Theory of Mind Development in Young Children Diagnosed with Attention-Deficit/Hyperactivity Disorder: 
A Traditional and Narrative Approach

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ABSTRACT

Extensive research on Theory of Mind (ToM) development in various clinical groups has shown that the ToM deficits evidenced in individuals with autism is variable and not specific to this population. This has resulted in the ToM construct being seen more as a disability dimension affected by multiple factors, and not as a marker for a specific disorder (Dyck, Ferguson, & Shochet, 2001). Investigations into ToM ability of these various clinical groups have assisted in more specifically delineating their social-cognitive strengths and weaknesses allowing for a better understanding of these individuals and the possibility of the development of more effective treatments.

With the often noted positive associations between ToM and; a) executive functioning, b) social relationships, and c) language development, a clinical group requiring investigation of their ToM development is children with Attention-Deficit/Hyperactivity Disorder (AD/HD), as they generally experience significant difficulties in these areas. Currently however, there is only a very limited and generally disparate body of knowledge about these children’s ToM functioning gleaned from small sample sizes with broad age ranges, typically consisting of unidentified AD/HD Subtypes and mainly utilising traditional ToM tasks.

The purpose of this study was to address these issues by: a) examining ToM development in young children diagnosed with AD/HD Predominantly Hyperactive-Impulsive Type (AD/HD-HI) or AD/HD Combined Type (AD/HD-C) only; b) utilising a larger sample size than previous research in this area, specifically around the critical age periods of first and second order ToM development; c) examining the developmental progression of ToM development in young children with AD/HD; and,
d) utilising a comprehensive range of traditional first and second order tasks and ToM related narrative tasks.

Seventy-eight children from two age groups, 4- to 5-years of age ($n = 28$), and 6- to 7-years of age ($n = 50$), participated in the study. Thirty-seven children diagnosed with AD/HD-HI or AD/HD-C were placed in the clinical group. Within the clinical group, there were a total of 13 in the 4- to 5-year-old group and 24 in the 6- to 7-year-old group. There were a total of 41 children in the non-clinical group.

Children were tested on a battery of ToM related tasks which combined both i) traditional first and second order protocols, and ii) two narrative approaches employing, firstly, Mayer’s (1967) wordless picture book *A Boy, a Dog, and a Frog*, and, secondly, line drawings based on an adaptation of Benson’s (1996) work. Two composite scores were calculated for each child’s performance on the first and second order ToM tasks, respectively. Performance on the narrative tasks was measured by the children’s use of internal state terms, their appropriateness of reply to probed questions, and their use of narrative structure components. Estimates of participants’ levels of neuropsychological, intellectual and language functioning were also obtained via administration of the Test of Variables of Attention (TOVA), the Kaufman Brief Intelligence Test (K-BIT), and the Peabody Picture Vocabulary Test, Third Edition (PPVT-III), respectively. Also, parents were asked to complete the AD/HD Rating Scale – IV (home version) and the Connors-March Developmental questionnaire regarding their child.

Overall, findings showed that, on the First Order ToM Measure, no significant differences emerged between the performance of the 4- to 5-year-olds in the clinical and non-clinical groups. Conversely, for the 6- to 7-year-olds, a significant difference was detected with children in the AD/HD group performing significantly more poorly
than their non-clinical counterparts. On the Second Order ToM Measure, children in the AD/HD group demonstrated significantly poorer performance when compared to their non-AD/HD counterparts. With regard to the narrative task based on *A Boy, a Dog, and a Frog*, findings showed that children with AD/HD, regardless of age, performed significantly more poorly on those measures requiring the child to 'move beyond grasping the general gist of the story'. Performance on the line drawings task evidenced no significant differences regarding the appropriate use of internal state terms between the clinical group types but did show a difference relating to the use of plot structure and causal statements with children in the AD/HD group performing more poorly in each case. The part that inner speech or self-talk might have played in these findings is also discussed. Strengths and limitations of the present study are identified, the clinical implications coming from the present study's findings are discussed, and directions for future research are proposed.
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CHAPTER 1
INTRODUCTION

This inquiry is concerned with Theory of Mind (ToM) functioning in a clinical group of young children diagnosed with Attention-Deficit/Hyperactivity Disorder, focusing on the Subtypes; Attention-Deficit/Hyperactivity Disorder, Predominantly Hyperactive-Impulsive Type (AD/HD-HI) and Attention-Deficit/Hyperactivity Disorder, Combined Type (AD/HD-C), as compared with a group of same-aged non-clinical children. Two age groups, 4- to 5-years and 6- to 7-years, are utilised. Further, the detection of any ToM developmental trends for the two clinical group types (AD/HD vs. non-clinical) is of interest also. This introductory chapter provides an overview of the structure of the thesis in order to furnish markers, or to ‘flag ahead’, regarding the logic underpinning the ordering of the content matter and the linkages therein.

Chapter 2 provides a review of the major empirical studies directly related to ToM research with normally developing children commencing with Wimmer and Perner’s (1983) false belief experimental protocol. Following on from this seminal protocol, the main developments in the field of predominantly laboratory-based ToM research are charted. Perner and Wimmer’s second order belief task, Flavell’s appearance-reality task, Perner’s deceptive box task, and Gopnik and Astington’s representational change task are reviewed and critically evaluated. The chapter continues with noting how ToM research has shifted from this largely laboratory-based focus to incorporate considerations of the importance of ‘social embeddedness’. To conclude, the recent emergence of research into the association between ToM
development and language development, incorporating i) Brunerian-based ‘narrative landscapes’, and, ii) metacognitive language studies, is discussed.

Chapter 3 identifies and discusses the major theoretical contributors to an ongoing interest in, and investigation of, ToM development in children. Piaget’s ideas on the child’s perspective-taking ability, language and his use of the clinical method are given prominence. Vygotsky’s input in the form of linguistic mediation, ecological validity and enculturation is evaluated. The usefulness of Bruner’s dual landscape of stories perspective is then assessed. This theoretical overview concludes with an evaluation of current advances in narrative structure theory in the form of the i) coherence, and ii) cohesion, of story structure and the employment of these two categories in the creation of a goal-based narrative.

The parallel between the inherent sequencing of material in Chapters 2 and 3, respectively, is notable. Empirically, the seminal laboratory-based experimental ToM protocols were largely based on Piagetian theorising. Follow-on ToM experiments then embraced a more Vygotskian perspective, which involved a recontextualising of the child as a participant in an inter-subjective social world. More recently, an empirical emphasis in ToM studies on children’s narratives which reflect the integration of a child’s linguistic, cognitive and social-cognitive abilities, are quite Brunerian in kind.

The focus of Chapter 4 is on studies into the comparative ToM development in children diagnosed with a clinical disorder, beginning with Baron-Cohen, Leslie and Frith’s (1985) use of their Sally-Anne task with children diagnosed with autism. Tager-Flusberg’s follow-on work from a narrative production perspective is discussed with particular reference to her use of Mayer’s (1969, 1973) wordless picture books *Frog Where Are You?* and *Frog On His Own*, an approach also employed by later
researchers. The emerging role of the importance of executive functioning to ToM development is noted followed by a review of studies examining ToM ability in children with emotional and behavioural difficulties leading subsequently into the ToM development of children diagnosed with AD/HD, the clinical focus of this thesis.

Chapter 5 presents the overarching aims of the current study, the rationale and the significance of the study to the area under investigation. Based on a critique of the studies and theories reviewed and evaluated in the preceding chapters, the need for a more comprehensive and coherent account of ToM development in children diagnosed with AD/HD, based on a sound theoretical orientation and employing a more rigorous methodology, is proposed. The aims and rationale of this thesis, intended to address this need, are then formulated, to wit: to restrict the focus with regard to ToM development in children diagnosed with AD/HD to children diagnosed with either AD/HD-HI or AD/HD-C only; to utilise a larger AD/HD group sample size than has hitherto been the case; to concentrate the ages of the AD/HD children and the comparative non-clinical children around the critical period of first and second order ToM attainment between 4- to 7-years of age; to chart the presence of any developmental progression in ToM performance as a function of age and clinical type; to employ a much more comprehensive battery of traditional first and second order tasks and ToM related narrative tasks than has previously been the case. A diagrammatic summary of the tasks and task measures, namely, First Order ToM Measure, Second Order ToM Measure, A Boy, a Dog, and a Frog wordless picture book narrative measures, and the line drawings measures, as they relate to the hypotheses and research questions under scrutiny, is provided as a lead-in to a more detailed exposition of these measures in Chapter 6. The chapter concludes with a
statement of the specific hypotheses to be tested and research questions to be addressed.

Chapter 6 describes this study’s methodology. The research design, the characteristics of the participants involved, the traditional and narrative ToM measures employed, the standardised measures of intellectual, language, and neuropsychological functioning administered, the procedure followed, and the analysis considerations taken into account, are all detailed. It is the intention of this chapter to show clearly the time and care taken to scrupulously ensure methodological rigour with regard to investigating the particular hypotheses and research questions which appeared in the preceding Chapter.

This study’s findings appear in Chapter 7, commencing with those emerging from the performance by both the clinical and non-clinical group of children on the traditional first and second order ToM tasks. Findings based on the two narrative tasks, that is, the wordless picture book task and the line drawings task, then follow.

In Chapter 8, a discussion of the findings, particularly in the light of previous research into this area, is undertaken. The part played in these findings by the use of a participant’s self-talk or inner speech is considered at some length, given the uniqueness of this study’s suggestion regarding its importance in ToM development in young children. The proposal, based on this suggestion, that children diagnosed with AD/HD may have a self-talk deficit is examined in some detail. Theoretical and clinical implications of these findings are discussed, the strengths and limitations of the present study are evaluated, and some directions for future research are put forward.
CHAPTER 2

THEORY OF MIND DEVELOPMENT: MAJOR EMPIRICAL UNDERPINNINGS

2.1 Wimmer and Perner’s False Belief Experimental Protocol

ToM research was initiated by Premack and Woodruff (1978) who sought to demonstrate that chimpanzees had a ‘ToM’, that is, the ability to impute mental states to one’s self and to others. Premack and Woodruff identified deceptive action as a way of demonstrating the presence of a ToM since it requires the conceptualisation of a deceived person’s wrong belief as a subgoal in another’s planning strategy. A follow-on appraisal of this notion by Dennett (1978) suggested that testing another’s ToM, or Intentional stance ability, is best done by the empirical employment of false belief situations in which “the subject is aware that he/she and another person observe a certain state of affairs x. Then, in the absence of the other person the subject witnesses an unexpected change in the state of affairs from x to y. The subject now knows that y is the case and also knows that the other person still believes that x is the case” (Wimmer & Perner, 1983, p. 106).

Based on this proposition, Wimmer and Perner (1983) designed a ToM ‘litmus test’, namely, the change of location method, thereby making it possible to empirically separate judgements based on the subject’s own mental state (his/her true belief) from judgements based on the other person’s different mental state (his/her false belief). A child’s understanding that a person has a false belief, one whose content contradicts reality, was considered to provide evidence that they appreciated the distinction between mind and world. The false belief task was superior to true belief tasks in
testing a child's concept of the mind “...because children could be correct on true-belief tasks by egocentrically assuming that others know what they themselves know and just reporting the true state of affairs” (Flavell, 2000, p. 16). Thus, correct performance on a false belief task, taken to indicate a ‘conception of mind’, requires correct representation by the child of two different epistemic states.

2.1.1 First Order Belief Task: Change of Location

Wimmer and Perner’s ToM experimental protocols have been influential ones and deserve to be detailed here in consequence. In their first order belief task (Wimmer & Perner, 1983), the child is told a story about a character named Maxi who places some chocolate in cupboard A and then goes outside to play. In his absence his mother uses some of the chocolate and puts it back in cupboard B (Maxi has no perceptual access to this event). Children are then asked to indicate the cupboard where Maxi will look for the chocolate when he returns. Children’s responses allowed Wimmer and Perner to discriminate between those children who did and did not have a ‘conception of mind’. The former group acknowledged Maxi’s (false) belief that the chocolate was in cupboard A and reported that he would look there, while the latter group judged that Maxi thought the chocolate was in cupboard B, where it was in actuality. This recognition of the difference between Maxi’s false belief and the reality of the matter was said to be the critical indication that a child has a ToM since “the child is said to grasp others’ thoughts or beliefs as representations that do not necessarily mirror a true state of affairs...” (Raver & Leadbeater, 1993, p. 351) and “…children recognize that other people may hold beliefs that are different from their own; they understand that a
person may believe something that they know to be false, and they can anticipate that the person will act on the basis of that false belief” (Austington, 1991, p. 159).

In Wimmer and Perner’s study, a developmental ‘schism’ was detected such that children younger than four years of age identified the location where the chocolate now was, even though they remembered that Maxi had placed the chocolate in the other cupboard and then went out to play. Instead of answering randomly, these younger children often made a specific false-belief error, stating that Maxi will look for the chocolate in the cupboard to which it was moved. Conversely, the 4-year-old children generally selected the correct location by employing a false belief versus reality distinction and were credited by the researchers with having a ToM. These children understood that Maxi’s actions depended on his beliefs rather than simply the real situation itself, because belief and reality diverged.

To explain this developmental schism, Wimmer and Perner (1983) considered central processing capacity arguments (e.g. Case, 1978). They suggested that children’s improved performance on cognitive tasks with age were attributed to an increase in central processing capacity which allowed the child to represent both the actual events of the story and also to represent the protagonist’s wrong belief. This explanation was found wanting however, since children simultaneously become able to represent not only a wrong belief but also the protagonist’s intentions and actions in relation to this belief: “If mental development depended mainly on an increase in processing capacity one would expect that this additional complication in the story should not be understood for at least another two years” (Wimmer & Perner, 1983, p. 25). Rather, their results were taken to indicate a unique conceptual development in mind understanding: “…the emergence of children’s ability to understand another person’s beliefs and how this person will react on the basis of these beliefs and their
understanding of deception is not a mere side effect of an increase in memory and central processing capacity. Rather, a novel cognitive skill seems to emerge within the period of 4 to 6 years” (Wimmer & Perner, 1983, p. 126).

2.1.2 Second Order Belief Task

Based on their earlier work, Perner and Wimmer (1985) developed a second order belief task experimental protocol to evaluate children’s understanding that people hold beliefs about reality as well as about other people’s beliefs. They believed that this type of task better captured the more dynamic social interactions that took place between individuals:

Although describing what people think about real events (first-order beliefs) plays a crucial role in explaining their physical interaction with objects and other people, it cannot entirely capture social interaction. Interaction between people is to a large degree based on an interaction of minds which can be properly understood only when one takes into account what people think about other people’s thoughts (second-order beliefs). (Perner & Wimmer, 1985, p. 438)

The same concepts that were used in the first order belief task were applied to study older children’s ability to combine these basic states recursively for attribution of second order states (beliefs about beliefs): “This recursive ability opens up understanding of a much richer variety of social interactions because it allows understanding not only of a particular person’s perception of a social situation but also of different persons’ concern about each other’s mental states” (Perner, 1988, p. 271).

By way of explanation, Perner (1988) indicates that the sentence: “John KNOWS that (the teacher is arriving)” expresses a proposition about John that

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1 Perner’s (1988) terminology is adopted to distinguish first and second order false belief understanding. Therefore, understanding first order beliefs means that child attributes a belief to X. Understanding second order beliefs means the child attributes to X a belief about Y’s belief.
contains an embedded proposition about the teacher. This is a propositional attitude construction as it contains two propositions, one embedded within the other. The sentence: “John KNOWS (Mary doesn’t KNOW [the teacher is arriving])” is an example of a new proposition being embedded in a second attitude construction, which highlights the recursive application of propositional attitude constructions forming new propositions. With regard to the first and second sentence examples respectively, Perner (1988, p. 272) notes that “… a child who can form an attitude construction containing an embedded proposition has the prerequisite for mentally representing and for attributing a first-order mental state as expressed in sentence (1). A child who realizes the recursive nature of this construction and can form doubly embedded propositions has the prerequisite for representing and attributing second-order mental states as expressed by sentence (2)”.

Perner and Wimmer’s (1985) second order belief task comprised two characters, John and Mary, who were independently informed about the move of an ice-cream van to a new location. There was a mistake however in John’s second order belief about Mary’s belief: “John thinks Mary thinks the van is still at the old place”. Children were tested on their understanding of second order beliefs by being asked “where does John think Mary will go for ice-cream”? Thus, children are required to make a judgement not about where John thinks the ice-cream van is, but about where John thinks that Mary believes it is. The researchers found that children from the age of approximately 6 onwards were able to answer this question correctly. Correct answers could only be given if children had formed a mental representation of John’s second order belief, because all shortcut reasoning based on first order beliefs or reality would have led to the wrong answer. This experimental approach overcame the problems inherent in other tasks seeking to test higher-order mental states such as the
*embedded think bubbles task* (Miller, Kessel, & Flavell, 1970) which required children to match descriptions of a higher-order mental state (e.g., Joanne is thinking of mummy thinking of daddy) to the corresponding think-bubble cartoon representation of that state (see Eliot, Lovell, Dayton, & McGrady, 1979). Perner and Wimmer (1985) and Perner (1988) note that whilst these studies tested children’s syntactic ability in matching embedded sentences with embedded think bubbles, they do not demonstrate children’s understanding of higher-order mental states: “Presumably many adults would be able to give a correct description of even a tenfold embedded think-bubble, but would find it impossible to understand under what circumstances such a belief might reasonably be entertained and what its role would be in determining that person’s behaviour” (Perner & Wimmer, 1985, p. 439).

### 2.2 Flavell et al’s Appearance-Reality Task: Unexpected Identity

Flavell, Flavell, and Green (1983) and Flavell, Green, and Flavell (1986) investigated children’s understanding of the distinction between appearance and reality. Children were shown an object from a distance which they thought was a rock but upon playing with it, realised it was a sponge. Children were then asked two questions, one about what the object looked like, and one about what it really was. Children younger than four said that it looked like a sponge and that it really was a sponge. Children older than four had little difficulty distinguishing between the appearance of the object (rock) and the reality (sponge) and answered correctly. The researchers concluded that the younger children’s difficulties with this distinction were deep-seated conceptual ones since, in more general terms, “...they have difficulty realizing that the object can be mentally represented as simultaneously white when
considered from one perspective and blue when considered from another. Consequently, they are reduced to repeating whichever single color they take it to “be”, in some undifferentiated sense, at that moment, either its remembered real color or its perceived apparent color” (Flavell, Lindberg, Green, & Flavell, 1992, p. 514).

Flavell et al. (1992) emphasised the importance of an understanding of the appearance-reality dichotomy as it related to the social world in terms of how people look (their physical appearance) and what they are really like (their ‘moral’ character):

Knowing that people can present psychological appearance-reality discrepancies is a critical part of children’s social-cognitive development. They will surely function more adequately in interpersonal situations as they realize that people may not always be thinking, feeling, wanting, or intending what they appear to be, that people who are attractive or unattractive in appearance may not be that same way in behaviour, and that people may have ulterior motives for their altruistic-seeming actions. (p. 514)

In their experiment, children aged between 3 and 5 years were shown a photograph of a child with a neutral expression and told a short story about how this child was very nice or very mean. The children were then told that the child in the photograph had an operation which temporarily made the child look the opposite of what he or she was really like and were shown a new photograph of the same child looking mean or nice. The children were then asked whether the child looked nice or mean (appearance question) and whether the child really and truly was nice or mean (reality question). Findings were consistent with previous appearance-reality research in that the younger children experienced significantly more difficulty in making the ‘social’ appearance-reality distinction than older ones. Flavell et al. (1992) account for their findings thus:

...young children do not fully appreciate that the selfsame stimulus can be mentally represented in different, even contradictory-seeming ways. As a consequence, they tend to represent the stimulus in only one of these ways at a given moment... this single-coding tendency takes the
form of a strong inclination to represent each focal child as “being”, in some non-specific, undifferentiated sense, either nice or mean but not both at once. (Flavell et al., 1992, p. 522)

2.3 Perner and Colleagues’ Deceptive Box Task: Unexpected Contents

Perner, Leekam and Wimmer (1987) adapted the change of location task with the aim of trying “…to make 3-year-old children comprehend another person’s mistaken belief by giving them direct experience of how they themselves could be misled when confronted with the same situation as another person” (pp. 132-133). Children aged between 3- to 4-years were shown a ‘Smarties’ candy box and then asked to guess what is inside, with all of them responding ‘Smarties’. They were then shown what was actually in the box, a pencil. The pencil was then put back into the box and the child was asked i) a control question about the actual content of the box, ii) a test question about his/her own previous belief about the content of the box, and iii) to anticipate what his/her friend, who had yet to look inside the box, will think is inside it. Findings were similar to those of Wimmer and Perner (1983) in that the older half of the sample tended to correctly anticipate that the next child would mistakenly think the tube contained Smarties and the younger children typically judged that the friend would think that the tube contained a pencil.

2.4 Gopnik and Astington’s Task: Representational Change

Gopnik and Astington (1988) modified the smarties task to investigate children’s understanding of representational change, that is, their ability to understand and acknowledge their own prior mistaken or false belief:
When we change our ideas about an object, our previous representation differs from our present representation. To understand representational change children must be able to say “I once thought this was X but now I think this is Y.” This ability is similar to the ability to understand another’s false belief “he thinks this is X but I think this is Y,” and the appearance-reality distinction “this looks like X but really is Y”. (Gopnik & Astington, 1988, pp. 27-28)

Although Perner et al. (1987) asked children about their own previous beliefs about the content of the box, Gopnik and Astington (1988) point out that Perner et al.’s line of questioning could be construed as leading the child. Children were asked, “Can you remember what’s inside here?” and when children responded ‘a pencil’ it was immediately followed by the further question, “But what did you think was in here?”

Apart from seeking to overcome these methodological concerns, Gopnik and Astington (1988) also sought to systematically investigate children’s representational change ability, with an emphasis on understanding the conceptual relationship(s) between representational change, false-belief and the appearance-reality distinction.

Gopnik and Astington (1988) incorporated elements from Wimmer and Perner’s (1983) false belief task, the contemporaneous appearance-reality work by Flavell and his colleagues (1983, 1986) and the unexpected contents task (Perner et al., 1987). In their resulting ‘hybrid’ experiments, children were questioned i) about their own mistaken belief, ii) about another’s mistaken belief, and also iii) about appearance and reality based on the same objects.

Their finding of a significant positive association between a subject’s score on the false belief task and his/her score on the appearance-reality task was taken to indicate that the developmental change in question was not simply a change that generally occurred at about 4 years of age; rather, that individual children were more likely than not to acquire insight into both problems at the same time. With regard to the answers on the representational change questions, Gopnik and Astington (1988)
found that: “A majority of 3-year-olds reported that when they had first seen the
deceptive objects they had thought that they were what they were later revealed to
be… whereas a majority of 5-year-olds remembered and reported their original
mistaken belief…” (p. 156).

Gopnik and Astington’s results also indicated that a child’s level of
understanding of his/her own mistaken belief was related to his/her appearance-reality
performance and to his/her understanding of another’s mistaken belief. All three
abilities were shown to emerge at about four years of age, possibly reflecting the
development of a more general ability to consider alternative representations of reality.
Apart from the suggested conceptual development and similarities between the three
abilities, Gopnik and Astington hypothesised that the three-year-old children in their
study lacked a ‘dual coding’ ability, since they appeared unable to decentre, focus on
and coordinate two or more properties of an object. Rather, they showed a centration
either on perceptual cues for reality questions, or on internal logic for object identity
questions.

2.5 The One Miracle Critique and False Belief Composite Scores

Chandler and Hala (1994) argued that it was misleading for ‘first generation’
ToM research to focus on a ‘one miracle’ approach, that is, the use of standard false
belief tasks to detect a conceptual watershed in the emergence of a ToM at 4 years of
age. They claimed that a ‘second generation’ of research findings had provided
evidence that 3-year-olds, and possibly even younger children, already had some
understanding of false belief. Chandler and Hala classified this research into 3
categories: 1) revising questions on false belief tasks to make them more
understandable; 2) attaching more salience to mental representations rather than to realities in the false belief tasks; and, 3) engaging the child in the false belief tasks rather than having them as a passive onlooker. With regard to the last category, Chandler and Hala maintain that “…if traditional measures of false belief could be modified in ways that would give subjects an opportunity to be actively involved in intentionally bringing about another’s false belief, then even young three-year-old subjects would have no difficulty in envisioning the false beliefs of those who were the targets of their own deceptive actions” (p.414). According to the researchers, their findings indicated that, if children are allowed to actively participate, some do succeed on false belief tasks at an earlier age than anticipated. However, Wellman, Cross and Watson’s (2001) more recent meta-analysis of studies pertaining to this early competence versus conceptual change dilemma concluded that: “…early competence accounts that claim apparent developments during the ages of 3 to 5 years are solely the products of overly difficult tasks masking young children’s essentially correct understanding of belief are not substantiated… That children’s false-belief judgments are systematically unrelated to such task variations increases the likelihood that their judgments reflect robust, deep-seated conceptions of human action, rather than task-specific responses provoked by the special features of one set of materials or questions” (pp. 671 & 678).

A related issue to this ‘one miracle approach’ was the rather common practice up until the mid-1990s of administering one ToM task to ascertain if a child ‘had a ToM’. With the proliferation of different types of ToM tasks, however, it became more difficult to decide which one would count as incontrovertible evidence that a child had ‘acquired a ToM’. Lalonde and Chandler (1995) attempted to resolve this dilemma by administering six ToM tasks and then creating a simple composite score by summing
the total number of correct responses across all the tasks to produce their ‘ToM measure’. This enabled an increase in the range of outcomes on the first order ToM measure and produced a more stable and representative index of the children’s overall level of ToM understanding: “…the sum of a set of multiple measurements of a construct is a more stable and representative estimator than any single measurement, particularly when diverse methods are used to assess the construct…” (Fahie & Symons, 2003, p. 55).

Since this time, other researchers such as Capage and Watson (2001), Carlson and Moses (2001), Ruffman, Slade and Crowe (2002), Fahie and Symons (2003) and Foote and Holmes-Lonergan (2003) have used composite-type ToM measures. Justification for this approach is reflected in Wellman et al.’s (2001) robust finding that a child’s performance across the false belief tasks investigated in their meta-analysis, namely, change-of-location tasks, unexpected-contents tasks (representational change) and unexpected-identity tasks (appearance-reality), was notably equivalent and there was no difference in the performance of a child on false belief tasks when asked about his/her own beliefs compared to being asked about another’s belief. This could also be interpreted as providing support for Gopnik and Astington’s (1988) earlier claim that the development of the ability to understand these three tasks occurs at about the same time in a child since the tasks are conceptually similar but vary in their task specifics (Gopnik & Astington, 1988; Wellman et al., 2001).

