for academic underachievement due to the primary symptoms associated with ADHD. In addition, the documented narrative impairment may

further hamper academic success in this population (Moonsamy et al., 2009). Narrative ability is critical to classroom performance and forms part of common daily activities (Kaderavek & Sulzby, 2000). Individuals with poor narrative ability are often negatively perceived by others (Hemphill & Siperstein, 1990). Furthermore, narrative ability fosters social communication, allowing one to engage with their peers (Coupland & Jaworski, 2003), thus supporting socio-emotional development.

Therefore, due to the large role that narratives play in academic and social settings, it is evident that narrative inability in children with ADHD cannot be ignored by those professionals working with this population. The findings that MPH-OROS® improves aspects of narrative ability in children with ADHD is valuable information for clinicians and speech-language pathologists as this evidence would prove beneficial when guiding parents in decision making processes regarding medication as well as the ongoing necessity of speech-language therapy in this population.

Disclosures

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