2.6 Social Embeddedness Perspective

Moore and Frye’s (1991) claim that ToM development and its links with the social world remained largely unexplored was initially overtaken by Frith, Happé and
Siddons (1994), Frombonne, Siddons, Achard, Frith and Happé (1994) and Lalonde and Chandler (1995), who investigated the degree of association between a child’s level of false belief understanding and his/her level of social-emotional competence. Within this social embeddedness context, measures of ‘everyday adaptation’ such as the Vineland Adaptive Behavior Scales were used to classify social-emotional competencies according to whether they did, or did not, seem to presuppose some appreciation of the possibility of false belief. In general, results tended to show that false belief understanding was positively associated with those social competencies believed to require an understanding of the life of the mind. As well, Happé’s (1994) naturalistic short stories about everyday situations in which people make non-literal utterances (e.g. jokes, pretending, sarcasm, etc) considered by her to reflect higher-order ToM reasoning beyond the more traditional first and second order ToM tasks, aimed “… to extend the range of tasks involving theory of mind to a more contextually embedded and realistic form…” (p.130-131).

ToM development from a social embeddedness perpective expanded during the 1990s to focus on such social variables as number of siblings (Perner, Ruffman, & Leekam, 1994) and family size in general (Lewis, Freeman, Kyriakidou, Maridaki-Kassotaki, & Berridge, 1996); children’s conversations with friends and family members (Brown, Donelan-McCall, and Dunn, 1996; Dunn, 1994; Dunn, 1996); peer social status (Dockett, Szarkowicz, Petrovski, Degotardi, & Rovers, 1997); social interaction with peers (Austington & Jenkins, 1995; Watson, Nixon, Wilson, & Capage, 1999), and children’s play (Austington & Jenkins, 1995; Hughes & Dunn, 1997; Jenkins & Austington, 2000). Many of these studies showed a significant positive relationship between false-belief understanding and the social variables under investigation.
Current research is still exploring many of these issues. For example, within a *family environment* context, Foote and Holmes-Lonergan (2003) investigated children’s use of mental state terms and specific types of arguments that occurred during conflict episodes with siblings aged between 3 and 5, and performance on a false belief measure (which consisted of a false belief composite score made up of eight false belief tasks). Results showed that use of other-oriented arguments (taking into account the sibling’s interests – compromise, conciliation, etc.) was significantly related with success on the false belief measure. The use of self-oriented arguments (giving a reason for the disagreement solely in defence of one’s own position or interest) and the use of mental state terms were not found to be associated with performance on the false belief measure; however mental state terms occurred very infrequently and the data were skewed. Arranz, Artamendi, Olabarrieta, and Martin (2002) examined ToM development in 114 pre-school children and found that the percentage of securely attached children who responded correctly to the false belief task was significant. However, they found no association between successful performance on this task and the number of siblings or number of older siblings.

Within a *social competence* context, Slaughter, Dennis, and Pritchard (2002) looked at ToM ability and levels of peer acceptance. Children between the ages of 4 and 6 were tested on a number of ToM tasks (creating a composite score) and were also rated on the basis of peer status. A modest association between ToM ability and level of peer acceptance was detected which increased with the age of the children. Capage and Watson (2001) tested 51 preschoolers and kindergartners on two false belief tasks (creating a composite score) and a social-problem solving task. They also asked teachers to fill in an aggression scale and social competence measure for each child. They found that the aggression scale was negatively related to the false belief
measure and the social competence measure was positively related to correct performance of both the false belief measure and social-problem solving task.

2.7 Language Development Studies

A concern for social relevance has also led to an investigation into the association between ToM development and language development. Nelson et al. (2003) have posited that if children’s developing knowledge and appreciation of their own and others’ mental states is facilitated in part by communication, language would therefore be a major tool through which children came to appreciate the life of the mind. Recent studies showing an association between children’s language skills and their performance on false belief tasks by Astington and Jenkins (1999) and the causal role of language in false belief understanding by Lohmann and Tomasello (2002, cited in Lohmann & Tommasello, 2003) provide support for this contention. Further, earlier studies investigating children’s talk about their own and others’ mental and emotion states during spontaneous speech within social interactions (cf., Astington & Jenkins, 1995; Wellman, Harris, Banerjee, & Sinclair, 1995) found a significant developmental increase in young children’s causal speech related to internal mental states and that the use of causal speech was related to their subsequent performance on a false belief task. Lohmann and Tomasello (2003) maintain that, overall, these studies showed that very young children could deal with unobservable psychological states and practised intentional communication within social interactions implying an implicit type of ToM.
2.7.1 Narrative Landscapes Studies

According to Bruner (1990), we make sense of events by appealing to the subjective states of the participants (e.g., beliefs, feelings, desires) and we use this ToM in a narrative form to understand others. Further, the cognitive processes used to interpret the intentions of others in stories, is related to the process we use to understand intentionality in real-life situations (Feldman, Bruner, Renderer, & Spitzer, 1990). Bruner (1990) maintains that this narrative organisation ability is ‘innate’ but that culture also equips us with powers of narration through its ‘tool kit’. Children’s literature is one of the major items in our culture’s tool kit. Wright Cassidy et al. (1998) found that 78% of books typically read to preschool children contained internal state language, 34% contained false beliefs, and 43% contained personality descriptors. They concluded that ToM concepts form an integral part of the literature read to young children and Astington (1990) notes that these concepts assist in their understanding and usage of mental state verbs.

Bruner (1990) and Bamberg and Damrad-Frye (1991) note that integration of the ‘landscape of consciousness’ and the ‘landscape of action’\(^2\) underpins the ability to produce a coherent narrative. As Van Kraayenoord and Paris (1996) put it:

Knowledge of narrative structure in picture books is an extension of narrative thinking, a fundamental mode of cognitive functioning according to Bruner (1986) that leads to analyses of particular events and episodes. Bruner (1986) suggests that landscapes of action and consciousness are constructed simultaneously during narrative thinking and that “our sensitivity to narrative provides that major link between our sense of self and our sense of others in the social world around us” (p.69). Thus, it is important to study how children

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\(^2\) Refer to chapter 3 for a definition and detailed discussion on the landscapes of consciousness and action in narrative.
construct actions in narrative and what they understand about narrative text features (i.e., their metacognitive landscapes of consciousness)... (p. 43)

Working from within a Brunerian context, Astington (1990) noted that the development of the integration of these narrative landscapes is closely related to the acquisition of a ToM. She suggests that young children fail tests of false belief because they understand the landscape of action but not the landscape of consciousness. Astington believes that children are unable to synchronise the landscapes of action and consciousness before the age of 4 years because, although they can form models of the world and compare these to the world, they cannot represent the process of modelling, that is, they do not have a model of the other’s mind representing reality. However, 4-year-olds can represent and understand this process, hence their newly acquired appreciation of the dual landscape of narrative and their subsequent spontaneous production of narratives incorporating a dual landscape perspective.

In support of her developmental contention, Astington (1990) cites the earlier work of Pitcher and Prelinger (1963) who coded the stories of 2- to 5-year-old children on a number of levels including action versus thought processes: “Although acknowledging that the number of attributions is quite small, they reported that ‘as age progresses [children] attribute more detailed processes of thinking and of feeling, affect, or emotion to the characters in their stories” (p.158-159, cited in Astington, 1990, p.168). Fox’s (1991) contemporaneous study also provided some support. Fox examined the written narratives of children aged 7- to 13-years in terms of the level of description of the story characters’ inner psychological world. Whilst approximately half of the 9-year-olds wrote about more than one character with self-reflective thoughts and feelings, approximately one-quarter of the 7-year-olds’ narratives wrote at this level, with most writing simple, subjective descriptions of the character’s inner psychological worlds. More recently, Guajardo and Watson (2002) followed in
Astington’s footsteps by employing Bruner’s narrative landscapes to explain false belief findings thus:

On a transfer task... a young child can understand that the candy bar has been moved from one cabinet to another, but he or she cannot simultaneously understand the importance of the character’s belief. By 4 years of age, children can comprehend both landscapes concurrently, enabling them to comprehend that another’s belief is his or her representation of reality, which is a critical point for understanding false belief. (p. 307)

So before the age of 4 years, children are unable to simultaneously understand the story in the landscape of action (the candy bar really is in the green cupboard) and in the landscape of consciousness (the character thinks the candy bar is in the blue cupboard).

2.7.2 Metacognitive Language Studies

Links have been identified between ToM ability and metacognitive language development. Astington and Jenkins (1995, cited in Charman & Shmueli-Goetz, 1998) found a significant correlation between children’s use of metacognitive terms and their performance on false belief tasks. Pelletier (1997) tested 61 kindergarten children on a story retelling task and found that the resulting number of metacognitive terms used was significantly related to the children’s performance on a number of false belief tasks.

Charman & Shmueli-Goetz (1998) asked forty 7-year-olds to complete two ToM tasks, two language tests and narrate a wordless picture book. No relationship emerged between performance on the ToM tasks and use of mental state terms in their narratives. A significant correlation was evidenced between the use of mental state terms and story structure devices such as explicit mention of the main theme and
resolution of story. Thus, the use of *structural devices* in a narrative may reflect a child’s development of meta-linguistic skill related to a mentalistic stance that takes account of the listener’s perspective: “A narrator who was acutely aware of the listener’s perspective would aid their comprehension of the events by clearly identifying the resolution of the story,… as well as by signalling the opening and ending of the story to the listener” (Charman & Shmueli-Goetz, 1998, p. 263). To the degree that the production of narratives is compromised, the ability of a listener to accurately understand the ‘gist’ of the narrative will be at risk (Wright & Newhoff, 2001).

In their ‘story construction from a picture book’ assessment that examined young children’s abilities to construct meaning using narrative, van Kraayenoord and Paris (1996) included the assessment items of identifying themes, ability to create an alternative title for the story and elaborate on the story beyond the ending, along with examining children’s ability to infer characters’ feelings and their use of metalinguistics and so on. Their inclusion of the items of alternative title and story elaboration were to assess each child’s ability to appropriately move beyond the last scene of the story to appropriately infer the actions/thoughts/feelings of the characters and to appropriately and succinctly express the overall ‘gist’ of the story, respectively. These items form part of ascertaining the child’s overall level of narrative thinking, meaning making, and taking into account the listener’s perspective.

Ruffman et al. (2002) explored the relation between the content of mothers’ utterances and ToM development in their children. Over the course of a year at three time points, mothers were asked to describe pictures to their child whilst looking at the picture book as they would with their child at bedtime. The mothers’ use of mental state utterances in these descriptions was associated with enhanced ToM understanding.
in their children as reflected in a composite score of the various ToM tasks, with children’s talk about desire as a mental state preceding their talk about beliefs as a mental state.

Overall, the majority of studies exploring links between ToM development and narrative components have been undertaken using clinical groups (e.g. Capps, Losh and Thurber, 2000; Cole, 2001; Tager-Flusberg, 1992; Tager-Flusberg, 1995; Tager-Flusberg & Sullivan, 1995). These studies and their findings will be discussed in Chapter 4.³

³ General Note: Sperry and Sperry (1996) identified the basic difference between i) narrative research into narration, which is a focus of this thesis, and, ii) narrative research into co-construction, as the former being concerned with analysing children’s responses to the prompt ‘tell me a story’ (the methodology employed, in part, in this thesis), as compared with the latter which focuses on episodes of talk between an adult and a child or children. Recent research within a co-construction paradigm has been conducted by Guajardo and Watson (2002) who examined narrative discourse as a possible determination of ToM development by manipulating children’s exposure to social discourse centred naturally around children’s storybooks. Those children exposed to sessions where the researcher read children’s storybooks, highlighting and discussing episodes containing mental references, false belief, deception, appearance-reality, and then led them in a related activity, showed significant improved performance on standard ToM tasks at post-testing. Also, Nelson et al. (2003) explored level of familiarity of discourse patterns and ToM success in 3-year-old children. They noted that these young children found it difficult to follow the, generally, unfamiliar discourse of a standard ToM task. However, children’s performance significantly improved when they engaged in explanatory discussion with the researcher about their responses suggesting that the open-ended discourse which allowed children to express their thoughts about the task, reflect on, and justify their responses, may have been integral to their understanding of it. These studies, employing a different methodological perspective to the one used in the present study, have been alluded to here in the interests of literature review ‘completeness’ regarding ToM and narrative research.
CHAPTER 3

THEORY OF MIND DEVELOPMENT: THEORETICAL UNDERPINNINGS

3.1 Introduction

Discussions in the philosophy of mind have exerted considerable influence on the development of the reflection and research on ToM in psychology. For example, debates on the existence of mental states considered as physical events by Davidson (1980) or as theoretical entities by Dennett (1987) and Fodor’s theory (1987) on information semantics or Dretske’s (1981) naturalist theory of mental contents. Additionally, work in the area of language acquisition, specifically on the acquisition and comprehension of terms related to mental and emotional states (Bretherton & Beeghly, 1982; Shatz, Wellman, & Silber, 1983) and Flavell and his colleagues research in the 1970s on metacognitive development⁴ and level I and II perspective taking⁵ have all contributed to the theoretical underpinnings of ToM research.

Previous to the aforementioned contributions, were the works of Piaget and Vygotsky. Piaget’s theory of cognitive development arguably provides the strongest foundation to ToM research. Indeed Flavell (2000, p. 16) notes that, “Those of us trying to peer into the ontogenesis of knowledge about the mind are clearly standing on Piaget’s shoulders”. Vygotsky’s work, with its emphasis on linguistic mediation,

⁴ Metacognition has been defined as any knowledge or cognitive activity that takes as its cognitive object, or that regulates, any aspect of any cognitive activity (Flavell, Miller, & Miller, 1993). It encompasses people’s knowledge about the nature of people as cognisers, different cognitive tasks, and possible strategies for coping with different tasks.
⁵ Level I perspective taking entails the ability to recognise that another person can see something different from oneself. Level II perspective taking entails the further ability to recognise how something appears to someone else. Flavell showed that, developmentally, level II perspective taking is associated with understanding ToM tasks.
ecological validity and enculturation has also provided some important groundwork. Astington (1996, p. 199) notes that Vygotsky’s developmental theory has assisted in providing a view of ToM development “…that integrates cognition and culture, and gives an active role to individuals as well as to their societies”.

In all, Piaget and Vygotsky significantly contributed to a more integrated position concerning the development of both thought and language. With the beginnings of this integration of thought and language, came the increasing importance of the child’s narrative in understanding the development of thought life. Contemporary trends in narrative and language research, including the work of Bruner, have emerged over the years and have greatly influenced the current area of ToM research. This chapter will focus on the following influences: Piaget, Vygotsky, Bruner, and narrative and language.

3.2 Piaget, Perspective-Taking, Language and the Clinical Method

Flavell (2000) maintains that Piaget’s theory of cognitive development has provided a strong foundation for ToM research and Wellman (1991), in an earlier acknowledgement, stated that his own ToM research represents a return to the intriguing questions Piaget raised long ago “…in which he explored the content of children’s thinking, that is, how children make sense of the substantive nature of their worlds” (p. 317). Feldman (1992, p. 107) notes that ToM research “…preserves a view of the child as an active seeker after knowledge, as building mental models of the world through exploration – models that undergo successive qualitative reorganisation in more abstract and powerful terms over time. Thus, it preserves the central gains of the Piagetian era…”.
The qualitative changes in cognitive ability that Piaget (1926) detailed included the importance of being able to consider one’s own mental states in relation to others. This was described as a development in logical thinking away from egocentrism towards a de-centred view of reality accommodating multiple perspectives. Children are initially unaware that such things as conceptual, perceptual, and emotional perspectives or points of view exist. Consequently, they are unaware that they themselves have such perspectives in relation to external objects and events, or that others do, or that their own perspective may not be the same as those of others, or that they may be unwittingly reporting their own perspectives when asked to report another’s. For Piaget, intellectual development consisted of overcoming such egocentrism by progressively decentering from how the world appears within one’s perspective, to an objective, perspective-independent understanding. Piaget and his colleagues used egocentrism as an explanatory construct in their investigations into a range of social-cognitive topics: perceptual perspective-taking; egocentric communication; the misattribution of mental characteristics to physical objects (animism) and physical characteristics to mental events (realism); and understanding of thoughts, dreams, intentions, and morality (Piaget, 1926; Piaget, 1954; Piaget, 1962; Piaget, 1977; Piaget & Inhelder, 1956).

Most of Piaget’s work in the area of perspective-taking focused on spatial perceptual perspective-taking (Piaget & Inhelder, 1956) and verbal communication (Piaget, 1926). An example of the former involved showing children, 4- to 11-years of age, a scale model of three mountains and photographs of the model corresponding to various points of view. Children were asked to choose from the photographs the various perspectives from which a doll would be able to perceive the scenery. Piaget and Inhelder (1956) described the children’s results in four stages: the younger
children (stage 1: approximately 5- to 6-years-old) made errors indicative of poor perceptual perspective-taking skills with some electing the photograph displaying their own view regardless of where the doll was placed, interpreted by Piaget as an egocentric error: “...the child can only represent a group of mountains by constantly referring to his own viewpoint. Actually, the subject is not aware of possessing a viewpoint distinct from those of other observers” (Piaget & Inhelder, 1956, p. 243). With age, children became increasingly better at ascertaining the doll’s view which was attributed to their ability to accommodate multiple perspectives through decentration (stage 4: approximately 9- to 10-years-old)⁶.

Piaget (1926) believed that the child’s cognitive structure gets expressed in his use of language which provides a window into the child’s thought life. His listening to and recording of children’s speech and his use of story recall as a methodology resulted in him classifying a substantial proportion of a young child’s speech as egocentric:

...young children often used pronouns and demonstrative adjectives – like he, she, it, that, this – without indicating clearly to what they are referring... A child may also express causal relations poorly, and seldom connect the cause with its effect... Another aspect of egocentric speech is manifested in the observation that the child’s story or explanation does not form a coherent and integrated whole. His account is fragmentary; it is merely composed of a large number of specific and unrelated items which are juxtaposed one upon the other. (Ginsburg and Opper, 1969, pp. 91-92)

Piaget saw these egocentric speech properties as evidence of the child’s inability to take the other person’s point of view. He concluded that, with increasing

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⁶ Similarly, ToM task errors would seem familiar to Piaget. For example, when children make mistakes on the appearance-reality tasks they usually do so by encoding the stimulus in only one way – ‘centering’ on one aspect and failing to ‘decenter’ to consider the other. Flavell (1992) also notes that the concepts of ‘phenomenism’ (centering on the appearance) and ‘realism’ (centering on the reality), are also taken from Piaget’s writings and that Piaget studied appearance-reality concepts in his studies of conservations.
age, the child’s use of egocentric or non-communicative speech declined and socialised or communicative speech usage increased as he/she became more aware of the views of others and adapted his/her language accordingly (Flavell, 1963). Piaget stressed the importance of the child’s interactions with peers as an integral part of this development away from egocentrism towards socialised speech. Thus, “one can learn the meaning of perspective – and thereby acquire the rationality and objectivity which only a multiperspective view can confer – only by pitting one’s thoughts against those of others and noting similarities and differences” (Flavell, 1963, p. 369).

To explore the contents of children’s thoughts, Piaget (1926) adopted the clinical method, which allowed him the flexibility of being able to further explore interesting responses by children to questions he posed and to rephrase questions, rather than the more traditional testing method. He believed that the clinical method encouraged the flow of spontaneous tendencies on the child’s part rather than constrained the child to respond to a series of standard questions thereby forcing children’s responses into artificial channels of set question and answer.

In Piaget’s later work, he refined his clinical method as he felt it relied too heavily on language and did not always refer to concrete objects (Flavell, 1963). The new method involved the researcher’s questions referring to concrete objects or events, which the child had before them. Also, the child was usually able to express themselves through the manipulation of the objects and not solely rely on language.

3.3 Vygotsky, Linguistic Mediation, Ecological Validity and Enculturation

Because early ToM research preserved many of the basic tenets of Piagetian theory (Feldman, 1992), with children, following Piaget’s lead, viewed as ‘little theory
construction scientists’, it “…did not give much attention to the social context or to the consequences of the acquisition of a theory of mind for children’s social development” (Astonington & Olson, 1995, p. 182). However, Feldman (1992) claims that the area of ToM research has eventually become to represent a Kuhnian paradigm shift for post-Piagetian developmental psychology:

The new paradigm creates a more inclusive and powerful model of cognitive development by incorporating these important achievements of the earlier era into a larger structure. Piaget’s active, thinking, and reasonable organism was alone in a world with uninterpreted objects to be explored. The new literature on theory of mind recontextualizes Piaget’s solitary thinker in a social world composed of enculturated and communicating human adults. (p. 107)

According to Astonington (1996, p. 199), Vygotsky’s developmental theory has assisted in formulating this approach to studying ToM development since it “…integrates cognition and culture, and gives an active role to individuals as well as to their societies”. Vygotsky’s (1978) work emphasised that children develop a ToM through participation in cultural activities such as playing with peers and interacting with family members thereby sharing their culture’s way of regarding and talking about people’s relations to one another and to the world and hence developing a differentiated sense of self. Vygotsky (1962) also regarded language as a powerful mediating mechanism in the development of thought. Bruner (1997, p. 68) describes this Vygotskian perspective:

Meaning making…requires not only language but a grasp of the cultural content in which language is used. Mental development consists in mastering higher order, culturally embodied symbolic structures, each of which may incorporate or even displace what existed before. As

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7 Taking on Vygotsky’s ideas, ToM researchers have found, for example, that participation in pretend play facilitates children’s understanding of false belief (Astonington, 1996) and ToM development is mediated by family talk and interaction (Dunn, Brown, Slomkowski, Tesla, & Youngblade, 1991) and co-operative sibling social interaction (Perner et al., 1994). Additionally, Vygotsky’s ideas on language as a powerful mediating mechanism in the development of thought would suggest that language competence facilitates ToM understanding, and this seems to be the case (Astonington & Jenkins, 1999).
instruments of mind, they do not mature exclusively through endogenous principles of growth. They are not only appropriated from the tool kit of the culture and its language, but depend upon continued social interaction. Consequently, the most central question for Vygotsky is how a culture’s symbolic tools manage through social interaction to get from ‘outside’ into our ‘inside’ repertory of thought.

Thus, mental functioning can only be understood by examining the social and cultural processes from which it derives (Vygotsky, 1978). Vygotsky’s general genetic law of cultural development proposes that language and thinking develop first in the child in interaction with another person and that these interpersonal functions gradually become intrapersonal as children realise their cultural and historical significance:

Any function in the child’s cultural development appears twice, or on two planes. First it appears on the social plane, and then on the psychological plane. First it appears between people as an interspsychological category, and then within the child as an intrapsychological category... Social relations or relations among people genetically underlie all higher functions and their relationships. (Vygotsky, 1981, p. 163)

As well, Vygotsky’s focus on the process rather than the outcome is essential in his genetic method. Accordingly, “…we need to concentrate not on the product of development but on the very process by which higher forms are established. These processes are social in origin and in nature, and are peculiarly human” (1978, p. 64). To this end, Vygotsky focussed on naturally occurring changes in the child’s development as a result of the acquisition and deployment of mediational systems such as spoken and written language. Mediation refers to the internalization of socio-historical and cultural activities and behaviours. It includes both tool and sign use, with tool use representing externally oriented behaviour and sign use, particularly language use, being internally oriented. The combination of tool and sign use is uniquely human and permits the development of higher psychological or mental functions.
Signs such as language facilitate goal-directed thinking, permitting planning, monitoring and achievement of problem solving. Garton (1992, p. 89) writes:

According to Vygotsky, in the preverbal period of development, children’s tool use is akin to that of monkeys and apes. Once speech (and any other sign system) is incorporated into an activity that was once the domain of tool use, the action is transformed along new lines. Language enables the transformation of the behaviour into more abstract realisations, permitting the more flexible mental activities characteristic of humans. The dual origin of sign systems versus practical activity is the hallmark of Vygotsky’s theory, and the most important theoretical contribution made by him was the unification of the two processes. In particular, speech was accorded an organising function that both facilitates tool use and permits the transformation into new and higher forms of intelligent behaviour.

Vygotsky saw egocentric speech deriving from social speech (language as communication) as a way to regulate behaviour, not as reflecting egocentric thinking as did Piaget. Egocentric speech then becomes inner speech, unintelligible to others and regulates one’s actions. Inner speech allows less reliance on concrete reality by enabling flexible abstract thinking, representing relationships mentally. Therefore, representation is a necessary outcome of linguistically mediated social interaction, since cognitive objects are introduced via speech in a social context. To study egocentric speech, Vygotsky organised his activities like Piaget, but added frustrations (e.g., a pencil for the drawing task would be missing) so he could observe the relationship between egocentric speech and problem solving. Children’s egocentric speech almost doubled in difficult situations, appearing briefly to release tension and as a medium for planning a solution to the problem (Vygotsky, 1962).

By placing cultural mediation at the centre of the process of cognitive development, social origins take on a special importance in Vygotsky’s theories that is less symmetrical than Piaget’s notion of social equilibration. For Vygotsky, the social world does have primacy over the individual as it is the bearer of cultural artifacts, the
achievements of prior generations in materialised form, without which the development of mind is impossible. Indeed, these ideas do not appear to have any clear counterpart in Piaget’s work, and consequently may be more appropriately characterised as being different, rather than in conflict with it (Bruner, 1997).

3.4 Bruner, Intentionality and the Dual Landscape of Stories

Bruner’s (1990) view of the mind was an active entity. Gopnik (1990, p. 334) summarised Bruner’s position thus: “... knowledge is never ready-made or given, either by the mind or the world. It is instead created.... And, in this sense, and in spite of all their other differences, he is squarely in the tradition of Piaget”. This active mind begins at birth, detecting and creating the world and so, for Bruner, we are intentional beings from the outset. The mind was not only active, but also engaged with the world, in particular, with someone else. Bruner emphasised the intersubjectivity and intentionality associated with things such as gestures and glances: “Bruner showed that we begin to learn these skills even in earliest infancy; in fact, they may be the helpless infant’s most powerful tool. And he showed that something as simple as a shared gaze or a game of peekaboo may prefigure the communicative complexities charted by playwrights and novelists” (Gopnik, 1990, p. 336).

Like Vygotsky, Bruner saw that knowledge was grounded in the social world. So knowledge requires a mind, a world and a community. Bruner’s (1990) major theoretical tenet was the “…inseparability of individual human growth from the instruments of the culture in which it occurs” (p. 346). Bruner (1990; 1997) saw folk psychology as the principal cultural instrument which allows us to think about and assign meaning to our world, primarily through story-telling. For Bruner, stories help
us to understand events, and also to comprehend that events that appear on the surface to suggest one thing may actually mean another because of people’s motives, beliefs, intentions, and emotions which underlie these happenings. Bruner (1986) refers to this schism as the dual landscape of stories:

One is the landscape of action, where the constituents are the arguments of action: agent, intention or goal, situation, instrument, something corresponding to a “story grammar”. The other landscape is the landscape of consciousness: what those involved in the action know, think, or feel, or do not know, think or feel. The two landscapes are essential and distinct... (p. 14)

Bruner (1990) regards well-formed narrative as the idealised form of folk psychology since it is “…capable of combining in a single structure... the internal subjective and the outer objective. It even provides guidance for its user about which things should be taken for granted and which need explaining” (p.349). Intentional states play an important role in this narrative process since events are not seen to be independent of our beliefs, emotions, and desires. For Bruner, our self and our worlds are symbolically created since they reflect the folk theory of a particular culture, not a universal folk theory, and are embedded in the stories we tell to one another and to our children. From a developmental perspective, Bruner’s (1990) constructivist theory portrays children as being increasingly able to narrativise their experiences.

Leadbeater and Raver (1995, p. 191) describe Bruner’s ideas thus:

Children do not merely ‘insert’ already existing narratives into their play with others; they must construct for themselves what is there to be found in their culture... The child constructivist-narrator exists in a cultural context that supports some stories over others (e.g., people are happy on their birthdays)... Bruner’s narrator uses the tools of narration... to organize or give meaning to his or her own and others’ ongoing experiences. This ‘push’ to narrate allows children to engage in constructive interpretation of the causes of their own and others’ behaviors.
Bruner’s work has brought to the fore the relationship between narrative and intentionality, including the importance of intentional states, but little emphasis was placed on the *narrative’s structural components*. Yet it is these structural components such as plot, goal, attempt, outcome (GAO) sequences and interclausal connectives that not only organise our narratives, but also assist in creating meaning.

3.5 *Story Structure: Coherence and Cohesion*

“Narrative structures provide a format into which experienced events can be cast in the attempt to make them comprehensible, memorable, and shareable. Such structures are perhaps the most common, if not universal, means of structuring series of events” (Olson, 1990, p. 100). Two main categories of narrative structure have been proposed, namely, i) *coherence*, and ii) *cohesion*. According to Shapiro and Hudson (1997), within a developmental framework, the distinguishing features of each category are as follows:

To make a story *coherent*, the child uses story schema to structure the content into a culturally defined sequence that includes a formal beginning, setting and background orientations to introduce characters, internal responses (e.g., thoughts and feelings), a problem and resolution (i.e., the plot), and an ending. *Story cohesion* is established by employing linguistic devices, such as pronominalization, temporal and causal connectives, and subordinate clauses, which tie a span of sentences together to form a whole. (p. 24)

A story’s causal *coherence* is linked to the creation of a *goal-based* narrative based on the narrator’s understanding of people’s *internal mental or feeling states*, that is, on *psychological causation*, and what this implies about an individual’s motives and goals (Lorch et al., 1999; Trabasso & Nickels, 1992). Studies conducted in the 1980s investigated the use of internal state terms and psychological causation in children’s
narratives. Peterson and McCabe (1983) found frequent use of internal state information that referred to psychological causality in the narratives of the 4- to 6-year-old children. Wolf, Rygh, and Altshuler's (1984) longitudinal study of children's use of internal state terms in the narratives they produced found that their 2-year-old subjects described what the characters saw or heard, adding mention of the characters' feelings later. At around the age of 4, children referred to the characters' cognitions, whilst concurrently explaining and reflecting on internal experiences. Stein (1988) analysed the narratives of kindergarten to fifth grade children and found that only the older children consistently produced goal-based narratives as compared to the use of goal based narratives by the kindergarten children.

Story coherence also encompasses the plot of the story, the primary organising device of the narrative, which contains a sequence of causally linked events designed to deal with a situation. Benson (1996) succinctly defines plot as an intentional structure that is goal-oriented and forward-moving. For a narrative to be organised well, a knowledge and understanding of intentions and goals is imperative. Berman (1988) asked children to narrate events that occur in the wordless picture book called *Frog, Where Are You?* (Mayer, 1969) which is about a boy's continued search in the face of failure for his pet frog that had escaped. To do this, the children needed to understand what was depicted in each picture and then encode these interpretations into a narrative form. Berman found that most 3- and 4-year-old children and a few 5-year-olds described the pictures in isolation. From age 5 to age 12, the children increasingly organised the events sequentially in relation to an overall plot line that involved a sustained search.

Trabasso and Nickels (1992) note that "... Berman's 'plot line and sustained search' arose from the children's use of knowledge about plans and goal-directed
action” (p.250). Their follow-on study using the same picture book examined how children deal with narrative structure, including sets of goals. They found that 4-year-olds could identify immediate goals, if not overarching ones, and that episodes including a goal, an attempt to achieve that goal, and an outcome increased substantially in frequency of production at around age 5. Only the 9-year-olds in the study handled multiple goals with ease. Trabasso and Nickels (1992, p. 250) concluded that:

Children are increasingly able to explain actions in terms of goals or purposes. …they come to rely upon the presence of goals and goal-directed actions… they move from describing isolated states and actions to the temporal and then to the causal sequencing of events. This is followed by organising the narrations into episodes that include goals, actions, and outcomes.

Leonard (1977) examined the emerging competence of story construction in children’s spontaneously generated stories and concluded that by the age of 4 or 5 most children are able to construct primary narratives, that is, those that are “…whole and complete, with a beginning, a middle, and an end” (p. 180). The primary narrative was found to incorporate four phases, to wit, i) a state of equilibrium, ii) a disruption of that equilibrium, iii) an action or set of actions to counter the disruption, and, iv) a new stage of equilibrium.

Benson (1996) explored the narratives of 4- to 5-year-olds to see how narrative structure was associated with inclusion of a conflict, references to internal states and psychological causation. The children were asked to invent stories using either replica toys or line drawings. Benson found that narrative structure skill, that is, the ability to produce goal-based narratives, was closely associated with age and that narrative structure skill was a good predictor of the inclusion of a conflict, references to internal states and psychological causation in the children’s narratives. Benson concluded that
the primary narratives produced by children, more so than the description or sequential narratives were,

...likely to include both a conflict and attributions about psychological causation. This helps us understand the motives and goals of characters. Thus, the results indicate that as primary plotted narratives emerge from the simpler form of the sequential narrative, they are more likely to include precisely the sort of information that is believed to be a precursor to inventing goal-based narratives...from ages 4 to 5 may be the critical time for the child to develop a story schema that includes conflict and internal state information as well as plotted structure...

(Benson, 1996, p. 244)

With regard to the second narrative structure category, story structure cohesion, a critical element is interclausal connectives which join adjacent clauses in a narrative at the sentence level. These include additive, continuative, temporal, adversative and causal connectives. Segal, Duchan, and Scott (1991) maintain that these connectives play a crucial part in building a coherent mental model for interpreting occurrences in the story world. In fact, Segal and Duchan (1997) refer to interclausal connectives as model-building connectives in order to highlight their conceptual, rather than linguistic function:

The role of connectives in narratives, then, is to guide the interpreter as to how to construct meaning for a text. They tell interpreters when to add information, and what they need to supply to make the text coherent. The connectives provide cues for how events and objects in the story relate to one another. In this way, connectives function to help interpreters build a mental model of the narrative. (p. 99)

Causal connectives in particular play an important role in connecting entities being constructed in a mental representation. They indicate that the semantic relationship between the adjacent and preceding clauses is dependent and they “...are needed when the storyteller is describing goal-directed actions or the characters’ thoughts and emotional reactions to the plot” (Shapiro & Hudson, 1997, p. 26). On a
developmental level, Caron (1997) suggests that the emergence and subsequent use of various connectives by young children “... could be related to the new ability of children to handle several mental spaces in their representation, which can be paralleled by their developing theory of mind. Interesting lines of research can be explored concerning linguistic development in children in relation to, not their logical competence, but their representational capabilities” (p. 69). Braunwald (1997) also links a child’s use of causal connectives to his/her ability to engage in socially appropriate interchanges with others. Braunwald maintains that, developmentally, this usage requires the ability to integrate language, thought and social understanding, and is dependent upon a notion of intersubjectivity. More specifically, McCabe and Peterson (1997) have noted that, in terms of the order of appearance of causal connectives, children usually express psychological before physical causality, and physical before logical causality.

Narratives are comprised of whole-part relationships. Each narrator’s composition of a narrative utilising the abovementioned components creates an overall perspective, a whole. Specific events within a story are always viewed from the overarching perspective that appears in an integrated relationship. Parts and wholes in a narrative therefore, rely on each other for their viability:

In Vladimir Propp’s (1968, 1984) terms, the parts of a narrative serve as “functions” of the narrative structure as a whole. But that whole cannot be constructed without reference to such appropriate parts. This puzzling part-whole textual interdependence in narrative is, of course, an illustration of the defining property of what is called the “hermeneutic circle”. For a story can only be “realized” when its parts and whole can, as it were, be made to live together.

(Bruner, 1992, p. 235)

That is, the specific events in a story need to be constituted in the light of the theme(s) of a story in order to be made “functions” of the story. This interdependence implies
that the overall narrative, the theme(s) of a story, the general *gist* also play an essential role in organising human experience, which allows for interpretation and informing action.
CHAPTER 4

THEORY OF MIND DEVELOPMENT IN CLINICAL CHILDREN

4.1 Children Diagnosed with Autism

Interest in ToM development in clinical children has been twofold: i) how knowledge from the study of normal development might inform the study of developmental psychopathology, and also, ii) how the study of the latter can inform the former:

One way to try and understand what it means to have a human conception of mind is to explore what happens when development goes wrong to a point where such a conception either fails to develop at all, or develops abnormally. We thus potentially stand to gain insight into the development of a conception of mind by studying the unfortunate case of autism. (Mitchell, 1997, p. 57)

Autism is a pervasive developmental disorder and its diagnosis is largely based on behaviours which strongly appear to implicate a lack of understanding of mind. Wing and Gould (1979) characterised autism as a syndrome consisting of a triad of impairments in the domains of socialisation, communication and imagination. Mitchell (1997) notes that “…there is an underlying factor that unifies the triad, such that if there is an autistic impairment in socialisation, then inevitably there will be related impairments in communication and imagination” (p. 66). This triad of impairments forms the basis of defining the disorder in the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR) (American Psychiatric Association, 2000). Mitchell (1997) describes how the autistic triad of impairments potentially accounts for a lack of understanding about the mind holding beliefs. With regard to the domains of socialisation and communication, an individual who lacked this understanding would
probably treat people more like machines rather than individuals trying to make sense of the world. They would not be oriented towards meanings behind the literal words of another person’s conversation and they would lack the understanding of how mental states affect behaviour, resulting in serious difficulty relating and communicating with others. As for the domain of imagination, Mitchell (1997) notes that, “...beliefs cannot be observed directly, so to understand their existence requires a leap of the imagination” (p. 73).

Based on this initial reasoning, studies in the area of ToM development and autism began to proliferate, commencing with the seminal study by Baron-Cohen et al. (1985) who were the first to apply the false belief model developed by Wimmer and Perner (1983) to assess ToM as a possible explanation of autism. They changed the format of the false belief task, which resulted in a readily comprehensible story line with simple vocabulary, completely nonverbal response mode and a scenario that was more appropriate in content for older children. Their Sally-Anne task consisted of two doll protagonists (Sally and Anne) who go through the following procedure. Sally places a marble in her basket and then leaves the scene, the marble is transferred by Anne and hidden in her box, and then Sally returns. The experimenter then asks the child the critical belief question of ‘where will Sally look for her marble?’ and the child points to the location they believe to be correct. If they point to the basket (the previous location) then they pass the belief question since they have demonstrated an understanding of Sally’s false belief; this conclusion was warranted if two control questions were also answered correctly. Whilst there were no errors evidenced on the control questions, only 20% of children with autism passed the belief question compared to 85% of the non-clinical children and 86% of the children diagnosed with Down’s Syndrome. The authors concluded that the failure rate of autistic children on
this task constituted a specific cognitive deficit in their ToM that could not be attributed to mental retardation in general as children with Down’s Syndrome performed close to ceiling on the task.

Subsequent research examining ToM development in children with autism has shown that they experience significant difficulty in understanding that the mind holds beliefs. Two extensive reviews of studies in this area (Happé, 1995; Yirmiya, Erel, Shaked, & Solomica-Levi, 1998) showed that most research demonstrated a significant impairment in performance in children with autism when compared to children matched for mental or language age, to children with specific language impairment, to children diagnosed with Down’s Syndrome, and to normally developing children. The studies reviewed generally employed the more traditional ToM tasks. A number of studies in this area have also explored ToM understanding in children with autism utilising a narrative methodology.

4.1.1 Narrative Production Studies

Tager-Flusberg and Sullivan (1995) claim that a major reason “...why developmental psychologists have focused on narrative discourse, and particularly story-telling, is because the capacity to narrate builds on an integration of linguistic, cognitive, and social-cognitive capacities, which continue to develop long after early childhood...” (p. 241). Capps et al. (2000) maintain that because of this, researchers have recently begun to employ narrative methods as a way of investigating atypical development. They believe that this story-telling approach is a promising one in relation to a number of disorders including autism “...because of autistic individuals’ social-communicative deficits in general,... and pragmatic deficits in
particular...Analysis of narrative practices affords unique insights into autistic impairment in that narrative involves both pragmatic language skills and an appreciation of the role of mental states in predicting and explaining behaviour” (p. 193).

Using a narrative production methodology, Tager-Flusberg (1992) found links between metacognitive language and ToM ability in children with autism. Her analysis of spontaneous speech samples from children with autism showed that these children were comparable to the Down’s Syndrome control group in the kind of narrative produced about perception, desires and emotion. However, children with autism referred significantly less often to cognitive mental states. Tager-Flusberg (1992) argued that “the paucity of language for cognitive states...reflects an impaired ability to reflect on their own and other people’s minds.” (p. 170).

Contrary to her 1992 finding, Tager-Flusberg (1995) found no significant difference in the proportion of mental state terms used by children with autism, non-autistic children with a developmental disability, and normally developing children, in exploring narrative production using the wordless picture book, *Frog, Where are You?* (Mayer, 1969). There were, however, group differences in story length and structure. Children with autism told significantly shorter stories, were less likely to construct stories with a resolution and tended to ambiguously introduce new characters. The use of causal statements to explain the relationship between events was absent in the stories told by the children with autism. Although no direct associations were made between metacognitive language ability and ToM development, the results overall demonstrated that children with autism experienced significant difficulty explaining human action within a psychological explanatory framework, and that narrative
abilities, including narrative structure devices, may be a useful indicator of ToM abilities.

Tager-Flusberg & Sullivan (1995) utilised another of Mayer’s wordless picture books, *Frog on His Own* (Mayer, 1973) to further explore causal attributions, mental state language, and ToM. Groups did not differ in their use of mental state terms or causal statements. However, when *probed* about characters’ emotions and thoughts, the autistic group was less accurate in labelling the emotions and provided fewer causal explanations of emotions and thoughts. Also, strong positive correlations between narrative measures (e.g., narrative length, cognitive state terms) and performance on ToM tasks were found for the autistic group suggesting that ToM was related to the ability to infer characters’ internal states in story-telling as well as to the ability to structure stories so as to bind narrative events into a coherent story line.

*Frog on His Own* (Mayer, 1973) was also employed by Capps et al. (2000) to compare the narrative abilities of children with autism, children with developmental delays, and normally developing children. Whilst groups did not differ in their use of causal language or internal state terms, children with autism and developmental delays were less likely to identify the causes of characters’ internal states and tended to simply label emotions and explain actions. Capps et al. interpreted this finding as an indication of a limited appreciation of and access to the social problem-solving function of narratives. For the children with autism, narrative ability level was positively associated with performance on ToM tasks and with an index of conversational competence.

Losh and Capps (2003) examined narrative abilities in high-functioning children with autism or Asperger’s Syndrome as compared with normally developing children across two different discourse contexts: i) a wordless picture book context and
ii) a more open-ended conversational storytelling (personal narratives) context. The latter was designed to provide a context that more closely resembled daily interaction, having less structure, and being more dynamic and spontaneously demanding. Although children in the autistic or Asperger’s Syndrome group described fewer episodes in the story book task and used less causal language, they performed relatively well when compared to the normally developing children. In the personal narratives task, however, the children with autism or Asperger’s Syndrome generally exhibited more frequent production of irrelevant comments, displayed heavier reliance on prompts to clarify themes, used less causal language, and experienced difficulty utilising complex syntactic and evaluative devices as well as displaying a lack of diversity in using the devices, than did the comparison group.

4.1.2 Executive Dysfunction

After the initial surge of studies examining ToM development in children with autism, it was clear that although in many cases there were severe impairments in ToM understanding, it was not necessarily the core deficit. For a deficit to be considered as primary to autism, it has to be universal (i.e., manifested in all or almost all individuals with autism) and it has to be unique (i.e., not manifested by most individuals with other clinical diagnoses) (Yirmiya et al., 1998).

Some individuals with autism passed first order and second order ToM tasks showing that being able to acknowledge beliefs did not prevent an individual from being autistic (e.g. Dahlgren, Dahlgren Sandberg, & Hjelmquist, 2003; Dahlgren & Trillingsgaard, 1996; Eisenmajer & Prior, 1991; Ozonoff, Pennington, & Rogers, 1991). Also, populations without autism experienced difficulty in acknowledging false
belief such as those individuals with developmental disabilities and Down’s Syndrome (Benson, Abbeduto, Short, Nuccio, & Maas, 1993; Yirmiya et al., 1998; Yirmiya, Solomonica-Levi, Shulman, & Pilowsky, 1996; Zelazo, Burack, Benedetto, & Frye, 1996); schizophrenia (Corcoran, Cahill, & Frith, 1997; Langdon, Coltheart, Ward, & Catts, 2002; Mazza, De Risio, Surian, Roncone, & Casacchia, 2001; Pickup & Frith, 2001); non-vocal children with cerebral-palsy (Dahlgren et al., 2003); visual impairment (Minter, Hobson, & Bishop, 1998); and deafness (Peterson & Siegal, 1995; Russell et al., 1998).

Mitchell (1997) notes, that although people with autism are socially impaired and have communication difficulties, there is another defining characteristic that would be difficult to relate to an impaired ToM. This is, the observation that people with autism insist on sameness, appear content to arrange items in lines repetitively, and tend to have a very narrow range of interests, suggesting an attentional problem (Courchesne et al., 1994; Pierce, Glad, & Schreibman, 1997).

Enns (1990) notes that children become increasingly more efficient at allocating attention to important information, which is not so much a result of an increase in attentional capacity, but of control over where attention is directed. Bryson, Wainwright-Sharp and Smith (1990) suggest that this increasing control over attention may underlie the development of the child’s cognitive ability to “decentrate” (Piaget, 1952). Decentration allows the child to focus on more than one feature of a problem simultaneously. The newfound ability to coordinate several aspects of a problem helps the child to appreciate that there are several ways to look at things and this ability in turn leads to a decline in egocentrism. It seems therefore that control over one’s attention contributes to ToM development.
The capacity to control our own attentional focus is known as the executive function (Mitchell, 1997). It is a "...complex cognitive construct that encompasses the set of processes that underlie flexible goal-directed behaviour (e.g. planning, inhibitory control, attentional flexibility, working memory)” (Hughes, 2002a, p. 69). It brings behaviour progressively under the control of internally represented information resulting in greater capacity for predicting and controlling one’s environment, and one’s behaviour in it, consequently permitting far more effective adaptive functioning.

Research has provided robust evidence for an executive dysfunction in autism (Hughes, 2002b), and in the autistic literature, these deficits have also been tied to a deficit in mentalising (Ozonoff et al., 1991; Pennington & Ozonoff, 1996). This link with executive function and ToM development in individuals with autism has led to numerous studies with normally developing preschoolers, showing a significant relationship between individual differences in executive functioning and ToM, independent of both age-related effects and general ability (for a review, see Perner & Lang, 1999). Also, this interest has led to investigations in ToM development of children with apparent executive function impairments and social problems.

4.2 ToM Development in Children with Emotional and Behavioural Difficulties

Studies conducted in the area of the social-cognitive knowledge of children and adolescents with emotional and behavioural difficulties have contributed to an understanding of ToM development. Early work by Happé and Frith (1996) in this area was based on their insistence of the need for a "...systematic test of mentalising in groups with known social impairment” (p. 387) in light of the research on ToM and autism. They suggested that children with conduct disorder may experience difficulties
with ToM understanding, as they exhibited severe social and adaptive problems as evidenced by the work of Dodge and his colleagues (e.g., Dodge, 1993; Milich & Dodge, 1984). Children with conduct disorder were tested on two standard first order false belief tasks, which they all passed. It should be noted, however, that such first order ToM tasks are typically grasped by 4- to 5-year-old children whilst the mean age in this study was 9:8. Therefore, a delay in ToM development was still a possibility, however it may have been more subtle, possibly one or two years. Work with younger children was needed to better investigate ToM ability with these children.

Hughes, Dunn, and White (1998) compared ToM, emotion understanding, and executive functioning of preschoolers rated by parents on Goodman’s (1994; 1997) 25-item Strengths and Difficulties Questionnaire as ‘hard to manage’ to a matched control group. They stated that the ‘hard to manage’ preschoolers had a significantly poorer understanding of emotion, false belief, and executive functioning than controls. With regard to the false belief result however, there was only a small group difference in answers to the prompted explanation of the actions of the protagonist and this was explained by the significantly lower verbal ability of the ‘hard to manage’ group. ‘Memory for own false belief’, ‘deceptive box tasks’, and ‘spontaneous explanations’ of the actions of the protagonist in the false belief tasks yielded no group differences with regard to performance.

Cole (2001) examined the social-cognitive skills of ‘aggressive boys’ aged 8.5 to 13 via a narrative methodology, comparing their stories to a group of normally developing boys. The ‘aggressive’ group was found to lack the necessary social-cognitive knowledge to construct the setting for the story. They described significantly fewer bits of information about the context of the story and the events that initiated it. Cole (2001) states that “…this finding confirms previous studies in which children
with behavioural disorders showed deficits in listener perspective taking and gathering and perceiving social cues surrounding an event in order to relate appropriately” (p. 339). Further, although the ‘aggressive’ boys did not differ significantly from their normally developing peers on the plot and outcome components of the story, they fell short in their provision of information required to effectively orient their listener. Cole described this orienting deficit thus:

Without full information at the beginning of the story, the listener has to work harder to understand the rest of it. If the storyteller does not attribute a mental state to the listener (i.e., theory of mind) and understand that the listener needs ample information to comprehend and enjoy the story, he or she may not provide complete information to set up the story for the listener. (Cole, 2001, p. 340)

Perner, Kain and Barchfeld (2002) compared executive function and second order false beliefs in children aged 4- to 6-years scoring high and low on AD/HD symptoms respectively according to a short teacher report form (Du Paul, Power, Anastopoulos, & Reid’s (1998) 18-item AD/HD Rating Scale-IV). Children rated as high in AD/HD characteristics were termed ‘at-risk’ for AD/HD and were found to demonstrate poorer executive functioning in a number of areas including attention and planning. False belief task performance showed no difference between the two groups. It is worth noting, however, that Perner et al. (2002), as with Hughes et al. (1998), classified their children on the basis of a short questionnaire; the children did not have a formal diagnosis and were recruited from the general community, not from clinical settings.

Most recently, Fahie and Symons (2003) studied children (mean age = 6:5) referred to a mental health clinic for attention and behaviour problems in order to assess the degree of association between executive functioning and ToM performance. Four kinds of false belief tasks were employed with scores aggregated to give a
composite ToM score. Attention problems and impulsivity were found to be negatively related to ToM, whilst working memory was positively related. As well, “relations between ToM and executive functioning were stronger than those found in hard-to-manage preschoolers (Hughes et al., 1998) or community controls (Perner et al., 2002). This may be because children in the current study were referred to a mental health clinic due to their behaviour difficulties and attention problems” (p. 68). Fahie and Symons postulated that their participants evidenced about a 2-year delay in their ToM development.

4.3 Children with Attention-Deficit/Hyperactivity Disorder (AD/HD)

Studies examining ToM ability in children with emotion and behavioural difficulties have, in some instances implied that children with AD/HD would perform similarly (e.g., Fahie & Symons, 2003; Hughes et al., 1998) as executive dysfunction characteristics are also typical in these children (Grodzinsky & Diamond, 1992; Pennington & Ozonoff, 1996). It is imperative however that children diagnosed with AD/HD are examined with regard to their ToM ability since AD/HD is not synonymous with ‘hard to manage’ children or children ‘at risk’ of AD/HD etc., but rather, represents a distinct disorder (cf. Barkley, 1997b).

According to the DSM-IV-TR (American Psychiatric Association, 2000, p. 85), the essential feature of this disorder is “… a persistent pattern of inattention and/or hyperactivity-impulsivity that is more frequently displayed and more severe than is typically observed in individuals at a comparable level of development”. Further, “although many individuals present with symptoms of both inattention and hyperactivity, there are individuals in whom one or the other pattern is predominant”
The three Subtypes are: i) Attention-Deficit/Hyperactivity Disorder, Predominantly Inattentive Type (AD/HD-I), ii) Attention-Deficit/Hyperactivity Disorder, Predominantly Hyperactive-Impulsive Type (AD/HD-HI), and iii) Attention-Deficit/Hyperactivity Disorder, Combined Type (AD/HD-C) (see Appendix A for the DSM-IV-TR diagnostic criteria for AD/HD). It is estimated that AD/HD affects 5% - 10% of Australian children aged between five and eighteen years (Selikowitz, 1995). According to the DSM-IV-TR, the disorder is more frequent in males than in females, with male-to-female ratios ranging from 2:1 to 9:1, depending on the Type and the setting.

The primary cause of AD/HD is still unknown but a deficit in executive functioning has been implicated in this disorder. A review of 18 studies focusing on the role of executive functioning in AD/HD by Pennington and Ozonoff (1996) showed that 15 of the studies found evidence of significantly poorer performance on the part of the AD/HD group as compared with the control group. In particular, group differences were consistently found in the motor inhibition tasks leading Pennington and Ozonoff to conclude that “…the cognitive model linking EF deficits to the behavioral symptoms of AD/HD is that the three cardinal symptoms of AD/HD, hyperactivity, distractibility, and impulsivity are all due to a deficit in the executive function of inhibition” (p. 63). Further support for this contention has come from Barkley (1997a; 1997b) and Schachar, Mota, Logan, Tannock, & Klim (2000). In particular, Barkley’s model of AD/HD highlights a core deficit in behavioural inhibition which gives rise to secondary executive dysfunction and impaired motor control, resulting in impaired self-regulation of behaviour. Deficits in behavioural inhibition prevent the effective operation of four other executive functions, resulting in secondary deficits in nonverbal working memory, verbal working memory, self-
regulation of emotion and motivation, and reconstitution (i.e., the creative use of past experience for problem solving). These secondary deficits influence motor control, resulting in significantly diminished goal-directed and self-regulated behaviour in children with AD/HD.

4.3.1 Social Impairments

Researchers have also described the social awkwardness and pervasive interpersonal difficulties that children with AD/HD frequently encounter (cf. Clark, Cheyne, Cunningham, & Siegal, 1988; DuPaul, McGoe, & Eckert, 2001; Grenell, Glass, & Katz, 1987; Guevremont & Dumas, 1994). It has been noted that these social difficulties are often persistent across situations and over time (Klein & Manuzza, 1991; Whalen & Henker, 1985) and tend to be irrespective of gender (Greene et al., 2001).

Normally developing children perceive their AD/HD counterparts as being disruptive, unpredictable and aggressive, and tend to respond to them with aggression, criticism and rejection even after only a few social contacts (Barkley, 1998; deHaas & Young, 1986; Fliceck & Landau, 1985). Whalen and Henker (1985) note that AD/HD children’s peer interactive style is usually unintentionally inept with some children genuinely surprised and dismayed by the negative outcomes associated with their behaviour. It has been suggested that the atypical social behaviours exhibited by AD/HD children result from social-reasoning deficits and impulsive response styles (Grenell et al., 1987)

Dodge and his colleagues (e.g., Crick & Dodge, 1994) proposed a comprehensive model of social competence where individuals proceed through a
sequential, cognitive process from encoding incoming stimuli to form a mental representation of the social situation to enacting the behaviour chosen. Socially incompetent behaviour can result from inappropriate cognitive reasoning at any stage of the model. Results from studies with hyperactive children show deficiencies in encoding and cue utilisation, in the ability to attend to available social cues, to adopt another’s perspective, and to evaluate accurately the intentions of others (Moore, Hughes, & Robinson, 1992; Zentall, Cassady, & Javorsky, 2001).

4.3.2 Language Impairments

Language impairments, including pragmatic language deficits are also common in children with AD/HD (Cantwell & Baker, 1991; Flicek, 1992; Gizzo, 2002; Pennington, Grossier, & Welsh, 1993; Hill, 2000) with D’Incau (2000) reporting that approximately one in three children with AD/HD manifests a language impairment. Kim and Kaiser’s (2000) study provided some support for this claim. They investigated the language characteristics (semantic, syntactic, and pragmatic) of 11 children with AD/HD and 11 normally developing children, aged between 6- to 8-years. A number of language tests were administered and samples of children’s language were also collected during free play with an adult conversational partner using the Pragmatic Protocol. Although their pragmatic knowledge as measured by the Test of Pragmatic Language did not differ from that of the normally developing children, significantly more inappropriate pragmatic behaviours in conversational interactions was displayed by the children with AD/HD. They did not respond to their conversational partner’s questions or requests, frequently interrupted, tended to give less feedback to speakers, and used ambiguous vocabulary in their conversation. With
regard to pragmatic language deficits in particular, Gizzo (2002) tested a group of 20 boys with AD/HD and 20 normally developing boys, aged 11- to 13-years during a structured and unstructured telephone task. Results showed that the boys with AD/HD had significantly more problems in conversation skills.

A number of narrative abilities believed to be related to executive functioning have also been tested with AD/HD children using story retelling tasks. Tannock, Purvis, and Schachar (1993) found that 30 boys, aged 7- to 11-years, with AD/HD performed significantly more poorly in the production of their narratives compared to 30 same aged normally developing boys. Whilst they were able to extract the main idea from the stories, the boys with AD/HD provided less information overall and their stories were more poorly organised and less cohesive. These boys also used more semantically inappropriate word substitutions and included more incorrect or misinterpreted information.

Purvis and Tannock (1997) observed similar trends when examining the story recall abilities of a number of groups of children including 14 children with AD/HD and 14 normally developing children aged 7- to 11-years. Children with AD/HD showed more difficulties in sequencing information, maintaining accurate interpretations of story events, organising, and monitoring their story retelling, resulting in a less organised and cohesive account of story events, than did the comparison group. Purvis and Tannock concluded that these problems exhibited by the AD/HD group were a consequence of deficits in higher-order executive functioning. Follow-on studies by Lorch et al. (1999) and Milch-Reich, Campbell, Pelham, Connelly, and Geva (1999) came to similar conclusions, with children in the respective AD/HD groups not as effective in processing the causal structure of stories, showing
less sensitivity to the causal connections among events, and including fewer causal relations in story narrations than the comparison groups.

4.4 ToM Development in Children Diagnosed with AD/HD

An early attempt to link ToM performance and AD/HD took the form of a case study of a 9-year-old boy by Buitelaar, Swaab, van der Wees, Wildschut, and van der Gaag (1996). Findings showed a relatively good performance on first order ToM tasks but clear performance deficits on all of the second order ToM tasks administered. Moreover:

A further observation of his problem-solving approach to the second-order tasks revealed a marked rigidity and inability to shift in perspective taking across the different persons involved in the stories. Overall, his scores on the different TOM tasks were lower than those of all normal and than six out of a sample of 10 high functioning autistic children. (p. 46)

Yirmiya et al. (1998) encouraged further research into a possible ToM – AD/HD link at this point by highlighting that:

...individuals with Attention deficit hyperactivity disorder (AD/HD) who have been tested as a comparison group in examining “executive functions” abilities of individuals with autism have not yet been tested on tasks assessing ToM abilities. This group of children with AD/HD may share some of the attentional difficulties experienced by individuals with autism and thus provide important information regarding the role of attention mechanisms in ToM abilities, which are currently missing in the literature. (p. 303)

A series of studies followed in the late 1990s in which small numbers of children with clinical diagnoses including AD/HD were compared on ToM task performance. Buitelaar, van der Wees, Swaab-Barneveld, and van der Gaag (1999) compared a number of clinically diagnosed groups of children and a normally developing group of children all aged between 8- to 18-years. They found that children
with a diagnosis of AD/HD (n = 9) performed significantly lower on second order false belief tasks than the two clinical control groups (conduct disorder and dysthymia) as well as the normally developing groups. Also, the authors note that the children with AD/HD also had lower scores “…to a lesser degree, on first-order ToM and emotion-recognition” (p.48). However, whether or not this ‘lesser degree’ was significant or not is unclear. Overall, their findings led them to further postulate that: “…children with AD/HD are just as impaired on social cognitive tasks as high-functioning children with autism and with PDD-NOS (pervasive developmental disorder – not otherwise specified), especially with regard to second-order mentalizing skills…” (p. 51).

Strange (1999) employed a larger group of 31 children with AD/HD and compared their results to 32 normally developing children, all aged between 5- to 10-years. No significant group differences were evidenced on the maxi false belief task, in fact all but two children scored correctly, one from each group. On both the deceptive box task and second order false belief task, however, the AD/HD children performed more poorly. In something of a turnaround, Charman, Carroll and Sturge (2001) and Dyck et al. (2001) both used Happé’s Strange Stories, a set of naturalistic short vignettes (lie, joke, sarcasm etc.) developed to test ‘higher-order ToM reasoning’. Charman et al. tested 22 boys with a mean age of 8.7 years and diagnosed with AD/HD-C and compared their results to 22 normally developing boys with a mean age 9 years. The AD/HD-C group performed as well as their normally developing counterparts on the stories. Dyck et al., examining the comparative performance of 35 children with AD/HD-I, and 36 normally developing children, found no significant difference. This non-significant finding may have been a result of Dyck et al. utilising a group of AD/HD children with an Inattentive Subtype. This last concern is addressed in the next chapter.
CHAPTER 5

DEVELOPMENT OF A THEORY OF MIND IN YOUNG CHILDREN DIAGNOSED WITH AD/HD: THE WHY AND WHEREFORE OF THE PRESENT STUDY

5.1 Introduction

The purpose of the current chapter is to present: a) the overarching aims of the current study; b) the rationale and significance of the study to the area under investigation; c) the specific hypotheses to be tested; d) the research questions to be addressed; and e) where necessary, specific rationales and analysis considerations will be stated for some hypotheses and research questions. In general terms, the present research has set out to investigate ToM performance in children diagnosed with AD/HD (the clinical group) as compared to children without a diagnosis of AD/HD (the non-clinical group) utilising two age groups (4- to 5-years and 6- to 7-years). The detection of any developmental trends across the two age groups, within each clinical group type regarding performance on the various tasks, is of interest also.

5.2 Aims

The overarching aim of the present investigation is to provide a more comprehensive evaluation of ToM development in young children diagnosed with AD/HD than is presently the case. This will be achieved in a number of ways. Firstly, by restricting the focus with regard to ToM development in the AD/HD group to children diagnosed with either AD/HD-HI or AD/HD-C only. Secondly, by utilising a
larger AD/HD group sample size than has hitherto been the case. Thirdly, by concentrating the AD/HD and non-clinical groups’ ages around the critical period of first and second order ToM attainment between 4- to 6-years of age. Fourthly, by charting the presence of any developmental progression in ToM performance as a function of age and clinical type. Finally, by utilising a comprehensive battery of traditional first and second order tasks and ToM related narrative tasks.

5.3 Rationale and Significance

In the following section the present study’s rationale and the significance of this research to the area under investigation are detailed.

5.3.1 ToM Development in Young Children Diagnosed with AD/HD - Specifying Subtypes

Building on the research regarding individuals with autism and ToM ability, researchers noted the importance of investigating ToM development in other groups with known social impairments and executive functioning difficulties (e.g., Happé & Frith, 1996; Yirmiya et al., 1998). Studies that followed in this area employed groups of children who were conduct disordered, aggressive, hard to manage, experienced attention and impulsivity problems, and were at risk of AD/HD, however, studies employing children diagnosed with AD/HD were missing. Although there have recently been a handful of studies examining ToM development in children diagnosed with AD/HD, the overall results do not present a clear account of these children’s
conception of mind. Part of the reason for this lack of clarity is the neglect of specifying Subtypes.

In only two of the previous studies investigating ToM development in children with AD/HD was the Subtype taken into account. Employing Happé's (1994) Strange Stories task, Charman et al. (2001) examined the comparative performance of children diagnosed with AD/HD-C, whilst Dyck et al. (2001) evaluated the performance of children diagnosed with AD/HD-I. With the exception of Charman et al., and Dyck et al., it appears that the remaining studies in this area have investigated ToM development in children with AD/HD by collapsing across the three Subtypes, suggesting a global form of AD/HD. A main reason for the interest in investigating ToM development in children with AD/HD has been because of their executive dysfunction behavioural characteristics (for e.g., impulsivity) and their well documented social and externalising problems. However, these characteristics do not necessarily characterise all three Subtypes. For instance, during the DSM-IV field trials, Lahey et al. (1994) found that, among clinic-referred children, AD/HD-HI and AD/HD-C groups were rated as more globally impaired than the AD/HD-I group. AD/HD-HI children did not differ from AD/HD-C children on ratings of peer dislike, but both of these groups were more disliked than the AD/HD-I children. In addition, both the AD/HD-HI and AD/HD-C groups received higher ratings than the AD/HD-I group on measures of disruptive behaviour.

Lahey et al.'s (1994) findings were validated by Gaub and Carlson (1997) who found relatively independent areas of impairment for each AD/HD Subtype in their study. Whilst the children in the AD/HD-I Subtype group were impaired in all areas measured (behavioural, academic, and social functioning), they displayed more
appropriate social behaviour and fewer externalising problems than the children in the AD/HD-HI or AD/HD-C groups.

Barkley (1997a; 1997b) suggested that children with AD/HD-HI and AD/HD-C have more difficulty with behavioural persistence, or with sustaining attention, whereas children with AD/HD-I seem to have more difficulty with selective attention. Research suggests problems in response inhibition and motor system control seem to be the core deficit of the former groups (Barkley, 1997a, 1997b; Pennington and Ozonoff, 1996). In fact, Barkley’s (1997b) model of AD/HD is intended to explain HI and C Subtypes only, with behavioural inhibition placed at a central point in its relation to four other executive functions, which are dependent upon it for their effective functioning. More particularly, with regard to the distinctiveness said to exist between the AD/HD-HI and AD/HD-C Subtypes:

... these may simply be separate developmental stages for the same disorder, given that the hyperactive-impulsive behaviour appears to arise first in development... If so, then the diagnosis of AD/HD, Predominantly Hyperactive-Impulsive Type will probably be given primarily to preschool-age children, many of whom will then move into the Combined Type by their elementary school years. (Barkley, 1997a, p. 72)

Further, with regard to the AD/HD-I Subtype:

... it is becoming increasingly evident that this Subtype of AD/HD may not be a Subtype at all, but an entirely distinct disorder having a qualitatively different form of inattention from that seen in AD/HD, and a different pattern of comorbid psychiatric disorders and psychological impairments associated with it. (Barkley, 1997a, p. 72)

In this regard, McBurnett, Piffner, and Frick (2001) found recently that children with AD/HD-I had uniquely elevated sluggish cognitive tempos (i.e., inconsistent alertness and orientation characterised by sluggishness, drowsiness, daydreaming) compared to children with AD/HD-HI and AD/HD-C.
Thus, research examining ToM development in children with AD/HD needs to clearly specify AD/HD Subtypes and avoid having children with AD/HD-I in the same group as children with AD/HD-HI and AD/HD-C as the performance of the former group could be substantially different. Indeed it has been suggested that children with AD/HD-I would be less impaired in their ToM ability than children with AD/HD-HI and AD/HD-C (Petrovski, 1999).

In an attempt therefore to provide some clarification regarding the confusing and sometimes contentious situation alluded to above regarding the ignoring of Subtypes in AD/HD research, the present research focused on children with AD/HD diagnosed with the Subtypes: i) AD/HD-HI or ii) AD/HD-C only. Children whose diagnosis placed them in the AD/HD-I Subtype group were excluded from the study.

5.3.2 Sample Size, Age Sensitivity and Developmental Progression

The current research also addresses limitations inherent in: i) the small sample size of AD/HD groups which has typified previous research in this area, and ii) the previous methodological designs which have overlooked or ignored the critical age periods associated with the attainment of a first and then a second order ToM understanding, focusing instead on older children and/or large age ranges. For example, although Strange (1999) tested a relatively large sample size of 31 AD/HD children on first and second order false belief tasks, the age range was considerable, 5- to 10-years, with a mean age of 8 years. Buitelaar et al.’s. (1999) study utilised not only a large age range (8 – 18 years), but also an older group of children and a sample size of 9. It is very likely that these broad age ranges with a mean of at least 8 years are not sensitive to picking up differences on first order and possibly second order ToM tasks.
With regard to redressing the concern about the small sample size of previous studies, the current study has a combined sample size of 37 children in the AD/HD-HI and AD/HD-C group. With regard to redressing the concern about the use of older children and large age ranges, the present study utilises children in both the clinical and non-clinical groups aged between 4- to 7- years and placed in either the 4- to 5-years age group or the 6- to 7-years age group, both representing critical developmental periods in ToM understanding. This refined critical-age based methodology will also allow for the charting of any developmental progression in the AD/HD group which has hitherto been lacking in the literature.

5.3.3 Using Traditional First and Second Order False Belief Tasks

Traditional first and second order false belief tasks were utilised in the present research. The conceptual similarities of these tasks, and consequently the value of utilising a comprehensive battery and creating composite scores, has been previously stated, however apart from Buitelaar et al’s (1999) study, no studies have incorporated this methodology to measure ToM in children with AD/HD.

The current research incorporated a comprehensive battery of first and second order false belief tasks, thereby allowing participants to produce composite scores that enabled for the possibility of an increase in the range of outcomes and, most importantly, allowed a more stable and representative index of these participants’ overall grasp of ToM understanding. Two outcome measures were derived from the composite scores of the first and second order ToM tasks, namely, ‘First Order Theory of Mind Measure’ and ‘Second Order Theory of Mind Measure’. Specifically, the composite score pertaining to the First Order ToM Measure comprised the unexpected
transfer task, deceptive box task (with and without child involvement), appearance-reality task, and the Sally-Anne task. The composite score associated with the Second Order ToM Measure comprised the two second order false belief tasks, namely, the village task and the beach task.

5.3.4 Narrative, Theory of Mind and Children with AD/HD

Whilst the use of traditional first and second order false belief tasks presents an invaluable component to understanding ToM development in young children, the tasks are limited by their largely socially decontextualised processes (Austingtong & Olson, 1995; Feldman, 1992). The more recent influences of Vygotsky and Bruner’s work on ToM research has led to recontextualising the young child in an intersubjective social world, internalising stories in order to interpret and understand his/her world. Language is seen as a powerful mediating mechanism in the development of goal-directed thought and appreciation of the life of the mind (Vygotsky, 1979; Nelson et al., 2003). According to Schneider and Winship (2002, p. 372): “…narratives are a good context for examining language use in a realistic context. Narratives are a part of everyday life, in casual conversations with others as well as in the more structured setting of school. For this reason they are described as having ecological validity.” Tager-Flusberg and Sullivan (1995) maintain that a major reason underpinning research into narrative discourse, particularly generative style story-telling, is that “…the capacity to narrate builds on an integration of linguistic, cognitive, and social-cognitive capacities, which continue to develop long after early childhood” (p. 242). Capps et al. (2000) concur, stating that because of these reasons and specifically the fact that “…narrative involves both pragmatic language skills and an appreciation of
the role of mental states in predicting and explaining behaviour” (p. 193), researchers have recently begun to analyse narrative practices as a means of investigating atypical development.

Yet no studies have been conducted thus far with young children with AD/HD using a *generative* narrative approach, which requires the child to produce his/her own story in order to explore ToM development. The task chosen by both Charman et al. (2001) and Dyck et al. (2001), namely, Happé’s Strange Stories, utilises an oral recounting by the examiner to the child of various situations which are taken to incur such things as jokes, sarcasm, and appearance/reality distinctions. The child is then required to extract information from the examiner’s stories and to use processes based on inference and integration of this material in order to make a correct response. Happé (1994) notes that the Strange Stories task were designed “...to extend the range of tasks involving theory of mind to a more contextually embedded and realistic form” (pp. 130-131). Whilst agreeing in part with this description, Happé’s task is considered, nonetheless, to fall short in this regard when compared with the *generative narrative approach* employed in the present study. This generative narrative approach provides an even more realistic form of ToM appraisal as it is based on the child’s own narrative responses to dynamic and changing structures of social situations and the spontaneous creation of social situations, as appear before them in the wordless picture book and the line drawings, respectively.

Moreover, there is a paucity of studies conducted into the narrative abilities of children with AD/HD in general; those that have been conducted focus mainly on executive function processes through the methodology of story re-telling tasks (cf. Lorch et al., 1999; Purvis & Tannock, 1997; Tannock et al., 1993). Whilst these studies provide some evidence of comparatively poorer narrative performance on these
re-telling tasks by children with AD/HD (e.g. poorer productivity, causal structure, organising and monitoring), participants’ narrative abilities in the context of ToM development have not been examined.

The current study therefore addresses this limitation by utilising two narrative methodologies: i) by generating a narrative using a wordless picture book and, ii) by generating a narrative from a set of line drawings. The wordless picture book chosen was Mayer’s (1967) *A Boy, a Dog, and a Frog*. Mayer’s books have been widely used to investigate ToM development in individuals with autism (Capps et al., 2000; Tager-Flusberg, 1995; Tager-Flusberg & Sullivan, 1995) and Graham (1990) notes that wordless picture books elicit children’s emerging awareness of narrative structure and cognitive and emotional responses. *A Boy, a Dog, and a Frog* was specifically chosen as it seemed there was less information to process and synthesise (e.g., number of characters) for the children with AD/HD compared to the other books in the series, and yet at the same time long enough for the children to become acquainted with the characters. Also, the story line was easy to follow and, unlike many of the other wordless picture books used which have one dominant theme, for example, Mayer’s *Frog Where Are You?*, the story used in the current study has a distinct theme change part-way through the story (‘boy trying to catch frog’ to ‘frog trying to find boy’) enabling for the possibility of exploring children’s level of mental flexibility within a narrative context.

The line drawing narrative methodology, adapted from Benson (1996), required the child to generate a story incorporating five drawn objects that they are shown on a piece of paper. There is ‘less support’ than the wordless picture book task in the sense that the child does not have a sequence of pictures to guide them through the process of creating a story, they only have 5 unrelated objects. This potentially posits a greater
challenge for the effective use of his/her social-cognitive and language skills. Studies utilising narrative methodology when investigating ToM development have not previously used this approach. It was chosen, along with the wordless picture book task, as the story content generated was taken to reflect the child’s performance in his/her day-to-day social interaction and the demands of this task were seen to potentially conform more closely to those of the kinds of daily interaction experienced by the child due to its less structured context, more dynamic nature, and greater demand for spontaneity.

5.3.4.1 Narrative Variables

For each of these tasks, the ToM related narrative variables investigated were gleaned from the empirical and theoretical literature discussed and evaluated in this thesis. For the wordless picture book task the variables were: i) *internal state terms* (mental, volition, affect expression, emotion), ii) *probed responses* (emotional reference of the story characters, emotional explanation of the story characters’ emotions, mental state reference of the story characters), iii) *narrative structure* (theme, causal statements – mental/emotion, causal statements – action/behaviour, GAO sequences, episodes), iv) *alternative title*, and v) *story elaboration*. The inclusion of the items of story elaboration and alternative title were to assess each child’s ability to appropriately move *beyond* the last scene of the story to appropriately *infer* the actions/thoughts/feelings of the characters; and to appropriately and succinctly express the overall ‘gist’ of the story, respectively (see van Kraayenoord & Paris, 1996). These items form part of ascertaining the child’s overall level of narrative thinking, meaning making and taking into account the listener’s perspective.
For the line drawings task the variables were: i) *internal state terms* (mental, volition, affect expression, emotion), and ii) *narrative structure* (causal statements – mental/emotion, causal statements – action/behaviour, plot structure).

### 5.4 Statement of the Hypotheses and Research Questions

In this section, the hypotheses and research questions for the current study are detailed. Hypothesised predictions are conceptualised based on previous theory and research. Where past research and theory provide little or no direction for clear predictions to be made, research questions have been formulated.

See Figure 5.1 for a diagrammatic overview of the main areas covered in the study. Finally, this section also provides rationales and analysis considerations for the stated hypotheses and research questions of the study when necessary.
A. First Order Theory of Mind Measure (H1; RQs 1 - 3)

↓

B. Second Order Theory of Mind Measure (Hs 2 - 3)

↓

C. A Boy, a Dog, and a Frog Wordless Picture Book

C1: internal state terms measure of the appropriate use of i) volition, ii) affect expression, iii) emotion, and iv) mental state, terms during story-telling (Hs 4.1 – 4.3; RQs 4.1 – 7)

C2: probed responses measure of appropriateness of reply to questions focusing on the three categories of i) emotional reference, ii) emotional explanation, and iii) mental state reference, with regard to the story characters (Hs 5.1 – 5.3; RQs 8.1 – 10.3)

C3: probed responses measure of appropriateness of reply to questions focusing on the generation of i) an alternative story title, and ii) an elaboration of the story’s ending (RQs 11 – 12)

C4: narrative structure measure of the appropriate use of i) theme, ii) causal statements (mental/ emotion), iii) causal statements (action/ behaviour), iv) GAO sequences, and v) episodes (Hs 6.1 – 6.4; RQs 13.1 - 16)

↓

D. Line Drawings

D1: internal state terms measure of the appropriate use of i) volition, ii) affect expression, iii) emotion, and iv) mental state, terms during story-telling (H7; RQs 17 – 19)

D2: narrative structure measure of the appropriate use of i) plot structure, and ii) causal statements (Hs 8.1 – 8.2; RQs 20.1 – 22.2)

Figure 5.1 Major Areas of Study by Task Type and Measure (related hypotheses and research questions in parentheses)
A. First Order Theory of Mind Measure

Research Questions 1 – 3

1. Will there be a significant difference between the 4- to 5-year-old AD/HD and non-clinical groups’ mean total score on the First Order ToM Measure?

2. Will there be a significant relation between clinical group type (6- to 7-year-old AD/HD and non-clinical groups) and performance on the First Order ToM Measure?

3. In the AD/HD group, will there be a significant difference between the 4- to 5-year-olds’ mean total score and the 6- to 7-year-olds’ mean total score on the First Order ToM Measure?

Hypothesis 1

1. In the non-clinical group, there will be a significant relation between age group and performance on the First Order ToM Measure, such that a significantly higher proportion of children in the 6- to 7-year-olds’ group will score perfectly compared to the 4- to 5-year-old group.

B. Second Order Theory of Mind Measure

Hypotheses 2 - 3

2. There will be a significantly higher mean score evidenced by the 6- to 7-year old non-clinical group as compared to that produced by the 6- to 7-year-old AD/HD group on the Second Order ToM Measure.

3. There will be a significant relation between clinical group type (6- to 7-year-old AD/HD and non-clinical groups) and performance on the justification measure, such
that a significantly higher proportion of children in the non-clinical group will provide substantial justifications compared to the AD/HD group.

**C. A Boy, a Dog, and a Frog Wordless Picture Book**

**C1: A Boy, a Dog, and a Frog – Internal State Terms**

**Research Questions 4.1 – 4.3**

Will there be a significant difference between the 4- to 5-year-old AD/HD and non-clinical groups on the number of appropriate internal state terms produced, namely,

4.1. volition;

4.2. affect expression;

4.3. emotion?

**Research Questions 5.1 – 5.3**

Will there be a significant difference between the 6- to 7-year-old AD/HD and non-clinical groups on the number of appropriate internal state terms produced, namely,

5.1. volition;

5.2. affect expression;

5.3. emotion?

**Research Questions 6.1 – 6.3**

Will there be significant developmental progression for children with AD/HD regarding the number of appropriate internal state terms produced, namely,

6.1. volition;
6.2. affect expression;
6.3. emotion?

**Hypotheses 4.1 – 4.3**

There will be significant developmental progression for children without AD/HD regarding the number of appropriate internal state terms produced, namely,

4.1. volition;
4.2. affect expression;
4.3. emotion,

with the older children producing significantly more than the younger children.

**Research Question 7**

7. Will there be a significant relation between clinical group type (AD/HD and non-clinical groups) and the number of appropriate mental state terms produced?

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**C2: A Boy, a Dog, and a Frog – Probed Responses (Internal State Terms)**

**Research Questions 8.1 – 8.3**

Will there be a significant difference between the 4- to 5-year-old AD/HD and non-clinical groups regarding the appropriateness of their answers to the probed questions on the,

8.1. emotional reference of the story characters;
8.2. emotional explanation of the story characters’ emotions;
8.3. mental state reference of the story characters?
Research Questions 9.1 – 9.3
Will there be a significant difference between the 6- to 7-year-old AD/HD and non-clinical groups regarding the appropriateness of their answers to the probed questions on the,
9.1. emotional reference of the story characters;
9.2. emotional explanation of the story characters’ emotions;
9.3. mental state reference of the story characters?

Research Questions 10.1 – 10.3
Will there be significant developmental progression for children with AD/HD regarding the appropriateness of their answers to the probed questions on the,
10.1. emotional reference of the story characters;
10.2. emotional explanation of the story characters’ emotions;
10.3. mental state reference of the story characters?

Hypotheses 5.1 – 5.3
There will be significant developmental progression for children without AD/HD regarding the appropriateness of their answers to the probed questions on the,
5.1. emotional reference of the story characters;
5.2. emotional explanation of the story characters’ emotions;
5.3. mental state reference of the story characters,
with the older children producing significantly more than the younger children.
Research Questions 11 - 12

11. Will there be a significant relation between clinical group type (AD/HD and non-clinical groups) and performance on ability to produce an appropriate alternative title for the book?

12. Will there be a significant relation between clinical group type (AD/HD and non-clinical groups) and performance on ability to appropriately elaborate on the story’s ending?

Research Questions 13.1 – 13.4

Will there be a significant difference between the 4- to 5-year-old AD/HD and non-clinical groups regarding the use of narrative structure components, namely,

13.1. theme;
13.2. causal statements (mental/ emotion);
13.3. causal statements (action/ behaviour);
13.4. GAO sequences?

Research Questions 14.1 – 14.4

Will there be a significant difference between the 6- to 7-year-old AD/HD and non-clinical groups regarding the use of narrative structure components, namely,

14.1. theme;
14.2. causal statements (mental/ emotion);
14.3. causal statements (action/ behaviour);
14.4. GAO sequences?

**Research Questions 15.1 – 15.4**

Will there be significant developmental progression for children with AD/HD regarding the use of narrative structure components, namely,

15.1. theme;
15.2. causal statements (mental/ emotion);
15.3. causal statements (action/ behaviour);
15.4. GAO sequences?

**Hypotheses 6.1 – 6.4**

There will be significant developmental progression for children without AD/HD regarding the use of narrative structure components, namely,

6.1. theme;
6.2. causal statements (mental/ emotion);
6.3. causal statements (action/ behaviour);
6.4. GAO sequences,

with the older children producing significantly more than the younger children.

**Research Question 16**

16. Will there be a significant relation between clinical group type (AD/HD and non-clinical groups) and the number of episodes produced?
D1: Line Drawings – Internal State Terms

Research Questions 17 - 19

17. Will there be a significant difference between the 4- to 5-year-old AD/HD and non-clinical groups on the number of appropriate internal state terms produced (volition, affect expression, emotion and mental)?

18. Will there be a significant difference between the 6- to 7-year-old AD/HD and non-clinical groups on the number of appropriate internal state terms produced (volition, affect expression, emotion and mental)?

19. Will there be a significant developmental progression for children with AD/HD regarding the number of appropriate internal state terms produced (volition, affect expression, emotion and mental)?

Hypothesis 7

7. There will be significant developmental progression for children without AD/HD regarding the number of appropriate internal state terms produced (volition, affect expression, emotion and mental), with the older children producing significantly more than the younger children.
**D2: Line Drawings – Narrative Structure**

**Research Questions 20.1 – 20.2**

Will there be a significant difference between the 4- to 5-year-old AD/HD and non-clinical groups regarding the use of narrative structure components, namely,

20.1. plot structure;

20.2. causal statements?

**Research Questions 21.1 – 21.2**

Will there be a significant difference between the 6- to 7-year-old AD/HD and non-clinical groups regarding the use of narrative structure components, namely,

21.1. plot structure;

21.2. causal statements?

**Research Questions 22.1 – 22.2**

Will there be significant developmental progression for children with AD/HD regarding the use of narrative structure components, namely,

22.1. plot structure;

22.2. causal statements?

**Hypotheses 8.1 – 8.2**

There will be significant developmental progression for children without AD/HD regarding the use of narrative structure components, namely,

8.1. plot structure;

8.2. causal statements,
with the older children producing significantly better structured plots and significantly more causal statements than the younger children.

5.4.1 Rationale and Analysis Considerations for the Study’s Hypotheses and Research Questions

First Order Theory of Mind Section

A two-way ANOVA will not be conducted for the first order ToM data as it is expected that the data will not meet the necessary assumptions. Specifics regarding these data characteristics are outlined below.

Research Question 1: There are a small number of studies looking at the difference in performance between children with and without AD/HD on first order ToM tasks, however as previously stated, no clear picture emerges. Buitelaar et al.’s (1996) study only examined the performance of one 9-year-old boy with AD/HD on first order ToM tasks with results showing no significant impairment and the Buitelaar et al. (1999) study examined the first order ToM performance of 9 children with AD/HD aged 8- to 18-years and it is unclear whether or not a significant difference was found between this group and the non-clinical group. Finally, Strange (1999) found no significant difference in performance between the AD/HD and non-clinical groups on the maxi false belief task, with all but two children scoring perfectly, however she did find that the children with AD/HD performed significantly less well on the deceptive box task (although the actual mean difference appeared quite minimal: $M = 3.42$ vs. $M = 3.97$ out of a possible 5). The children in her study also encompassed a large age range, from 5- to 10-years, with a mean age of 8 years.
Although it was felt in light of the current theoretical literature review that there may be a difference between the 4- to 5-year-old AD/HD and non-clinical group in their performance on this measure, with the former group performing significantly poorer, it was decided to pose a research question due to the overall sparse and disparate empirical findings. In keeping with the logic presented for Hypothesis 1 comments below, it was decided that there would likely be enough variation in the total scores on the First Order ToM Measure for the 4- to 5-year-old children to enable analysis using an independent samples t-test. Therefore, differences between mean total scores will be examined.

**Research Question 2**: Due to the sparse and disparate findings outlined above, a research question is posed for the 6- to 7-year-old children as well. As stated in Hypothesis 1 comments below, it was expected that most of the 6- to 7-year-old non-clinical children would score perfectly on the First Order ToM Measure. This being the case, the current question is stated in a way that would require non-parametric analysis with scores collapsed to investigate perfect vs. imperfect performance on the measure.

**Research Question 3**: As there is no empirical evidence regarding the developmental progression of ToM in young children with AD/HD a research question is posed. In light of the literature review, it was decided there would likely be enough variation in the scores of the 4- to 5-year-old and 6- to 7-year-old AD/HD children to enable the use of the independent samples t-test statistic for analysis. Therefore, differences between mean total scores will be examined.

**Hypothesis 1**: Previous research with normally developing children in the area of social-cognitive ability generally has shown a developmental progression, that is, older children generally display more sophisticated cognitive processes than younger children (Harnishfeger & Bjorklund, 1994; Serra, Loth, van Geert, Harkens, &
Minderaa, 2002). This being the case, it was reasonable to conclude that the same progression would be evidenced amongst the current group of non-clinical children on the First Order ToM Measure. It is predicted that a significantly higher proportion of children in the 6- to 7-year-old group will score perfectly compared to the 4- to 5-year-old group on the First Order ToM Measure. Further, the prediction is stated in such a way that would require non-parametric analysis because it was thought that, although there may be enough variation in the scores attained from the younger age group, this would probably not be the case with the older children. It was expected that most of the older children would score perfectly on the First Order ToM Measure and so the scores would likely be collapsed to investigate perfect vs. imperfect performance on the measure.

**Second Order Theory of Mind Section**

**Hypothesis 2:** Despite the limitations inherent in the handful of studies looking at the difference in performance between children with and without AD/HD on second order ToM tasks (Buitelaar et al., 1996; Buitelaar et al., 1999) and the recursive thinking task (Strange, 1999), the current inquiry is posed as a hypothesis. Limitations of these studies include, being based on one case (Buitelaar et al., 1996) and another with only 9 cases and no clarification of the children’s AD/HD Subtype (Buitelaar et al., 1999). Also, a recursive thinking task (embedded think bubbles task) does not equate to a second order ToM task (see Chapter 2) and again, there was no clarification regarding AD/HD Subtype in Strange’s (1999) study. All these studies however found a significant difference in the performance of children with and without AD/HD, with the former performing significantly poorer. Therefore it is predicted that the children
with AD/HD in the current study will perform significantly more poorly than their non-AD/HD counterparts. Analysis is dependent upon the results. If there is sufficient variation in the distribution of the scores, then the independent samples t-test statistic will be utilised. If the data is largely categorical, non-parametric statistics will be used.

**Hypothesis 3:** Although there is no research investigating differences in performance between AD/HD and non-clinical children on their second order ToM justification responses, given the reasoning above, it is expected that the children with AD/HD will perform significantly poorer than the non-clinical group. Non-parametric statistics will be used to analyse the responses, as they will be categorised.

*A Boy, a Dog, and a Frog* Wordless Picture Book – Internal State Terms, Probed Responses (Internal State Terms), Probed Responses (Alternative Title & Story Elaboration) & Narrative Structure Sections

**Research Questions 4.1 – 6.3 (Internal State Terms); 8.1 – 10.3 (Probed Responses); 13.1 – 15.4 (Narrative Structure):** Although it was felt in light of the current literature review on children with AD/HD and social-information processing (e.g., Crick & Dodge, 1994; Milch-Reich et al., 1999) that children with AD/HD may perform significantly poorer on a number of the narrative variables (e.g., causal statements), it was decided to pose research questions as these studies were not directly examining ToM in a narrative context. Also, there is a lack of research examining the developmental progression of narrative ability in children with AD/HD, hence these inquiries have also been posed as research questions. Two-way ANOVAs will be used to analyse the results.
Research Question 7 (Internal State Terms): The reasons for posing this inquiry as a research question are the same as those above. However, unlike the other three internal state term variables (volition, affect expression, emotion), previous research (e.g., Tager-Flusberg & Sullivan, 1995) has demonstrated that the methodology (wordless picture book) employed in the current study yields few mental state terms. This being the case, it was decided that analysis of this variable would probably be categorical (no mental states vs. one or more mental states) and, so as not to lose statistical power, it was decided to explore differences between the AD/HD and non-clinical groups only and not investigate differences between age groups. Non-parametric statistics will be used to analyse the responses.

Research Questions 11 – 12 (Probed Responses): These inquiries are posed as research questions as virtually no empirical research exists with any groups of children on their ability to produce an appropriate alternative title for a book or elaborate on a story’s ending, and there is certainly no previous research investigating the performance between AD/HD and non-clinical children in these areas. Also, so as not to lose statistical power, it was decided, due to the exploratory nature of the inquiries, to explore differences between the AD/HD and non-clinical groups only and not investigate differences between age groups. Non-parametric statistics will be used to analyse the responses, as they will be categorical.

Research Question 16 (Narrative Structure): This inquiry is also posed as a research question as there is no previous research investigating the performance between AD/HD and non-clinical children on their production of episodes when narrating a story. Previous work (Trabasso & Nickels, 1992) with normally developing children suggests that the emergence of complete episodes increases substantially after the age of approximately 5, with the younger children’s narratives containing very few
episodes. This being the case, it was decided that analysis of this variable would probably be categorical and, so as not to lose statistical power, it was decided to explore differences between the AD/HD and non-clinical groups only and not investigate differences between age groups. Non-parametric statistics will be used to analyse the responses.

Hypotheses 4.1 – 4.3 (Internal State Terms); 5.1 – 5.3 (Probed Responses);

6.1 – 6.4 (Narrative Structure): Previous research in the narrative ability of normally developing children generally shows a developmental progression, that is, older children generally display more sophisticated narrative use and ability than younger children (Schwartz & Trabasso, 1984; Thompson & Myers, 1985; Trabasso & Nickels, 1992; van den Broek, 1997). This being the case, it was reasonable to conclude that the same progression would be evidenced amongst the current group of non-clinical children. Two-way ANOVAs will be used to analyse the results.

Line Drawings – Internal State Terms & Narrative Structure Sections

Internal State Terms Variable: It was decided to create a composite score by adding the number of appropriate volition, affect expression, emotion, and mental state terms in the children’s narratives from the line drawings. This was based on previous research utilising this methodology (cf. Benson, 1996) which analysed the data by collapsing the internal state terms as there were not enough data generated for each individual internal state term to analyse them separately. It was decided that there would probably be enough variation in the distribution of the composite internal state variable scores to conduct a two-way ANOVA.
Causal Statements Variable: It was decided to create a composite score for the causal statements by adding the number of appropriate mental/emotion and action/behaviour causal statements. This was because, unlike the wordless picture book methodology, it was expected that, especially for the younger children, the line drawing methodology would yield fewer causal statements overall (cf. Benson, 1996) due to the task being more demanding on creating a story and the resulting stories being shorter in length. It was decided that there would probably be enough variation in the distribution of the composite causal statements variable scores to conduct a two-way ANOVA.

Research Questions 17 – 19 (Internal State Terms); 20.1 – 22.2 (Narrative Structure): See Rationale and Analysis Considerations for A Boy, a Dog, and a Frog research questions (4.1 – 6.3; 8.1 – 10.3; 13.1 – 15.4) as the same reasoning applies.

Hypothesis 7 (Internal State Terms); 8.1 – 8.2 (Narrative Structure): See Rationale and Analysis Considerations for A Boy, a Dog, and a Frog hypotheses (4.1 – 4.3; 5.1 – 5.3; 6.1 – 6.4) as the same reasoning applies.
CHAPTER 6
METHODOLOGY

6.1 Introduction

The primary purpose of this chapter is to provide a comprehensive presentation of the methodology designed to successfully investigate the specific hypotheses and research questions posed. The study investigates the differences between ToM development in children with AD/HD compared to children without AD/HD (non-clinical) from two separate age groups (4- to 5-years and 6- to 7-years). Further, the investigation of the presence of a developmental progression on the ToM measures is conducted for the two clinical groups (AD/HD vs. non-clinical).

A detailed description of the characteristics of the participants, measures employed, the administration procedures, research design and analysis considerations are discussed for the current research. This chapter demonstrates that an appropriate methodology has been employed to successfully address the research questions and hypotheses. In addition, procedures are described in sufficient detail to enable other researchers to duplicate the methodology employed in this study.

6.2 Participants

A total of 78 children from two age groups, 4- to 5-years of age (n = 28), and 6- to 7-years of age (n = 50), participated in the study. Overall, there were 56 males and 22 females. Thirty seven children had previously been diagnosed with AD/HD-HI or AD/HD-C and were placed in the clinical group. Within this clinical group, there was a
total of 13 (8 males; 5 females) in the 4- to 5-year-old group with a mean age of 5.1 years, and 24 (20 males; 4 females) in the 6- to 7-year-old group with a mean age of 6.8 years. Five of the children in the AD/HD group experienced some language difficulties and three other children had a concurrent diagnosis of oppositional defiant disorder. Of the 41 children placed in the non-clinical group, there was a total of 15 (8 males; 7 females) in the 4- to 5-year-old group with a mean age of 4.9 years, and 26 (20 males; 6 females) in the 6- to 7-year-old group with a mean age of 6.8 years.

6.3 Recruitment

Children with AD/HD were recruited via a number of means. The researcher distributed flyers, sent letters, and spoke with a number of AD/HD parent groups and paediatricians in the west and south-west Sydney region; a flyer regarding the study was posted in the newsletter of the NSW Learning Difficulties Coalition; an advertisement for participants was placed in 'Sydney's Child' magazine – a monthly magazine mainly reaching parents through Sydney schools; a media release was sent to local newspapers in the west and south-west Sydney region which was subsequently printed by three local newspapers (see Appendix B for flyer, letters, magazine advertisement and newspaper articles). The non-AD/HD children were recruited from two pre-schools, a primary school and a 'kids club' (i.e., an afterschool/holiday group for children) located in the same region of Sydney. These control children had no current medical, behavioural, or attentional problems and none were taking psychotropic medication of any kind.
6.4 Confirmation of AD/HD Diagnosis

All children who presented for the study in the AD/HD group had previously been given a diagnosis of AD/HD. Additional background information relating to this diagnosis, and in some cases clarification of the Subtype in relation to the DSM-IV criteria, was based on information from the Conners-March Developmental Questionnaire (Conners & March, 1994) and the AD/HD Rating Scale - IV (home version) (DuPaul et al., 1998) completed by the parent, the Test of Variables of Attention (TOVA) (Greenberg, 1996) completed by the child, information obtained from the child’s paediatrician/ clinical psychologist and previous relevant medical documentation. Through this process, some children were excluded due to ambiguous information, having an Inattentive Subtype or comorbid Asperger’s Syndrome. Children were also excluded, as was the case in the non-clinical group, if they had a full-scale IQ of less than 80, showed evidence of a neurological disorder, were not attending a pre-school (applies to younger children only), had a language disorder or the main language spoken at home was not English. The children remaining in the AD/HD group after the completion of this confirmation process unambiguously met the criteria for a DSM-IV (American Psychiatric Association, 1987) diagnosis of either AD/HD-HI or AD/HD-C.

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8 For the children that constituted the final sample, 86.5% of paediatricians/ clinical psychologists returned information wherein I requested confirmation of the child’s diagnosis in relation to DSM-IV criteria.
9 For the AD/HD group, exclusions were as follows: neurological impairment (3), with one of these children also diagnosed with obsessive compulsive disorder and another also having a low IQ; inattentive subtype (2), with one of these children also having significant speech difficulties; comorbid Asperger’s Syndrome (1); low IQ (1); medication taken before testing and dyslexia (1); ambiguous data regarding AD/HD diagnosis (1); main language spoken at home was not English (1); child uncooperative and therefore unable to collect data during 1st session (1); mother unable to make sessions 2 and 3 (1); child was not attending a pre-school (1). Therefore, there were a total of 12 exclusions (this does not include those that initially inquired but did not proceed to the first session). For the non-clinical group, two children were excluded due to inability to complete the TOVA task.
6.5 Psychostimulant Medication

Thirty-three children in the AD/HD group were receiving psychostimulant medication and this treatment was discontinued 24 hours before testing, a washout period considered to be adequate in previous research (e.g., Cunningham & Barkley, 1979, and Charman et al., 2001), for the three separate occasions that the child was tested.

6.6 Differences and Similarities between AD/HD and Non-Clinical Groups

There were no significant differences in terms of age, sex, IQ or language ability (see Section 7.1 and 7.2 for details). However, as expected, TOVA scores and parent ratings on behavioural functioning, as measured by the AD/HD Rating Scale – IV (home version), clearly differentiated the two groups (see Section 7.2 for details).

All participants lived in suburbs that fell within one standard deviation either below or above the average Index of Relative Disadvantage. The Index of Relative Disadvantage is a measure of socio-economic status that encompasses such indicators as income, educational qualifications and occupations (Australian Bureau of Statistics, 1998). English was the first and only language of each child.
6.7 Measures

6.7.1 AD/HD Rating Scale – IV (Home Version) (DuPaul et al., 1998)

The AD/HD Rating Scale – IV (home version) is a behaviour questionnaire with the 18 items directly adapted from the DSM-IV criteria for AD/HD. Inattention symptoms comprise the odd-numbered items, and Hyperactive-Impulsive symptoms are represented by the even-numbered items. Parents are asked to rate the frequency of each symptom on a four-point likert scale from Never or rarely (0) to Very often (3) that best describes the child’s home behaviour over the previous six months (in accordance with DSM-IV guidelines). The total scale raw score is obtained by adding the Inattention and Hyperactivity-Impulsivity subscale raw scores. The manual indicates that the rating scale has adequate psychometric properties for use as a screening and diagnostic tool (DuPaul et al., 1998). Coefficient alphas were calculated to determine the internal consistency of the scale, with an obtained alpha coefficient of .92 for the total score. Four weeks apart test-retest reliability data were obtained with a Pearson product-moment correlation coefficient of .85 for the total score. Also, subscale scores were found to correlate significantly with questionnaires commonly used in the assessment of AD/HD (i.e., the Conners Parent and Teacher Rating Scales). Parent ratings on the AD/HD Rating Scale-IV (home version) were also demonstrated to discriminate between children with AD/HD and clinic-referred children who did not have AD/HD (DuPaul et al., 1998).
6.7.2 Test of Variables of Attention (TOVA) \textit{(Greenberg, 1996)}

The TOVA is a standardised, normed, well-validated and reliable neuropsychological non-language\textsuperscript{10} continuous performance test (CPT). It was specifically developed for use in screening neurologically-based attentional deficits. The TOVA measures 4 variables: impulsivity (commission errors); inattention (omission errors); variability (consistency of response); response time (speed of information processing).

It presents a single geometric stimulus in either the upper (target) or lower (nontarget) portion of the computer screen and requires the respondent to press a microswitch each time the target is presented during a 22.5 minute trial (for children aged 4- or 5-years the trial lasts 11.5 minutes). It contains 2 test conditions: target-infrequent and target-frequent. In the first half of the test (the target-infrequent half) a target is presented only once every 3.5 non-target presentations. In this half, which is similar to most other CPTs, the task is boring and fatiguing, and the subject has to pay close attention in order to respond to the infrequent targets. When the subject does not respond to a target it is called an error of omission (inattention). In the second half of the test in which targets appear frequently, the subjects are expected to respond most of the time, but they must occasionally inhibit the tendency to respond. When the subject

\textsuperscript{10} Forbes (1998) notes that nearly all commercially available CPTs use letters or numbers as stimuli. This produces an unavoidable confounding between language processing skills and CPT performance. The popular A-X CPT form, in which a response is made only if a specific stimulus (A) is followed by another specific stimulus (X), confounds attention, short term memory and language processing skills. These issues are particularly important because it is frequently asserted that a substantial number of AD/HD children have comorbid learning disabilities. The TOVA was specifically designed to avoid confounding by language processing skills or short term memory problems. In addition, it uses relatively brief stimuli presentations, relatively short inter-stimulus intervals, and lasts much longer than most CPTs. These characteristics are particularly important because they were the parameters identified in Corkum and Siegel's (1993) review as the conditions most likely to differentiate AD/HD and normal children.
responds to the nontarget, it is called an error of commission (impulsivity). The target is presented 20% in the first half of the test and 80% in the second half.

Greenberg (1987) demonstrated that the TOVA variables differentiated attention deficit children from normal children and reflected response to methylphenidate. The manual notes that, with regard to the sensitivity and specificity of the TOVA, equal weighing via summed standardised scores of the TOVA and 10-item Conners Parent-Teacher Questionnaire of 73 children with Attention Deficit Disorder (with and without hyperactivity) and matched normals, correctly classified 85% of normal and 72% of the children with an attentional deficit (15% false positives and 28% false negatives). Discriminant analysis of Connors alone and TOVA variables alone correctly classified 35% and 69% of the children with attentional deficits, respectively. The manual also reports no significant differences for test-retest results in the TOVA variables and notes that the comorbidity of a learning (reading) disorder with an attentional deficit did not significantly affect the TOVA, thus confirming the language-free basis of the TOVA. The TOVA was individually administered according to the suggested guidelines in the manual.

6.7.3 Kaufman Brief Intelligence Test (K-BIT) (Kaufman & Kaufman, 1990)

The K-BIT is a psychometrically sound instrument, being a valid, reliable, standardised, well-normed assessment of intelligence measuring both verbal and nonverbal abilities. It is designed for individuals aged 4- to 90-years. The test takes

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11 The scores obtained from the K-BIT translate well to major intelligence tests: “the inclusion of vocabulary and matrices subtests... facilitates the translation of scores earned on the K-BIT to scores earned by the same person on many current comprehensive intelligence tests... the IQ standard score yielded by the K-BIT and the difference between standard scores earned by an individual on the two subtests bear a conceptual relationship to the global scores that are provided by numerous major intelligence tests for children and adults” (Kaufman & Kaufman, 1990, p.7).
approximately 15 minutes to administer and comprises two subtests, Vocabulary and Matrices. The manual (Kaufman & Kaufman, 1990) reports on the internal consistency of the K-BIT by computing the corrected split-half reliability coefficients for vocabulary, matrices and the K-BIT IQ composite for 14 age groups. Values for vocabulary ranged from .89 - .98 (mean = .92). Matrices split-half coefficients ranged from .74 - .95 (mean = .87). Split-half reliability coefficients for the K-BIT composite were also excellent, with values ranging from .88 - .98 (mean = .93). Test-retest reliability coefficients for four age samples on the vocabulary subtest ranged from .86 - .97 (mean = .94). Coefficients for the matrices subtest ranged from .80 - .92 (mean = .85) and the ranges for the K-BIT IQ composite were .92 - .95 (mean = .94). Overall, the test-retest correlation coefficients support the split-half results, offering strong support for the reliability of all standard scores given by the K-BIT. Intercorrelations between the vocabulary and matrices subtests for 14 age groups were also investigated (Kaufman & Kaufman, 1990). Results indicated moderate intercorrelations with coefficients ranging from .38 - .75 (mean = .59). The manual notes that these results are “low enough to support the unique contribution to the K-BIT of each subtest, but high enough to support their combination to produce the K-BIT IQ Composite” (Kaufman & Kaufman, 1990, p. 58). The manual also describes the process of validating the K-BIT, providing evidence from internal and external analyses conducted by a number of different researchers, of the construct and concurrent validity of the test. Briefly, for construct validity of the K-BIT IQ composite, coefficients ranged from .63 - .80, and for concurrent validity of the composite score, coefficients ranged from .23 (unusually low) - .86. The K-BIT was individually administered according to the manual’s guidelines.

The PPVT-III (Form IIIA) was administered to determine receptive vocabulary. The PPVT-III is a standardised, norm-referenced, untimed, wide-range test requiring the participant to select from four pictures the one that best represents the meaning of a stimulus word presented orally by the examiner. The test is designed for individuals aged 2-and-a-half onwards with testing time averaging approximately 12 minutes. The manual reports satisfactory reliability coefficients computed for the PPVT-III. These include internal consistency (.94), alternate-forms (.94) and test-retest (all test-retest reliability coefficients, corrected for restriction of range, were in the .90s for the four age groups tested) (*Dunn & Dunn*, 1997). Further, the manual discusses evidence of validity for the PPVT-III, specifically, content, construct, internal and criterion. For criterion validity, the corrected correlations between the PPVT-III and various intelligence and language tests ranged from .75 - .90. The test was individually administered according to the manual’s guidelines.

6.7.5 *A Boy, a Dog, and a Frog* Wordless Picture Book

A 30 page wordless picture book titled *A Boy, a Dog, and a Frog* (1967) by Mercer Mayer was used. Participants were shown the book and were told: “I’ve got a book here called ‘A Boy, a Dog, and a Frog’ and it’s a special book because it’s got no words. I will show you the pictures of the book one page at a time and I want you to look at them, you don’t have to say anything, just look at the pictures.”
The researcher then went through the book with the child, slowly turning the pages. At no point did the researcher say anything to the child about the story. Then the researcher went back to the beginning of the book and said: “Now I’m going to go back to the first picture and I will show you the pictures again. This time I want you to tell me a story that goes with the pictures. I am going to tape your story for a girl (if participant is a girl) / boy (if participant is a boy) called Lisa/ John because she/ he has never seen the story and would like to know how the story goes, is that ok?”

Again, the researcher turned the pages for the child as the child told the story. On occasion, some children required prompting to continue the story. These prompts were limited and generally took the form of, “what is going on here?”

It should be noted that the inclusion of mentioning that the story was being taped for another child who had never seen the book before was to minimise the possibility of the child leaving out information in his/her story. This was because it was possible that, if the child was simply telling the story ‘for the researcher’, the child may have assumed that the researcher knew what was happening (as they could see the book), and so not provide as much detail.

6.7.5.1 Probing

Similar to Tager-Flusberg and Sullivan (1995), after the participants told their narratives, the researcher returned to four pages in the book and probed the participants to label and explain the emotional state (‘emotional reference’) for some of the characters. Additionally, participants were probed about what each character was thinking (‘mental state reference’) at the time. Finally, after van Kraayenoord and Paris (1996), participants were asked what they thought happened next after the last picture
in the story (‘story elaboration’) and to create an alternative title for the story (‘alternative title’) in order to assess each child’s ability to appropriately move beyond the last scene of the story and appropriately express the overall ‘gist’ of the story, respectively (see Appendix C for the four pages chosen for probing and last picture).

For each page that the researcher returned to for probing, the first question was one that allowed the child to ‘re-familiarise’ themselves with that part of the story. The complete probe questions were as follows:

"Tell me what is happening in the story here."

"Tell me how the ________ feels"

"Why does the ________ feel ________?"

"Tell me what the ________ is thinking."

(Show last picture of boy, dog, frog sitting on/ in bath) “This is the last picture of the story, but what do you think happens next?”

(Close book and say) “If you wanted to make up another title for this story, what would be a good name for this story?”

On occasion, some children required prompting in answering some of the above questions. These prompts were limited and generally took the form of: “What do you think the ________ could be feeling/ thinking?” “Why do you think the ________ might be feeling that?” “What do you think would be another good name for this story?” For the question regarding what might happen next in the story, if the child responded by saying, for example, “they dried themselves”, the researcher prompted again by saying, “Yes, and what do you think happened after that?” The rationale behind this extended prompting was to try and move the child’s answer beyond the physical setting of the last picture, and this would require a mental representation of what might happen next in the story.
6.7.5.2 Coding of Wordless Picture Book Narratives

6.7.5.2.1 Inter-Rater Reliability Considerations

Where possible inter-rater reliability was assessed by computing the Cohen’s kappa reliability coefficient. However, as kappa can only be computed for square tables in which the row and column are identical, it was necessary to assess inter-rater reliability by computing the Spearman rank correlation coefficient for those variables where this was not the case. Therefore, where it was not possible to compute a Cohen’s kappa reliability coefficient, the Spearman rank correlation coefficient is reported.

Since coding of the four types of internal state terms and the probed responses involved making subjective decisions, 16 (one fifth) of the transcripts were coded by an independent second rater in order to assess inter-rater reliability. Coding the narrative structure devices also involved making subjective decisions and since two raters completed the coding, 16 (one fifth) of the transcripts were coded twice (by a different rater to the first) in order to assess inter-rater reliability.

6.7.5.2.2 Coding of Narratives for Internal State Terms

Each narrative was examined for specific words that represented the following internal states: mental, emotion, volition and affect expression. Refer to Table 6.1 for examples of these terms and the sources used to guide the coding of each internal state term.
Table 6.1

*Internal State Term References and Examples*

<table>
<thead>
<tr>
<th>Mental states – Shatz et al. (1983)</th>
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<tbody>
<tr>
<td>Example: <em>know, think, wonder, dream, forget</em></td>
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<table>
<thead>
<tr>
<th>Emotion – Wellman et al. (1995)</th>
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<tbody>
<tr>
<td>Example: <em>angry, happy, mad, jealous</em></td>
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<tr>
<th>Volition – Benson (1996) and Bretherton &amp; Beeghly (1982)</th>
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<tbody>
<tr>
<td>Example: <em>want, trying, have to, need</em></td>
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<table>
<thead>
<tr>
<th>Affect expression – Bretherton &amp; Beeghly (1982)</th>
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</thead>
<tbody>
<tr>
<td>Example: <em>smile, cry, scream</em></td>
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</tbody>
</table>

6.7.5.2.3 Inter-Rater Reliability for Internal State Terms

The raters reached a high level of reliability: mental state terms ($r_s = .8$), emotion state terms ($\kappa = .9$), volition terms ($\kappa = .9$) and affect expression terms ($\kappa = .8$).

6.7.5.2.4 Coding of Narratives for Probed Responses

There was a total of six times wherein the participant was probed regarding a character. A score of 1 was given each time the participant appropriately labelled the character’s emotional state, with a maximum score of 6. Each time an emotional state was appropriately labelled, the participant’s explanation of the emotional state (‘emotional explanation’) was examined and a score of 1 was given if it were appropriate and a score of 0 if inappropriate. The final score for emotional explanation was represented as a proportion (appropriate explanations divided by total number of explanations) derived from the appropriate emotional labels. Being a proportion score,
the maximum was 1 and the minimum 0. With regard to the thoughts of the characters, a score of 1 was given each time the participant appropriately labelled the character’s thought state, with a maximum score of 6.

The ‘story elaboration’ and ‘alternative title’ variables were scored 1 for an appropriate response and 0 for an inappropriate response. Responses that were considered appropriate for the story elaboration variable were those in which the child appropriately elaborated on the story beyond the last picture of the boy, dog and frog in the bathroom. For example, ‘They keep him for a while and then put him back to the river’ and ‘Well they get out of the bath and start playing together in his room. And the frog tries to hide behind green things so you can’t find him’. Responses that were scored a zero were ones that were inappropriate elaborations, did not move beyond the last picture and/or offered a ‘typical’ story ending phrase. For example, ‘I think the boy doesn’t have any towel to wipe himself with’ (inappropriate), ‘They get out of the bath’ (no evidence of moving beyond the last picture) and ‘They lived happily ever after’ (typical story ending phrase). Examples of responses that were considered appropriate for the remaining variable of alternative title, were ‘The frog who found a home’, ‘The frog hunt’, and ‘The boy who tries to catch a frog’. Responses considered inappropriate were those that clearly did not relate to the story or were in essence identical to the original title, for example: ‘The magic cup’ and ‘The hare and the horse’ (did not relate to the story); ‘A boy, a frog and a dog’ and ‘The dog and the frog’ (similar to original title).
6.7.5.2.5 Inter-Rater Reliability for Probed Responses

Overall, the raters reached a high level of reliability: emotional reference ($r_s = .8$), emotional explanation ($r_s = .6$), mental state reference ($r_s = .7$), story elaboration ($\kappa = 1.0$) and alternative title ($\kappa = .8$).

6.7.5.2.6 Coding of Narratives for Narrative Structure Devices

Several measures were used to assess participant's narrative construction ability. The first of these measures was episode structure. In order to analyse this, the story was broken down into five episodes by adapting the causal network model (cf. Trabasso & Nickels, 1992; Trabasso & van den Broek, 1985) as a general guide. Each episode contained an event, a goal, an attempt, an outcome and a reaction (see Table 6.2). Following is an excerpt from a participant's narrative illustrating a complete episode:

Then the little boy said to the dog to go and then they went onto the log. Then the little boy got the net to try to catch the frog. Then the dog got close to the frog and then the little boy tries to catch him with the net but as soon as the little boy tried to catch the frog in the net, the frog jumped and caught, the little boy caught the dog. Then when the little boy found out that he had caught the dog and the frog had jumped away, the frog got a very angry look. (Episode 3).

A score of one was given for each complete episode present in the participant’s narrative, with a maximum score of five.
Table 6.2

Outline of Episodes for 'A Boy, a Dog, and a Frog' Story

<table>
<thead>
<tr>
<th>EPISODE</th>
<th>PICTURES</th>
<th>STORY OUTLINE</th>
</tr>
</thead>
</table>
| 1       | 1-6      | E: sees frog/finds frog  
G: catch frog  
A: running down hill to get frog  
O: falls in water failing to catch frog  
R: frog annoyed |
| 2       | 7-9      | E: eye to eye with frog in water  
G: catch frog  
A: boy reaches out to get frog  
O: frog jumps away onto a nearby log  
R: boy and dog annoyed/ frog amused |
| 3       | 10-15    | E: frog on log/ boy directing dog in order to trap and catch frog on the log  
G: catch frog  
A: boy and dog sneak up on either side of frog sitting on log  
O: frog jumps off log and boy accidentally catches dog instead  
R: frog annoyed/ boy looking at dog in net, both not happy |
| 4       | 16-23    | E: boy giving up on catching frog  
G: leave frog feeling bad about himself  
A: boy screams at frog  
O: successful – frog now upset  
R: frog sad/ boy angry, gives up and exits |
| 5       | 24-30    | E: frog finds footprints  
G: to find boy and dog so he can play and be friends with them  
A: follows footprints  
O: successful – finds boy and dog in bath, begin to play together, become friends  
R: frog/boy/dog happy |
GAO sequences were also assessed according to the guidelines presented in Table 6.2. Following is an excerpt from a participant’s narrative illustrating a completed GAO sequence:

He went to the pond and wanted to catch a frog. He ran to try and catch him but he couldn’t. He went in the water and the dog did too. (GAO for Episode 1).

For each completed GAO sequence, a score of one was given, with a maximum score of five. The third narrative structure device measured was theme identification. The first component to the theme variable (theme1) is the boy trying to catch the frog and is the main theme of episodes one through the four. The third component to the theme variable (theme3) is the main theme of episode five (approximately one quarter of the book) and is about the frog trying to find the boy. The second component to the theme variable (theme2) is the identification of the transition that causally connects theme1 and theme3. Theme2 occurs at the end of episode four and at the beginning of episode five and involves knowing why the frog is sad and/or why the frog follows the boy home. Following is an example of a participant’s narrative where all three components of the theme variable are represented:

A boy is walking into the garden into a river and he tries to catch a frog and he sees one on a lily pad. He tries to catch it with a net but he falls over on a tree thing and the dog does too. They fall in the river and the lily pad goes away, and the boy umm, gets up out of the water with a bucket on his head. And the net didn’t fall in the water. He’s trying to catch it with his hands but he couldn’t because the frog went away and he went onto the trees and the boy was mad. And he said ‘we have to go because we can’t catch the frog’ but first, he tried to do it again. And he tried to catch it and he caught his dog. And while he was taking the dog out, the frog was mad and they were sitting on a log. And he said ‘we’re going now’. And the frog felt sad. They went to their house again and the frog got even sadder. He stumped away from the garden into his home. The frog was sad sitting on a rock. The boy went into the house and the frog followed him because he wanted to see him again. The boy was in the bath and the frog
was still looking for him. And then the frog went into the bathroom and he saw the dog and the boy. The frog jumped into the bath. The frog and the dog and the boy were happy.

Each theme component received a score of zero if absent and a score of one if present. The final score for the theme variable consisted of summing up the individual theme scores (maximum score = 3).

The final narrative structure device assessed was *causal statements* and included those statements in which the narrator infers the cause or motivation for certain events. In line with Capps et al. (2000) two categories of causal statements were coded, those that related to mental/emotion events and those that related to action/behaviour events (see Table 6.3 for examples of these causal statements taken from the participants’ narratives). A score of one was given for each appropriate causal statement present in each participant’s narrative. Two final scores were created by summing up the number of causal statements (mental/emotion) and causal statements (action/behaviour), respectively.

Table 6.3

*Causal Statement Examples*

<table>
<thead>
<tr>
<th>Mental/Emotion</th>
</tr>
</thead>
</table>
| “…and then he was really sad ‘cause he thought the boy was going to walk away”.
| “…the boy is very disappointed that he missed it”.
| “…the dog’s ears are down ‘cause he’s sad too for the boy”.

<table>
<thead>
<tr>
<th>Action/Behaviour</th>
</tr>
</thead>
</table>
| “…he saw footprints and so he followed the footprints”.
| “And the little boy is pointing to the right and so the dog goes right”.
| “…the boy’s just sitting up on the tub ‘cause he’s finished having a wash”.

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6.7.5.2.7 Inter-Rater Reliability for Narrative Structure Devices

Apart from the theme2 variable, which showed a moderate level of agreement, the inter-rater reliability results for the narrative structure variables indicate excellent agreement beyond chance: GAO sequences (κ = .7), theme1 (κ = 1.0), theme2 (κ = .6), theme3 (κ = 1.0)), causal statements (mental/ emotion) (κ = .8), episodes (rs = .9) and causal statements (action/ behaviour) (rs = .8).

6.7.6 Line Drawings

Adapting Benson’s (1996) narrative methodology, participants were shown an A4 page with five line drawings on it (see Appendix D for drawings shown). The drawings consisted of a girl, cat, bag, turtle, and a ball. The drawings were arranged in such a way as to minimise inferences about the relationships among the drawings. Each child was tested individually. Upon showing the page to the child, the researcher explained: “I have five drawings here on this sheet – a drawing of a girl, a cat, a bag, a turtle and a ball (the researcher points to each item as it was named). What I would like you to do is to make up a story using all of these things, that is, the girl, the cat, the bag, the turtle and the ball (the researcher again points to each item as they are named). I’m going to give you some time now to think up a story and when you’re ready to tell me your story, say, ‘I’m ready’. ” On occasion, some children required prompting in telling the researcher when they were ready to begin. When the child indicated that he/she ready to begin his/her story, the researcher said: “Ok good. Now I’m just going to tape it so I can remember your story if that’s ok? Ok you can begin your story now.”
6.7.6.1 Coding of Line Drawing Narratives

6.7.6.1.1 Inter-Rater Reliability Considerations

Where possible inter-rater reliability was assessed by computing the Cohen’s kappa reliability coefficient. However, as kappa can only be computed for square tables in which the row and column are identical, it was necessary to assess inter-rater reliability by computing the Spearman rank correlation coefficient for those variables where this was not the case. Therefore, where it was not possible to compute a Cohen’s kappa reliability coefficient, the Spearman rank correlation coefficient is reported.

Since coding of the four types of internal state terms and narrative structure devices involved making subjective decisions, 16 (one fifth) of the transcripts were coded by an independent second rater in order to assess inter-rater reliability.

6.7.6.1.2 Coding of Narratives for Internal State Terms

The same coding procedure as outlined for the wordless picture book (see Section 6.7.5.2) was used.

6.7.6.1.3 Inter-Rater Reliability for Internal State Terms

The raters reached a high level of reliability: mental state terms (κ = .8), emotion state terms (κ = .9), volition terms (κ = .9) and affect expression terms (r_s = .7).
6.7.6.1.4 Coding of Narratives for Narrative Structure Devices

Several measures were used to assess participants’ narrative construction ability. The first of these was *plot structure* and was assessed using guidelines set out by Benson (1996) that were primarily influenced by Leondar’s (1977) investigation on emerging competence in story construction. Each narrative was assigned to one of the following levels of plot structure complexity; a) if a narrative was produced that had no temporal sequence of events, it was designated a ‘description’; b) a narrative that predominately consisted of a temporal sequence of events was designated a ‘sequential’; c) narratives with a sequence of events were examined for the presence of all four phases of Leondar’s primary narrative: a state of equilibrium, a disruption of that equilibrium, an action or set of actions to counter the disruption, and a new stage of equilibrium. Those narratives having all four phases were classified as ‘primary plotted’. In line with Benson (1996), the disruption and actions to counteract it did not have to involve a conflict. A disruption was defined minimally as being an event that was out of the ordinary. Examples of complete narratives invented by some of the participants representing the different plot structures are shown in Table 6.4.
Table 6.4

Examples of Plot Structure

| Description | “A bag, a girl, and a cat and a turtle. They went out, out to play soccer”.
|             | “Cat, the person, the turtle umm the bag. Umm the ball. That’s the end of the story”. |
| Sequential  | “The girl was gonna pack her bag and she’s gonna put the ball and the turtle in and she’s getting ready to go to school and she’s put it on her shoulder and she’s going to go to school with the cat walking next to her all the way to school”. |
|             | “Once upon a time there was a girl who had a cat. When she went down the pond she found a turtle in the pond and when, and on her way back, she found a ball and a bag in the gutter”. |
| Primary Plotted | “Once upon a time there lived a girl called Suzie. She had a cat and a turtle. One day it was her grand final for basketball so she got her bag and put a ball, her basketball in the bag, her turtle in the bag, put the bag on her back and carried the cat. So she walked, she got into her car and drove along. And then the cat started to scratch something ‘cause it could smell something that Suzie did not tell her about. Then she scratched it open and played with the tortoise, tossing it up the roof and back. Then Suzie thought she was, and Suzie thought she was playing with the ball, so she left her. But when she got back, the cat and the turtle were screaming so she took the turtle, left the cat in the car, took her bag and the ball. And she said, “goodbye kitty” and threw it onto the road. The end. And they lived happily ever after”. |

The final narrative structure device assessed was causal statements and the coding procedure was the same as that for the wordless picture book (see Section 6.7.5.2)

6.7.6.1.5 Inter-Rater Reliability for Narrative Structure Devices

Apart from the causal statement (action/behaviour) variable which showed a moderate level of agreement, the inter-rater reliability results for the narrative structure variables indicate excellent agreement beyond chance: descriptive narratives ($\kappa = .8$),
sequential narratives ($\kappa = .8$), primary plotted narratives ($\kappa = 1.0$), causal statements (action/behaviour) ($r_s = .6$) and causal statements (mental/emotion) ($r_s = .8$).

6.7.7 First Order ToM Measure

In line with previous research (e.g., Capage & Watson, 2001; Foote & Holmes-Lonergan, 2003; Lalonde and Chandler, 1995) a ToM composite score was created by summing the correct responses across all ten of the first order ToM measures described below to produce a ‘First Order Theory of Mind Measure’. This enabled the possibility of an increase in the range of outcomes on the First Order ToM Measure and, most importantly, allowed a more stable and representative index of these participants’ overall grasp of ToM understanding.

6.7.7.1 Unexpected Transfer Task – Wimmer and Perner (1983). Measures 1 and 2

Children are shown 2 figures (Matthew$^{12}$ and his mother) and are told that they have just returned from a shopping trip having bought, amongst other things, a packet of sultanas$^{13}$, which are placed in a blue$^{14}$ toy cupboard. Later, unbeknownst to Matthew, who is out of the room playing outside, the sultanas are transferred to the green toy cupboard by mother who used some in her cooking. Matthew then wants to have some sultanas and just as he is about to enter, the children are asked three control

12 The name was changed from Maxi to Matthew as it was thought that this name would generally be a more familiar one to the young children in the present study.

13 In line with Lalonde and Chandler’s (1995) thinking where they substituted real chocolate for ‘pretend’ chocolate because “it is often difficult to get any kind of straight answer from young children in the presence of chocolate” (p. 176), and also due to the fact that a number of AD/HD children are discouraged from eating chocolate, pretend chocolate was substituted for pretend sultanas in the present study to reduce this potentially disruptive salient effect.

14 Children were first asked the colour of each of the two cupboards to ensure correct colour vision. All children answered correctly.
questions: (1) where the sultanas used to be; (2) where they are at the moment; and, (3) whether or not Matthew had seen them being moved. Following the control questions, two false belief questions were asked in counterbalance: “Where will Matthew think the sultanas are when he comes back?” and the ‘conversationally-supported’ test question: “Where will Matthew first look for the sultanas when he comes back in?” Emphasis is placed on first to help rule out the possibility that children may interpret the question “Where will Matthew look for the sultanas?” as meaning “Where will Matthew eventually find the sultanas?” (Siegal & Beattie, 1991; Peterson & Siegal, 1995). A score of one was given for each correct response to the false belief questions.

6.7.7.2 Deceptive Box Task - Gopnik and Astington (1988). Measures 3, 4 and 5

There are three parts to this task (representational change, false belief, appearance-reality) yielding three separate ToM scores. Children are shown a closed rice bubbles\textsuperscript{15} box and asked about its contents. Representative change: “What do you think is inside this box?” The children are then shown the true contents of the box (pencils) and asked, “Now what do you think is inside this box?”. Following these two questions, the critical test question, taken from Lewis and Osborne (1990) was asked: “What did you think was inside this box before we took the top off?”. False belief: Instead of being asked about their own beliefs, the children are asked what a naïve puppet character, Harry the kangaroo, would think is in the box. Children were first told that “Harry hasn’t seen inside this box” and were then asked the critical false belief question: “What will Harry think is inside this closed box before we take the top

\textsuperscript{15} This minor variant of using a single-serve rice bubbles packet instead of the smarties packet was due to the fact that some children with AD/HD are discouraged from eating chocolate and therefore may either be unfamiliar with the packaging, or the presence of a smarties box may unduly excite and distract them.
off?”. Appearance-reality: Appearance – “Does it look like this box has pencils in it or does it look like it has rice bubbles in it?” Reality – “What’s really inside this box? Are there really pencils inside it, or are there really rice bubbles inside it?” A score of one was given for a correct response to the critical representational change question and the false belief question. For the appearance-reality part, a score of one was given if the child correctly answered both the appearance and reality questions only.

6.7.7.3 Deception Task with Child Involvement – Lalonde and Chandler (1995).

Measures 6 and 7

Children were encouraged to ‘trick’ a puppet (Harry) by relocating some pencils16 from one container to another when Harry was absent. Children were first shown the two containers and asked what colour they were (purple and blue). Harry then entered and placed some pencils in the purple container and exited again. At this point, with Harry nowhere in sight, the children were told: “Now Harry has gone. I want you to help me play a trick on Harry. Let’s hide the pencils from him”. The children were asked to choose a spot, and if they happened not to choose the blue container, which only occurred in a small number of instances, they were encouraged to do so. At this point, the children were asked the three control questions: (1) where the pencils used to be; (2) where are they at the moment; and, (3) whether or not Harry had seen them being moved. Coinciding with Harry’s return, children were asked the two false belief questions in counterbalance: “Where will Harry think the pencils are when he comes in?” and “Where will Harry first look for the pencils?” A score of one was given for each correct response to the false belief questions.

16 Again, lollies were substituted for pencils to reduce possible distractions.
6.7.7.4 Appearance-Reality Task – Flavell et al. (1992). Measures 8 and 9

The current task focused on psychological appearance-reality discrepancies. The participant was firstly told: "Now we are going to look at some pictures of children and hear some stories about them. You need to listen carefully to remember these stories". Immediately following this, the participant was shown a photograph of a child with a neutral expression and told a short story about how this child was very nice or very mean. The participant was then told that the child in the photograph had an operation, which temporarily made the child look the opposite of what he or she was really like. At this point the participant was shown a new photograph of the same child looking the way the operation made him/her look. The participant was then asked whether the child looked nice or mean (appearance question) and whether the child really and truly was nice or mean (reality question). Four pairs of colour photographs of children’s faces were used (see Appendix E for photographs). Two pairs (one female pair and one male pair) showed a child with a neutral expression in one photograph, and the same child with a nice expression in the other (smiling, friendly). Each of the other two pairs (one female pair and one male pair) showed a child with a neutral expression in one photograph and a mean expression in the other (scowling, threatening). Therefore, the four pairs were female neutral-mean, female neutral-nice, male neutral-mean and male neutral-nice. Story and appearance were paired in the following ways: nice story and mean appearance male; nice story and mean appearance female; mean story and nice appearance male; mean story and nice appearance female. Unlike Flavell et al’s (1992) study where children were given all four combinations, each child in the present study was given only two stories; one nice story/mean appearance and one mean story/nice appearance. Therefore the stories were
balanced in the following way: participant 1 – mean story/boy and nice story/girl; participant 2 – nice story/boy and mean story/girl; participant 3 – mean story/girl and nice story/boy; participant 4 – nice story/girl and mean story/boy, and then back to the beginning. Finally the child was tested for memory of the original story. The researcher showed the child the original picture (neutral) and asked, “What did Andrew (or Kelly) do at school?” “Do you remember what he (or she) did in the story I told you?” If a child gave an incorrect answer, the researcher briefly summarised the behaviours described in the story and then encouraged the child to try to remember what the child did in the next story.

6.7.7.5 Sally-Anne Task – Baron-Cohen et al. (1985). Measure 10

Children are introduced to two doll protagonists (Sally and Anne) and they are then asked to name each doll to ensure they knew which was which. Both Sally and Anne have a container next to them and Sally places a marble in her container and then leaves the scene. The marble is transferred by Anne and hidden in her container. Upon Sally’s return, the researcher asked the child the critical belief question, ‘Where will Sally first look for her marble?’ followed by two control questions, ‘Where is the marble really?’ and ‘Where was the marble in the beginning?’

All children were administered the tasks in the First Order ToM Measure. This took approximately 30 minutes (see Appendix F for scripts of each task).
6.7.8 Second Order ToM Measure

It was decided to again create a composite score by summing the correct responses across the two second order ToM measures described below to produce a ‘Second Order Theory of Mind Measure’. The same reasons, as previously described in the section for the First Order ToM Measure applied. The justification responses from each story (total of 2) were firstly rated individually as described in the ‘Village task’ below and then each child’s two responses were categorised accordingly:
a) no justification (where the child had two zero order ratings)
b) some justification (where the child had either one zero order rating or two first order ratings)
c) substantial justification (where the child had either two second order ratings or one second order and one first order rating).

6.7.8.1 Village Task - Baron-Cohen (1989), Measure 1

This task examined children’s understanding of second order beliefs. The task utilised a toy village, which was set up on a table, as outlined by Baron-Cohen (1989), with the researcher and child sitting opposite each other as the story was told. During the story, the researcher moved the toy characters as appropriate. The child was firstly introduced to three doll protagonists the ice-cream man, Matthew and Joanne17 and then asked to name each doll to ensure they knew which was which. The child was then told the story with the three main characters (Matthew, Joanne, ice-cream man)

17 The original Baron-Cohen (1989) task used the names John and Mary. It was thought that Matthew and Joanne would generally be names that were more familiar to the young children in the present study. Further, they were names that were used in a number of different tasks to make it simpler for the children.
and two main locations (park and church). The story contained five prompt questions within it to ensure the child understood what was happening along the way. Following the story, each child was asked the critical test question: ‘Where does Joanne think Matthew has gone to buy ice-cream?’ and a justification question ‘Why does she think he has gone to the ______?’ Two control questions followed these questions: ‘Where did Matthew really go to buy his ice-cream?’ and, ‘Where was the ice-cream man in the beginning of the story?’ A score of 1 was given for a correct answer to the critical test question. For the justification question, responses were coded according to Baron-Cohen (1989) into one of three categories of belief attribution (second order, first order or zero order) according to whether the child took account of:

a) both characters’ beliefs (second order)

b) one of the characters’ beliefs (first order)

c) neither of the characters’ beliefs (zero order).

6.7.8.2 Beach Task – adapted from Baron-Cohen (1989). Measure 2

This task also examined children’s understanding of second order beliefs. It used part of the same toy village as the previous task however the two main locations were the park and the beach, rather than the park and church, and the three main characters were a group of friends (Peter, Matthew and Joanne). The researcher sat opposite the child as the story was told. During the story, the researcher moved the toy characters as appropriate. The child was firstly introduced to the three doll protagonists, Peter, Matthew and Joanne and then asked to name each doll to ensure they knew which was which. The child was then told the story. The story also contained seven prompt questions. Following the story, each child was asked the
critical test question: ‘Where does Peter think Joanne has gone to play ball?’ and a justification question ‘Why does he think she has gone to the ____?’ Two control questions followed these questions: ‘Where did Joanne really go to play ball?’ and, ‘Where were Joanne and Matthew going to play ball in the beginning?’ A score of 1 was given for a correct answer to the critical test question. For the justification question, responses were coded using the guidelines stated in the Village task.

Only children in the 6- to 7-year range (inclusive) were administered the tasks in the Second Order ToM Measure, taking approximately 15 – 20 minutes to complete (see Appendix G for scripts of each task).

6.7.9 Child Background Information

Relevant background information from each child was gathered by asking parents to complete a number of questions. The information gathered included: child’s name, date of birth, sex, whether the child had any learning disabilities, medication details, ethnic background, language spoken at home, residing suburb, occupation and level of education of parents, and sibling details.

6.7.10 Connors-March Developmental Questionnaire (CMDQ) (Conners & March, 1994)

The CMDQ presents as a booklet for parents of children and adolescents referred for AD/HD to fill in. It allows parents to provide clinically useful information for child assessment purposes and covers the following: description of problem(s);
home environment; treatment history; birth history; motor development; medical and psychiatric history; school behaviour and performance; history of family and child; temperament; and, medical history.

6.8 Procedure

Consent to conduct the current research was obtained from the University of Western Sydney Ethics Review Committee (Human Subjects). Written parental/guardian permission to participate was obtained for all children taking part in the study, as was verbal child consent at the time of test administration.

6.8.1 AD/HD Group

Parents/guardians initially phoned in response to newspaper articles/advertised and leaflets handed out to parent group organisations and paediatricians regarding the research. During the phone call the researcher explained the study in more detail and answered any questions the parents/guardians had in relation to the research. Those parents/guardians who desired their child to be a part of the research were asked preliminary questions to ascertain if their child was appropriate for the research. Once this was established, it was explained to the parent that their child would be tested over three separate sessions and a time was set for session one. The preferred location for testing each child was a room on the university grounds for the three sessions. However, as not all parents were able to get to the university for the three sessions, some of the children were tested at their home in a quiet area for
sessions one and three (session two was always at the university as the TOVA, which was on a computer, was not portable at this time).

Therefore, each AD/HD child was tested on three separate occasions as opposed to the non-clinical group who were tested over two sessions. It was decided to spread the tasks over another session for the children with AD/HD due to variables such as lack of attention and sustainability. This assisted in ensuring an environment that gave the children with AD/HD every possible chance to perform well on these tasks.

During the first session the K-BIT and ToM tasks were administered. During the second session the TOVA was administered and children aged 4 and 5 were also given the PPVT-III as their TOVA test only went for 11.5 minutes. In the final session the wordless picture book and line drawings tasks were administered and audiotaped. Further, the PPVT-III was administered to children aged 6- and 7-years.

Approximately one hour was required for session one. Sessions two and three required approximately 45 minutes each. Younger children required less time on sessions one and three because they were not administered the second order ToM tasks and, due to their developmental level, they were usually tested on less material in the K-BIT. Further, they were tested on the PPVT-III in session two.

The ToM tasks were administered in the following order (for both the AD/HD and non-clinical groups):

a) The unexpected transfer task – adapted from Wimmer and Perner (1983).


c) Deception task with child involvement – adapted from Lalonde and Chandler (1995).
d) Village Task - Baron-Cohen (1989) (A second order false belief task, therefore only 6- and 7-year-old children were administered this task).

e) Appearance-Reality task – Flavell et al. (1992).

f) Sally-Anne task – Baron-Cohen et al. (1985).

g) Beach Task – adapted from Baron-Cohen (1989) (A second order false belief task, therefore only 6- and 7-year-old children were administered this task).

The tasks overall were not counterbalanced due to the fact that questions and stories within some of these tasks required counterbalancing. Therefore, to ensure accuracy occurred at the ‘within task’ level, it was decided not to do the additional counterbalancing of the tasks overall.

At all times, children were encouraged to have breaks from the testing when they felt like it. The three testing sessions were always conducted within a four-week period for each child.

At the beginning of session one, parents were again informed of the research and asked to sign a consent form (see Appendix H). Parents/guardians were also asked if they would give the researcher permission to contact the professional(s) (paediatricians and psychologists) who had provided the diagnosis of AD/HD for their child. In all cases parents/guardians agreed and were asked to sign a ‘request for information’ form (see Appendix I for request for information form and example of letter sent to professionals to assist in confirming each child’s diagnosis). While the child was completing session one tasks, the parent/guardian was in another area completing the AD/HD Rating Scale - IV (home version), the Connors-March Developmental Questionnaire and child background information questions.
6.8.2 Non-Clinical Group

A letter explaining the research along with a parental/guardian consent form (see Appendix J), reply paid envelope (to the researcher), and a form for the parent to fill in containing i) child background information questions and, ii) the AD/HD Rating Scale - IV (home version), was sent home with children who were between 4- to 7-years of age, from the selected pre-schools, primary school and kids club. There was opportunity for parents to contact the researcher in order to ask any questions and discuss the research in more detail.

Apart from six children who were tested in a quiet area at their home, the testing sessions were conducted individually and in a quiet area on the school/ pre-school/ kids club premises. Each child was tested on two separate occasions. During the first session the following measures were administered: K-BIT; ToM tasks; and, PPVT-III. During the second session the TOVA was administered along with the wordless picture book and line drawings tasks. The narrative tasks were audiotaped.

Approximately one-and-a-quarter-hours were required for the first session and one hour for the second session. Younger children required less time because they were not administered the second order ToM tasks and, due to their developmental level, they were usually tested on less material in the K-BIT and PPVT-III. Further, the TOVA test was administered for only 11.5 minutes for children aged between 4- to 5-years. The two testing sessions were always conducted within a four-week period for each child.

A research assistant, who was a student in the masters of educational psychology program, administered the tasks to some of the primary school children.
Training for the research assistant consisted of 2 two-hour sessions in which procedures for administering the tasks were explained, administration practice took place and written instructions were given. The researcher administered the K-BIT, ToM tasks and the TOVA, whilst the student administered the PPVT-III, wordless picture book and the line drawing tasks. The researcher and research assistant conducted their testing in different areas of the school.

For session one, half the children were tested on the K-BIT and ToM tasks first whilst the other half received the PPVT-III first. For the second session, half the children were tested on the TOVA first whilst the other half received the wordless picture book and line drawings first. Testing was arranged in this way so that the researcher and research assistant were testing concurrently. At all times, children were encouraged to have breaks from the testing when they felt like it.

6.9 Research Design

A quasi-experimental design was employed in the current study. Firstly, a between groups (AD/HD group vs. non-clinical group) analysis was used to investigate differences in ToM ability between the children in the AD/HD group and the non-clinical group of children. Secondly, a cross-sectional analysis was used to investigate the developmental progression in ToM understanding, if any, across the two age ranges 4- to 5-years and 6- to 7-years, within each clinical type group. The two independent variables were: i) clinical type with two levels, namely, children diagnosed with AD/HD HI or C (the clinical group) and normally developing children (the non-clinical group), and ii) age group with two levels, namely, 4- to 5-years and 6-to 7-years. The dependent variables were, firstly, scores coming from a battery of
traditional measures of first order and second order ToM tasks, and secondly, scores emerging from performance on narrative tasks associated with a) the wordless picture book, *A Boy, a Dog, and a Frog*, and b) line drawings. The K-BIT, PPVT-III and TOVA were administered to assess the children’s levels of intellectual, language and neuropsychological functioning, respectively, whilst the AD/HD Rating Scale – IV (home version) assessed their behavioural functioning. As well, the TOVA, the AD/HD Rating Scale – IV (home version), and the Connors-March Developmental questionnaire, when taken together, provided an additional source of validation for the AD/HD diagnosis for the children in the clinical group. Collateral information pertaining to each child’s demographic characteristics was obtained from the child’s parent or guardian.

6.10 Analysis Considerations

Data were analysed using SPSS for Windows. For a description of the coding procedures for the qualitative data (e.g., narratives), refer to the measures section of this chapter.

6.10.1 Main Statistical Technique for First and Second Order ToM Tasks

As previously explained, the data pertaining to these tasks was best analysed using either t-tests for independent samples or, when there was not enough variation in the scores, chi-square tests. Where necessary, the application of the Bonferroni adjustment of alpha level to correct for possible Type I error (Huck & Cormier, 1996; Huberty & Morris, 1989) was utilised.
6.10.2 Main Statistical Technique for Narrative Tasks

Two-way between-subjects analysis of variance (ANOVA) was the main statistical technique utilised as the analysis involved four means and two independent variables. A two-way ANOVA always involves two independent variables and each of these variables has two or more levels (Huck & Cormier, 1996). The two independent variables in the current research each had two levels; clinical group type (AD/HD vs. non-clinical) and age (4- to 5-year-olds vs. 6- to 7-year-olds). As the two-way ANOVA statistical technique involves only one dependent variable, when multiple dependent variables were present in a given data set being analysed, multiple two-way ANOVAs were utilised with the application of the Bonferroni adjustment of alpha level to correct for possible Type I error (Huck & Cormier 1996; Huberty & Morris, 1989). As a follow-up to analyses that produced a significant interaction effect, a Scheffe test was conducted across the four groups created by age x clinical group type (Tabachnick & Fidell, 2001).

6.10.3 Assumptions of Inferential Testing and Non-Parametric Equivalents

Although it is not uncommon for research in the area of psychopathology to use inferential techniques with relatively small and uneven sample sizes as gaining participants with a required disorder is usually a difficult task, the assumptions of a chosen statistical technique still need to be adhered to. In the current research, because the cell sizes were relatively small and uneven, the assumptions of homogeneity of variance and normality were of concern. Therefore, in all the analyses, these assumptions were checked for. Specifically, the homogeneity of variance assumption
was computed using the Levene's Test of Equality of Error Variances. Where necessary, the data were corrected to allow the use of the two-way ANOVA statistic. These corrections are described in detail in the results chapter where appropriate. In a small number of cases where the data did not allow for the use of inferential statistical techniques, for example, due to an insufficient variation in the distribution of scores, then an appropriate non-parametric technique was substituted.

6.10.4 Two-Way ANOVA vs. MANOVA

The research questions posed in the current study were most appropriately addressed utilising the two-way ANOVA statistical technique over the multivariate analysis of variance technique (MANOVA). It was not of concern in the current research to pursue results regarding outcome variable selection or ordering, or in variable system structure. Also, with regard to the idea of conducting a MANOVA before multiple ANOVAs to control for Type I error:

We consider to be a myth the idea that one is controlling Type I error probability by following a significant MANOVA test with multiple ANOVA tests, each conducted using conventional significance levels. Furthermore, the research questions addressed by a MANOVA and by multiple ANOVAs are different; the results of one analysis may have little or no direct substantive bearing on the results of the other. To require MANOVA as a prerequisite to multiple ANOVAs is illogical, and the comfort of statistical protection is an illusion (Huberty & Morris, 1989, p. 307).
6.10.5 Type I and Type II Errors

As previously mentioned, the two-way ANOVA statistical technique involves only one dependent variable and so when multiple dependent variables were present in a given data set being analysed, multiple two-way ANOVAs were utilised with the application of the Bonferroni adjustment of alpha level to correct for possible Type I error (Huck & Cormier, 1996; Huberty & Morris, 1989). Further, when two-way ANOVAs were not employed for data analysis, as was the case with the data from the First and Second Order ToM Measures, the Bonferroni adjustment was still applied according to the number of analyses required. For example, with the First Order ToM Measure data there were four separate analyses, therefore the alpha level of .05 was divided by 4.

In some instances it was of more importance to protect against making a Type II error, that is, assuming no significant difference when a significant difference actually does exist. In analysing the performance of children with AD/HD versus children without AD/HD on measures such as language, intelligence and narrative length, it was considered important to ensure that no differences did exist, allowing greater confidence in the ToM related results. Where protection against making a Type II error was considered important, it is clearly stated and alpha is set at .10 instead of the conventional .05.
CHAPTER 7
RESULTS

7.1 Chronological Age and Sex

To ensure there were no significant differences between the AD/HD and non-clinical group that could be attributable to chronological age, independent sample t tests were performed with alpha set at .10 to avoid a Type II error. For the 4- to 5-year-old children, a t test showed no significant differences between the AD/HD group (M = 5.14, SD = .59) and the non-clinical group (M = 4.86, SD = .42), t = 1.48, p = .15. There was also no significant difference between the 6- to 7-year-old AD/HD (M = 6.84, SD = .67) and non-clinical group (M = 6.88, SD = .61), t = -.19, p = .85.

There was no significant relation between the clinical group type the child was in (AD/HD vs. non-clinical) and whether they were male or female as shown by chi-square analyses for the 4- to 5-year-olds ($\chi^2 (1, N = 28) = .62, p = .43$) and the 6- to 7-year-olds (Fisher’s Exact Test, $p = .73$).

7.2 Intellectual, Language, Neuropsychological and Behavioural Functioning

Measures of intellectual (K-BIT), language (PPVT-III and K-BIT expressive vocabulary) and neuropsychological (TOVA) functioning were analysed using a series of two-way ANOVAs with age (4- to 5-years and 6- to 7-years) and clinical group type (AD/HD and non-clinical) as the independent variables. Note, the scores on all these measures are standardised.
Table 7.1 presents the means, standard deviations and ANOVA results for the measures of intellectual, language and neuropsychological functioning. In order to protect against a Type II error when analysing the intellectual and language functioning variables, alpha was set at .10. For the variables of attention, the Bonferroni adjustment of alpha level was applied, \( p < .01 (~.05/4) \).
Table 7.1
Means, Standard Deviations and ANOVA Results of AD/HD and Non-Clinical Children on Intellectual, Language, Neuropsychological & Behavioural Functioning Measures

<table>
<thead>
<tr>
<th>Measures</th>
<th>4- to 5-year-olds</th>
<th>6- to 7-year-olds</th>
<th>Group</th>
<th>Age</th>
<th>Interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AD/HD (n = 13)</td>
<td>Non-clinical (n = 15)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>AD/HD (n = 24)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Non-clinical (n = 26)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>p</td>
<td>F</td>
<td>p</td>
</tr>
<tr>
<td>K-BIT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-vocabulary</td>
<td>102.08 (6.42)</td>
<td>105.53 (10.44)</td>
<td>104.08 (14.78)</td>
<td>109.27 (13.27)</td>
<td>2.61 n.s</td>
</tr>
<tr>
<td>-matrices</td>
<td>104.00 (6.10)</td>
<td>99.67 (11.63)</td>
<td>103.00 (10.69)</td>
<td>106.12 (12.41)</td>
<td>.59 n.s</td>
</tr>
<tr>
<td>-composite</td>
<td>103.23 (6.27)</td>
<td>102.73 (11.05)</td>
<td>103.96 (11.38)</td>
<td>108.54 (13.09)</td>
<td>.58 n.s</td>
</tr>
<tr>
<td>PPVT-III</td>
<td>98.00 (9.35)</td>
<td>101.00 (12.82)</td>
<td>100.83 (11.82)</td>
<td>105.92 (8.76)</td>
<td>2.55 n.s</td>
</tr>
<tr>
<td>TOVA</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>-inattention</td>
<td>79.54 (35.40)</td>
<td>103.33 (7.66)</td>
<td>71.75 (26.08)</td>
<td>100.58 (9.21)</td>
<td>27.25 &lt;.001</td>
</tr>
<tr>
<td>-impulsivity</td>
<td>91.69 (13.72)</td>
<td>103.07 (9.68)</td>
<td>85.42 (16.80)</td>
<td>105.77 (7.26)</td>
<td>29.27 &lt;.001</td>
</tr>
<tr>
<td>-variability</td>
<td>82.15 (22.76)</td>
<td>107.33 (4.98)</td>
<td>67.79 (25.95)</td>
<td>101.77 (10.31)</td>
<td>46.85 &lt;.001</td>
</tr>
<tr>
<td>-response time</td>
<td>92.62 (18.73)</td>
<td>93.00 (15.33)</td>
<td>82.13 (15.85)</td>
<td>87.88 (15.26)</td>
<td>.65 n.s</td>
</tr>
<tr>
<td>AD/HD Rating Scale</td>
<td>33.69 (9.84)</td>
<td>10.73 (7.49)</td>
<td>41.04 (9.70)</td>
<td>6.42 (6.09)</td>
<td>200.36 &lt;.001</td>
</tr>
</tbody>
</table>

(max score = 54)
Table 7.1 shows that with alpha set at .10, there were still no main effects for clinical group type and age\textsuperscript{18} and no significant interactions on the K-BIT variables and PPVT-III. This provides evidence that there is no significant difference between the 4- to 5-year-old AD/HD and non-AD/HD children and the 6- to 7-year-old AD/HD and non-AD/HD children on levels of intellectual and language functioning.

For the TOVA variables\textsuperscript{19} of inattention, impulsivity and variability, results showed a significant main effect for clinical group type. The main effect for clinical group type confirms that there is a significant difference between the AD/HD and non-clinical group that is consistent across age, with the former group exhibiting significantly higher levels of inattention, impulsivity and variability. There were no main effects or interactions for the TOVA response time variable.

The measure of behavioural functioning, as measured by the AD/HD Rating Scale – IV (home version), was also analysed using a two-way ANOVA with age (4- to 5-years and 6- to 7-years) and clinical group type (AD/HD and non-clinical) as the independent variables. Table 7.1 presents the means, standard deviations and ANOVA results for the AD/HD Rating Scale – IV (home version). Results for this measure showed a significant main effect for clinical group type. The main effect for clinical group type confirms that there is a significant difference between the AD/HD and non-clinical group that is consistent across age, with the former groups’ parents/guardians reporting significantly higher levels of AD/HD behavioural symptoms being displayed.

\textsuperscript{18} It was not expected that there would be a main effect for age as the scores are standardised. This applies to all the variables listed in Table 7.1.
\textsuperscript{19} For the ease of the reader it was decided to report untransformed data in Table 7.1 even though the data was skewed and there was a violation of the homogeneity of variance assumption on three of the four TOVA variables - inattention, impulsivity and variability. Transformations on this data were performed (Huck & Cormier, 1996; Tabachnick & Fidell, 2001). In all instances, the results from the transformed data showed the same pattern as the untransformed data (see Appendix K for details of transformations and table with transformed variables).
by their children. Further, mean scores\textsuperscript{20} for both AD/HD boys ($M = 40.43$, $SD = 10.51$) and AD/HD girls ($M = 32.33$, $SD = 9.94$) were greater than the 98\textsuperscript{th} percentile of the rating scale's normative data (38.9 and 30.0, respectively). Mean scores for both the non-clinical boys ($M = 7.74$, $SD = 6.93$) and non-clinical girls ($M = 8.50$, $SD = 6.99$) fell below their respective means of the reported normative data (12.54 and 9.51, respectively) (cf. DuPaul et al., 1998).

7.3 First Order ToM Measure

Due to the number of subsequent analyses, the Bonferroni adjustment of alpha level was applied, $p < .01 (0.05/4)$ to correct for possible Type I error.

\textsuperscript{20} Note that the current means include the data of the 4-year-olds ($n = 4$ AD/HD; $n = 10$ non-AD/HD) in the sample which is being compared against the means of the 5- to 7-year-old normative data by DuPaul et al. (1998).
Table 7.2

*Number of Children Answering Correctly on Each First Order ToM Task; Grouped by Age and Clinical Group Type*

<table>
<thead>
<tr>
<th>ToM Task</th>
<th>4- to 5-year-olds</th>
<th>6- to 7-year-olds</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AD/HD (n=13)</td>
<td>Non-clinical (n=15)</td>
</tr>
<tr>
<td></td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Matthew FB (think)</td>
<td>8</td>
<td>61.5</td>
</tr>
<tr>
<td>Matthew FB (look)</td>
<td>9</td>
<td>69.2</td>
</tr>
<tr>
<td>Deceptive Box (rc)</td>
<td>7</td>
<td>53.8</td>
</tr>
<tr>
<td>Deceptive Box (fb)</td>
<td>7</td>
<td>53.8</td>
</tr>
<tr>
<td>Deceptive Box (ar)</td>
<td>9</td>
<td>69.2</td>
</tr>
<tr>
<td>Deceptive Box (ci/think)</td>
<td>9</td>
<td>69.2</td>
</tr>
<tr>
<td>Deceptive Box (ci/look)</td>
<td>8</td>
<td>61.5</td>
</tr>
<tr>
<td>Appearance-Reality (mean)</td>
<td>6</td>
<td>46.2</td>
</tr>
<tr>
<td>Appearance-Reality (nice)</td>
<td>5</td>
<td>38.5</td>
</tr>
<tr>
<td>Sally-Anne</td>
<td>9</td>
<td>69.2</td>
</tr>
</tbody>
</table>

Table 7.2 shows the number and percentage of AD/HD and non-clinical children grouped by age, answering each first order ToM question correctly. As can be seen from Table 7.2, the distribution of scores in the 4- to 5-year-old AD/HD and the non-clinical group were sufficiently varied to conduct an independent sample *t* test to investigate if a difference in mean scores on the First Order ToM Measure existed. In answer to Research Question 1, results showed that there was no significant difference between the two groups, $t = -0.95, p = .35$ (AD/HD group $M = 5.92$, $SD = 3.35$ vs. non-clinical group $M = 7.00$, $SD = 2.65$).\(^{21}\)

As expected, an examination of the 6- to 7-year-old non-clinical group frequency distribution showed that, apart from three children, all scored perfectly on

\(^{21}\) A chi-square test was also performed on the data purely for comparison purposes with the 6- to 7-year-old results. Fisher's Exact Test was applied as the expected count frequencies were less than 5 in some cells. As expected results yielded no significant difference, $p = .67$
the First Order ToM Measure. This was not the case for the 6- to 7-year-olds in the AD/HD group. As previously stated, to appropriately investigate possible differences in performance between the 6- to 7-year-old AD/HD and non-clinical groups, those children in each group that scored between 0 and 9 on the measure were collapsed and compared against those in each group who scored perfectly (10). A chi-square analysis showed a significant relation between clinical group type and performance on the First Order ToM Measure. Therefore, there was a significant difference in the proportion of children scoring perfectly in the 6- to 7-year-old AD/HD and non-clinical groups, $\chi^2 (1, N = 50) = 12.18, p < .001$. From the frequencies in Table 7.3 it can be clearly seen that the non-clinical group performed significantly better on the First Order ToM Measure than the AD/HD group (Research Question 2).

Table 7.3

<table>
<thead>
<tr>
<th>Group</th>
<th>ToM Score (0 – 9)</th>
<th>ToM Score (10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-clinical (n = 26)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observed</td>
<td>3 (11.5%)</td>
<td>23 (88.5%)</td>
</tr>
<tr>
<td>Expected</td>
<td>8.8</td>
<td>17.2</td>
</tr>
<tr>
<td>AD/HD (n = 24)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observed</td>
<td>14 (58.3%)</td>
<td>10 (41.7%)</td>
</tr>
<tr>
<td>Expected</td>
<td>8.2</td>
<td>15.8</td>
</tr>
</tbody>
</table>

With regard to the AD/HD group, there was no significant difference between the performance of the 4- to 5 and 6- to 7-year-olds on the First Order ToM Measure, indicating that the performance of both age groups was comparable, $t = -2.34, p = .03$ (4- to 5-year group $M = 5.92, SD = 3.35$ vs. 6- to 7-year group $M = 8.29, SD = 1.94$)\(^{22}\) (Research Question 3). Although the marginally non-significant finding makes it worth

\(^{22}\) Unequal variance $t$ test result.
considering Keppel’s (1991) discussion regarding the right to reserve judgement on a particular result if that result falls between the initial alpha level and the adjusted alpha level, consideration also needs to be given to the chi-square analysis results on this data. A chi-square test (scores 0 through to 9 on the measure were collapsed within each age range and compared against those in each group who scored perfectly (10)) was also performed on the data for comparison purposes with the non-AD/HD groups’ results. Fisher’s Exact Test was applied as the expected count frequencies were less than 5 in one of the cells and results showed no significant difference, $p = .62$. With this chi-square analysis result in mind and with the general expectation that by the time children have reached the age range of 6- to 7-years they would be able to correctly answer first order ToM tasks with ease, the non-significant result is probably accurate.

To investigate possible differences between ages in the non-clinical group on the First Order ToM Measure, as expected, scores 0 through to 9 were again collapsed within each age range and compared against those children scoring 10 (imperfect vs. perfect performance). A chi-square analysis showed a significant relation between age group and performance on the First Order ToM Measure, $\chi^2 (1, N = 41) = 19.22, p < .001$. A significantly higher proportion of children in the older age group scored 10 compared to the younger age group thus accepting Hypothesis 1, with the results suggesting a developmental progression in first order ToM understanding for the non-clinical group (see Table 7.4).
Table 7.4

Non-clinical Groups’ First Order ToM Measure Score by Age

<table>
<thead>
<tr>
<th>Agegroup</th>
<th>ToM Score (0 – 9)</th>
<th>ToM Score (10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4- to 5-year-olds (n = 15)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observed</td>
<td>12 (80%)</td>
<td>3 (20%)</td>
</tr>
<tr>
<td>Expected</td>
<td>5.5</td>
<td>9.5</td>
</tr>
<tr>
<td>6- to 7-year-olds (n = 26)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observed</td>
<td>3 (11.5%)</td>
<td>23 (88.5%)</td>
</tr>
<tr>
<td>Expected</td>
<td>9.5</td>
<td>16.5</td>
</tr>
</tbody>
</table>

7.4 Second Order ToM Measure and Justification Responses

The composite score associated with the Second Order ToM Measure comprised the two second order false belief tasks, namely, the village task and the beach task. Apart from one child, the 6- to 7-year-olds’ in the non-clinical group correctly answered at least one of the belief questions on the second order false belief measure. This being the case, data on this measure were collapsed (inconsistent performance was scored as fail). A chi-square analysis showed a significant relation between clinical group type and performance on the Second Order ToM Measure, $\chi^2(1, N = 50) = 8.92, p < .01$. As can be seen from Table 7.5, a significantly higher proportion of children in the non-clinical group passed compared to the AD/HD group (Hypothesis 2).
Table 7.5

*Second Order ToM Measure Score by Clinical Group Type*

<table>
<thead>
<tr>
<th>Group</th>
<th>Fail</th>
<th>Pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-clinical (n = 26)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observed</td>
<td>11 (42.3%)</td>
<td>15 (57.7%)</td>
</tr>
<tr>
<td>Expected</td>
<td>16.1</td>
<td>9.9</td>
</tr>
<tr>
<td>AD/HD (n = 24)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observed</td>
<td>20 (83.3%)</td>
<td>4 (16.7%)</td>
</tr>
<tr>
<td>Expected</td>
<td>14.9</td>
<td>9.1</td>
</tr>
</tbody>
</table>

7.4.1 Justification Responses

In line with Baron-Cohen (1989), responses to the justification question for each second order false belief task were coded into one of three categories of belief attribution (second order, first order or zero order) according to whether the child took account of:

a) neither of the characters’ beliefs (zero order)

b) one of the characters’ beliefs (first order)

c) both characters’ beliefs (second order)

As each child had two separate justification responses, these were then categorised accordingly:

a) no justification (where the child had two zero order ratings)

b) some justification (where the child had either one zero order rating or two first order ratings)

c) substantial justification (where the child had either two second order ratings or one second order and one first order rating)
A chi-square analysis revealed a significant relationship between clinical group type and responses to the justification question. The proportions of no stated justifications to substantially stated justifications were different for the two groups of children, $\chi^2(2, N = 50) = 7.64, p = .02$. The frequencies are shown in Table 7.6. While there was not a great deal of difference in the proportions of ‘some justification’ for the AD/HD and non-clinical groups, it can be seen from Table 7.6 that 41.7% ($n = 10$) of children with AD/HD did not take into account any of the beliefs of the characters for the two stories in their justification responses (‘no justification’) compared to 11.5% ($n = 3$) for the non-clinical group. Also, only 12.5% ($n = 3$) of children with AD/HD gave ‘substantial justifications’ overall, compared to approximately three times that many children in the non-clinical group (68.5%, $n = 10$). Therefore Hypothesis 3 is accepted, with the AD/HD group performing significantly more poorly than the non-clinical group on the justification measure.

Table 7.6

*Responses to Justification Questions by Clinical Group Type*

<table>
<thead>
<tr>
<th>Group</th>
<th>Justification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
</tr>
<tr>
<td>Non-clinical ($n=26$)</td>
<td></td>
</tr>
<tr>
<td>Observed</td>
<td>3 (11.5%)</td>
</tr>
<tr>
<td>Expected</td>
<td>6.8</td>
</tr>
<tr>
<td>AD/HD ($n=24$)</td>
<td></td>
</tr>
<tr>
<td>Observed</td>
<td>10 (41.7%)</td>
</tr>
<tr>
<td>Expected</td>
<td>6.2</td>
</tr>
</tbody>
</table>
7.5 A Boy, a Dog, and a Frog Wordless Picture Book

7.5.1 Clinical Group Type Differences in Narratives

Although no group differences were expected in length of stories, analyses were conducted because of the need to correct for length of stories if group differences did exist. Table 7.7 presents the means and standard deviations of total number of words used and number of propositions in the stories for AD/HD and non-clinical children aged 4- to 5-years and 6- to 7-years, respectively. In order to protect against a Type II error when analysing the narrative length scores, alpha was set at .10
Table 7.7

Means, Standard Deviations and ANOVA Results of AD/HD and Non-Clinical Children on Narrative Length Measures

<table>
<thead>
<tr>
<th>Narrative Length Measures</th>
<th>4- to 5-year-olds</th>
<th>6- to 7-year-olds</th>
<th>Group</th>
<th>Age</th>
<th>Interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AD/HD (n = 13)</td>
<td>Non-clinical (n = 15)</td>
<td>AD/HD (n = 24)</td>
<td>Non-clinical (n = 26)</td>
<td>F</td>
</tr>
<tr>
<td>Total Number of Words</td>
<td>230.77 (52.99)</td>
<td>277.40 (86.31)</td>
<td>271.88 (126.43)</td>
<td>264.12 (86.65)</td>
<td>.72</td>
</tr>
<tr>
<td>Number of Propositions</td>
<td>32.69 (8.34)</td>
<td>39.00 (9.49)</td>
<td>38.50 (14.87)</td>
<td>39.28 (13.39)</td>
<td>1.38</td>
</tr>
</tbody>
</table>
Table 7.7 shows that with alpha set at .10 there were still no main effects for clinical group type and age and no significant interactions on number of words and number of propositions. This provides evidence that there is no significant difference between the 4- to 5-year-old AD/HD and non-clinical children and the 6- to 7-year-old AD/HD and non-clinical children on story length elements.

7.5.2 Internal State Terms

As expected, a large proportion of children in each cell stated no mental state terms, confirming the initial decision to analyse this data as a categorical variable. The data were collapsed (no mental states vs. one or more mental states) for each clinical group type (AD/HD vs. non-clinical) and analysed using chi-square. The remaining internal state term variables (volition, emotion, and affect expression) were analysed using a series of two-way ANOVAs. The Bonferroni adjustment of alpha level was applied, $p < .01 (.05/4)$ to correct for possible Type I error.\(^{23}\)

Table 7.8 presents the mean and standard deviation of multiple internal state term scores for AD/HD and non-AD/HD children aged 4- to 5-years and 6- to 7-years, respectively.

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\(^{23}\) This adjustment took into account the three internal state term variables analysed using two-way ANOVAs and the mental state term variable analysed using chi-square.
Table 7.8

*Mean Scores and Standard Deviations for Internal State Terms of Children with and without AD/HD, Aged 4- to 5 and 6- to 7-years*

<table>
<thead>
<tr>
<th>Internal State Terms</th>
<th>4- to 5-year-olds</th>
<th>6- to 7-year-olds</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AD/HD (n=13)</td>
<td>Non-clinical (n=15)</td>
</tr>
<tr>
<td></td>
<td>$M$   $SD$   $M$   $SD$</td>
<td>$M$   $SD$   $M$   $SD$</td>
</tr>
<tr>
<td>Volition</td>
<td>2.38   1.66    3.33   1.63</td>
<td>2.83   1.37    2.65   1.83</td>
</tr>
<tr>
<td>Affect Expression</td>
<td>.62    1.19    1.40   1.30</td>
<td>.38    .77     1.35   1.20</td>
</tr>
<tr>
<td>Emotion</td>
<td>2.62   2.79    4.87   3.85</td>
<td>3.25   2.75    5.04   3.57</td>
</tr>
</tbody>
</table>

Table 7.9 presents the results of three 2 x 2 ANOVAs on internal state terms, namely, volition, affect expression, and emotion, using age (4- to 5 and 6- to 7-years) and clinical group type (AD/HD and non-clinical) as the independent variables.
<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>.24</td>
<td>1</td>
<td>.24</td>
<td>.09</td>
<td>.77</td>
</tr>
<tr>
<td>Volition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>2.65</td>
<td>1</td>
<td>2.65</td>
<td>.99</td>
<td>.32</td>
</tr>
<tr>
<td>Group</td>
<td>5.69</td>
<td>1</td>
<td>5.69</td>
<td>2.13</td>
<td>.15</td>
</tr>
<tr>
<td>Age x Group</td>
<td>197.63</td>
<td>74</td>
<td>2.67</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Affect Expression</td>
<td>.39</td>
<td>1</td>
<td>.39</td>
<td>.32</td>
<td>.58</td>
</tr>
<tr>
<td>Age</td>
<td>13.78</td>
<td>1</td>
<td>13.78</td>
<td>11.31</td>
<td>.001</td>
</tr>
<tr>
<td>Group</td>
<td>.16</td>
<td>1</td>
<td>.16</td>
<td>.13</td>
<td>.72</td>
</tr>
<tr>
<td>Age x Group</td>
<td>90.19</td>
<td>74</td>
<td>1.22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotion</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>2.91</td>
<td>1</td>
<td>2.91</td>
<td>.27</td>
<td>.60</td>
</tr>
<tr>
<td>Group</td>
<td>72.95</td>
<td>1</td>
<td>72.95</td>
<td>6.80</td>
<td>.01</td>
</tr>
<tr>
<td>Age x Group</td>
<td>.96</td>
<td>1</td>
<td>.96</td>
<td>.09</td>
<td>.77</td>
</tr>
<tr>
<td>Error</td>
<td>794.27</td>
<td>74</td>
<td>10.73</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Results for volition showed no significant main effects for age or clinical group type and no significant interaction. Therefore there is no evidence to suggest that there is a significant difference between the 4- to 5-year-old AD/HD and non-AD/HD children and the 6- to 7-year-old AD/HD and non-AD/HD children (Research
Questions 4.1 and 5.1 respectively). Further there is no evidence of a developmental progression for either clinical group type (Hypothesis 4.1 and Research Question 6.1).

For the number of appropriate affect expression terms used, there was a significant main effect for clinical group type only. The main effect of clinical group type confirms that there is a significant difference between the AD/HD ($M = .46$, $SD = .93$) and non-clinical group ($M = 1.37$, $SD = 1.22$) that is consistent across age, with the former group producing significantly fewer affect expression terms (Research Questions 4.2 and 5.2). There is no evidence of a developmental progression for either clinical group type (Hypothesis 4.2 and Research Question 6.2).

With regard to the number of appropriate emotion state terms used, there was a significant main effect for clinical group type only. As with affect expression, the main effect of clinical group type on the emotion variable confirms that there is a significant difference between the AD/HD ($M = 3.03$, $SD = 2.74$) and non-clinical group ($M = 4.98$, $SD = 3.63$) that is consistent across age, with the former group producing significantly fewer emotion state terms (Research Questions 4.3 and 5.3). There is no evidence of a developmental progression for either clinical group type (Hypothesis 4.3 and Research Question 6.3).

For mental state production, a chi-square analysis showed no significant relation between clinical group type and identification of mental states, $\chi^2 (1, N = 78) = 4.10$, $p = .04$ (see Table 7.10) (Research Question 7). The marginally non-significant result makes it worth considering Keppel's (1991) discussion regarding the right to reserve judgement on a particular result if that result falls between the initial alpha level and the adjusted alpha level. Further, the trend evidenced in the mental states data is in the same direction as the majority of the narrative data. Therefore for this
instance, these two considerations suggest that Keppel’s approach is probably the most sensible.

Table 7.10

Identification of Mental States by Clinical Group Type

<table>
<thead>
<tr>
<th>Group</th>
<th>No Mental States</th>
<th>One or More Mental States</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-clinical (n = 41)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observed</td>
<td>26 (63.4%)</td>
<td>15 (36.6%)</td>
</tr>
<tr>
<td>Expected</td>
<td>30.0</td>
<td>11.0</td>
</tr>
<tr>
<td>AD/HD (n = 37)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observed</td>
<td>31 (83.8%)</td>
<td>6 (16.2%)</td>
</tr>
<tr>
<td>Expected</td>
<td>27.0</td>
<td>10.0</td>
</tr>
</tbody>
</table>

7.5.3 Probed Responses

Due to violation of the homogeneity of variance assumption and the substantial negative skewness of the 'emotional reference' variable, it was decided to transform this variable. Raw scores were transformed by reflecting the variable and then applying the base 10 logarithm of \((\text{constant} - x)\) (Tabachnick & Fiddell, 2001). This procedure satisfied the assumptions.24

The probed responses variables of internal state terms (emotional reference, emotional explanations and mental state reference) were analysed using a series of two-way ANOVAs. The Bonferroni adjustment of alpha level was applied, \(p < .02 (.05/3)\) to correct for possible Type I error for the ANOVA results. The probed responses variables of story elaboration and alternative title were analysed using a

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24 Again, for the ease of the reader it was decided to report the untransformed data in Tables 7.11 and 7.12 and footnote in the tables the results of the transformed data. The results from the transformed data showed the same pattern as the untransformed data.
series of chi-squares. Table 7.11 presents the mean and standard deviation of multiple probed responses (internal state term) scores for AD/HD and non-clinical children aged 4- to 5-years and 6- to 7-years, respectively.

Table 7.11

Mean Scores and Standard Deviations for Probed Responses (Internal State Terms) of Children with and without AD/HD, Aged 4- to 5 and 6- to 7-years

<table>
<thead>
<tr>
<th>Probed Responses:</th>
<th>4- to 5-year-olds</th>
<th>6- to 7-year-olds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal State</td>
<td>AD/HD</td>
<td>Non-clinical</td>
</tr>
<tr>
<td>Terms</td>
<td>(n=13)</td>
<td>(n=14)</td>
</tr>
<tr>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>Emotional Reference&lt;sup&gt;b&lt;/sup&gt;</td>
<td>3.69</td>
<td>1.75</td>
</tr>
<tr>
<td>(max score = 6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotional Explanation&lt;sup&gt;c&lt;/sup&gt;</td>
<td>.57</td>
<td>.35</td>
</tr>
<tr>
<td>(max score = 1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mental State Reference</td>
<td>2.31</td>
<td>1.55</td>
</tr>
<tr>
<td>(max score = 6)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<sup>a</sup>One participant did not wish to continue answering the probe questions so testing was discontinued for this child.

<sup>b</sup>Transformed mean and sd scores for emotional reference: 4-5 yrs: AD/HD .47 (.21), Non .33 (.17); 6-7 yrs: AD/HD .29 (.22), Non .20 (.21). NOTE: The interpretation of a reflected variable is just the opposite of what it was. Therefore, because a higher score on this variable denotes more appropriate emotional reference labelling, after transformation it now means that the higher the transformed mean score, the poorer the performance on this measure.

<sup>c</sup>NOTE: The final score for emotional explanations is represented as a proportion (appropriate explanations divided by total number of explanations) derived from the appropriate emotional references.

Table 7.12 presents the results of three 2 x 2 ANOVAs on internal state terms (probed responses), namely, emotional reference, emotional explanation and mental state reference using age (4- to 5 and 6- to 7-years) and clinical group type (AD/HD and non-clinical) as the independent variables.
Table 7.12

Summary of Three 2-Way ANOVA Results for Performance on Probed Responses

(Internal State Terms)

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emotional Reference&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>Age</td>
<td>11.43</td>
<td>1</td>
<td>11.43</td>
<td>8.50</td>
<td>.005</td>
</tr>
<tr>
<td>Group</td>
<td>9.34</td>
<td>1</td>
<td>9.34</td>
<td>6.95</td>
<td>.01</td>
</tr>
<tr>
<td>Age x Group</td>
<td>1.49</td>
<td>1</td>
<td>1.49</td>
<td>1.11</td>
<td>.30</td>
</tr>
<tr>
<td>Error</td>
<td>98.20</td>
<td>73</td>
<td>1.35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotional Explanation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>.32</td>
<td>1</td>
<td>.32</td>
<td>5.70</td>
<td>.02</td>
</tr>
<tr>
<td>Group</td>
<td>.56</td>
<td>1</td>
<td>.56</td>
<td>9.88</td>
<td>.002</td>
</tr>
<tr>
<td>Age x Group</td>
<td>.002</td>
<td>1</td>
<td>.002</td>
<td>.04</td>
<td>.84</td>
</tr>
<tr>
<td>Error</td>
<td>4.12</td>
<td>73</td>
<td>.06</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mental State Reference</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>29.22</td>
<td>1</td>
<td>29.22</td>
<td>11.12</td>
<td>.001</td>
</tr>
<tr>
<td>Group</td>
<td>22.40</td>
<td>1</td>
<td>22.40</td>
<td>8.52</td>
<td>.005</td>
</tr>
<tr>
<td>Age x Group</td>
<td>.88</td>
<td>1</td>
<td>.88</td>
<td>.34</td>
<td>.56</td>
</tr>
<tr>
<td>Error</td>
<td>191.87</td>
<td>73</td>
<td>2.63</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<sup>a</sup> Transformed ANOVA results for Emotional Reference are as follows:
- Significant main effect for age, $F(1, 73) = 9.91, p = .002$
- Significant main effect for clinical group type, $F(1, 73) = 5.29, p = .02$
- No significant interaction (age x clinical group type), $F(1, 73) = .26, p = .61$
Results for emotional reference\textsuperscript{25} showed a significant main effect for age and clinical group type, and no significant interaction. The main effect of age confirms the existence of a developmental progression on this variable. There is a significant difference between the 4- to 5-year-olds ($M = 4.01$, $SD = 1.14$) and the 6- to 7-year-olds ($M = 5.21$, $SD = 1.02$) that is consistent across clinical group type, with the younger group making significantly fewer appropriate references to characters’ emotions when asked (Hypothesis 5.1 and Research Question 10.1). The main effect of clinical group type confirms that there is a significant difference between the AD/HD ($M = 4.20$, $SD = 1.34$) and non-clinical group ($M = 5.14$, $SD = .83$) that is consistent across age, with the former group making significantly fewer appropriate references to characters’ emotions when asked (Research Questions 8.1 and 9.1).

With regard to emotional explanations, results showed a significant main effect for age and clinical group type, and no significant interaction. The main effect of age confirms the existence of a developmental progression on this variable. There is a significant difference between the 4- to 5-year-olds ($M = .66$, $SD = .28$) and the 6- to 7-year-olds ($M = .80$, $SD = .23$) that is consistent across clinical group type, with the younger group stating significantly fewer appropriate explanations for the story characters’ emotional states (Hypothesis 5.2 and Research Question 10.2). The main effect of clinical group type confirms that there is a significant difference between the AD/HD ($M = .66$, $SD = .29$) and non-clinical group ($M = .83$, $SD = .19$) that is consistent across age, with the former clinical group type stating significantly fewer appropriate explanations for the story characters’ emotional states (Research Questions 8.2 and 9.2).

\textsuperscript{25} The following means and standard deviations reported for the ‘emotional reference’ variable will be from the untransformed data to make comparisons with the other probing variables easier as they were not transformed. The results from the transformed data are footnoted in the table.
The same pattern of results was also evidenced with mental state reference, that is, a significant main effect for age and clinical group type, and no significant interaction. The main effect of age confirms the existence of a developmental progression on this variable. There is a significant difference between the 4- to 5-year-olds ($M = 2.86, SD = 1.86$) and the 6- to 7-year-olds ($M = 4.08, SD = 1.64$) that is consistent across clinical group type, with the younger group making significantly fewer appropriate references to characters’ mental states when asked (Hypothesis 5.3 and Research Question 10.3). The main effect of clinical group type confirms that there is a significant difference between the AD/HD ($M = 3.0, SD = 1.67$) and non-clinical group ($M = 4.22, SD = 1.75$) that is consistent across age, with the former group making significantly fewer appropriate references to characters’ mental states when asked (Research Questions 8.3 and 9.3).

As previously mentioned, it was decided to investigate possible differences in the variables of alternative title and story elaboration by clinical group type only so as not to lose statistical power. In answer to Research Question 11, no significant relation between clinical group type and the ability to produce an appropriate alternative title for the book was evident, $\chi^2 (1, N = 77) = 2.04, p = .15$. For the story elaboration variable, where the child was asked what he/she thought happened next in the story at the last page, a significantly higher proportion of children in the non-clinical group provided appropriate elaborations compared to the AD/HD group, $\chi^2 (1, N = 77) = 5.65, p = .02$ (Research Question 12).
7.5.3.1 Inner Speech or Self-Talk – further analysis from mental state reference

probing variable

When categorising the children’s answers to the statements of ‘tell me what the frog is thinking?’ and ‘tell me what the boy is thinking?’, it became clear that the correct answers contained ‘levels of richness’ that were not being tapped into by the current analysis. I will illustrate these ‘levels of richness’ by drawing on the utterances of three children who produced answers that were appropriate references to the frog’s mental state when he was sitting on the rock by himself after the boy had walked off home. In response to the statement ‘tell me what the frog is thinking’, one child responded ‘That he’ll never see him again’. Whereas two other children in the study stated, ‘I wish I could have gone home with him’ and ‘I should go to him, I’ll follow his footprints’. Although all of these children gave an appropriate reference to the frog’s mental state, the last two responses contain a dimension, a richness, which the first child’s response does not. This richness seems to entail ‘crawling into the skin’ of the character and producing their thoughts in the form of inner speech or self-talk. I sought to explore this presence of inner speech in the children’s answers to what the characters were thinking. In considering the fact that the production of a character’s inner speech required a level of ‘de-centrism’ and that the previous result showed that children with AD/HD made significantly fewer appropriate references to characters’ mental states, it seemed reasonable to tentatively hypothesise that the responses of the children with AD/HD would contain fewer inner speech qualities than the non-AD/HD children. So as not to lose statistical power, I decided, due to the exploratory nature of the inquiry, to explore differences between the AD/HD and non-clinical groups only
and not investigate differences between age groups. A chi-square analysis\textsuperscript{26} showed a significant relation between clinical group type and the presence of inner speech in the children’s responses, $\chi^2 (1, N = 77) = 8.08, p = .004$. A significantly higher proportion of children in the non-clinical group used inner speech when responding to what the characters in the story were thinking compared to the AD/HD group. It is interesting to note that just over one-third (35%) of the non-clinical group used inner speech compared to 8% for the AD/HD group. Of those children using inner speech in the non-clinical group, 3 children were from the 4- to 5-year-old range however no children with AD/HD used inner speech in this age range. For both groups, the majority of children using inner speech came from the older, 6- to 7-years age range (non-clinical = 11; AD/HD = 3). The implications attached to this finding will be elaborated on in the discussion.

7.5.4 Narrative Structure

Due to violation of the homogeneity of variance assumption of the four narrative structure dependent variables being analysed using two-way ANOVAs (theme, causal statements (mental/emotion), causal statements (action/behaviour) and goal/attempt/outcome sequences), it was decided to transform these variables. As the data were positively skewed, raw scores were transformed by computing the base 10 logarithm of (x+1) (Tabachnick & Fidell, 2001). This procedure satisfied the homogeneity of variance assumption for three out of the four variables. The remaining variable (causal statements for action and behaviour) was collapsed with the variable

\textsuperscript{26}Sixteen (one fifth) of the transcripts were coded by an independent second rater in order to assess inter-rater reliability by computing the Cohen’s kappa reliability coefficient. A high level of reliability was reached for the inner speech variable ($\kappa = .9$).
‘causal statements for mental and emotion’ to produce a ‘causal statement’ variable\(^{27}\) which subsequently satisfied the assumption. This meant that the hypotheses and research questions relating to these previous two causal statement variables could not be answered separately in the subsequent analysis. Reference will still be made to these hypotheses and research questions in the following results, however it will be in relation to the ‘causal statement’ variable only.

Table 7.13 presents the transformed mean and standard deviation of multiple narrative structure component scores for AD/HD and non-clinical children aged 4- to 5-years and 6- to 7-years, respectively with the untransformed data footnoted in the table.

Table 7.13

Transformed Mean Scores and Standard Deviations for Narrative Structure Components of Children with and without AD/HD, Aged 4- to 5 and 6- to 7-years

<table>
<thead>
<tr>
<th>Narrative Structure Components</th>
<th>4- to 5-year-olds</th>
<th>6- to 7-year-olds</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AD/HD (n=13)</td>
<td>Non-clinical (n=15)</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>LgTheme(^{a})</td>
<td>.21</td>
<td>.14</td>
</tr>
<tr>
<td>LgCausal Statements(^{b})</td>
<td>.15</td>
<td>.18</td>
</tr>
<tr>
<td>LgGAO Sequences(^{c})</td>
<td>.12</td>
<td>.15</td>
</tr>
</tbody>
</table>

\(^{a}\) untransformed raw mean and sd scores for theme: 4-5yrs: AD/HD .69 (.48), Non 1.53 (.52); 6-7yrs: AD/HD 1.63 (.82), Non 1.54 (.86)

\(^{b}\) untransformed raw mean and sd scores for causal statements: 4-5yrs: AD/HD .54 (.66), Non 3.27 (3.06); 6-7yrs: AD/HD 2.25 (1.82), Non 3.19 (2.64)

\(^{c}\) untransformed raw mean and sd scores for GAO sequences: 4-5yrs: AD/HD .38 (.51), Non 1.27 (.96); 6-7yrs: AD/HD .88 (.95), Non 1.42 (1.39)

\(^{27}\) Pearson’s product-moment correlation coefficient was calculated between the two causal statement variables: \(r = .34, p < .002\).
Table 7.14 presents the results of three 2 x 2 ANOVAs on narrative structure components, namely, theme, causal statements and GAO sequences using age (4- to 5 and 6- to 7-years) and clinical group type (AD/HD and non-clinical) as the independent variables. The Bonferroni adjustment of alpha level was applied, $p < .01$ (.05/4) to correct for possible Type I error\textsuperscript{28}. As a follow-up to analyses that produced a significant interaction effect, a Scheffe test was conducted across the four groups created by age x clinical group type.

\textsuperscript{28} This adjustment also took into account the ‘episode’ variable, which was being analysed using a chi-square test.
Table 7.14

Summary of Three 2-Way ANOVA Results for Performance on Narrative Structure Components

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>LgTheme</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>.14</td>
<td>1</td>
<td>.14</td>
<td>7.38</td>
<td>.008</td>
</tr>
<tr>
<td>Group</td>
<td>.13</td>
<td>1</td>
<td>.13</td>
<td>6.98</td>
<td>.01</td>
</tr>
<tr>
<td>Age x Group</td>
<td>.18</td>
<td>1</td>
<td>.18</td>
<td>9.87</td>
<td>.002</td>
</tr>
<tr>
<td>Error</td>
<td>1.38</td>
<td>74</td>
<td>.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LgCausal Statements</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>.42</td>
<td>1</td>
<td>.42</td>
<td>5.78</td>
<td>.02</td>
</tr>
<tr>
<td>Group</td>
<td>.92</td>
<td>1</td>
<td>.92</td>
<td>12.71</td>
<td>.001</td>
</tr>
<tr>
<td>Age x Group</td>
<td>.41</td>
<td>1</td>
<td>.41</td>
<td>5.63</td>
<td>.03</td>
</tr>
<tr>
<td>Error</td>
<td>5.38</td>
<td>74</td>
<td>.07</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LgGAO Sequences</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>.05</td>
<td>1</td>
<td>.05</td>
<td>1.03</td>
<td>.31</td>
</tr>
<tr>
<td>Group</td>
<td>.38</td>
<td>1</td>
<td>.38</td>
<td>7.62</td>
<td>.007</td>
</tr>
<tr>
<td>Age x Group</td>
<td>.05</td>
<td>1</td>
<td>.05</td>
<td>.92</td>
<td>.34</td>
</tr>
<tr>
<td>Error</td>
<td>3.65</td>
<td>74</td>
<td>.05</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For the identification of themes, significant main effects for clinical group type and age must be interpreted in terms of a significant age x clinical group type interaction. A difference between the 4- to 5-year-old AD/HD and non-AD/HD children’s narratives showed that the former group displayed significantly less
understanding of the story’s themes (Research Question 13.1). However, this
difference was non-existent between the 6- to 7-year-old AD/HD and non-AD/HD
groups (Research Question 14.1). Further, a significant developmental progression was
evidenced for the AD/HD children, but not for the non-clinical group, with their scores
remaining consistently high (Research Question 15.1 and Hypothesis 6.1,
respectively). Figure 7.1 depicts this interaction.

![Figure 7.1 The Interaction of Age and Clinical Group Type on Theme Identification](image)

There was a significant main effect for clinical group type on the use of causal
statements confirming a significant difference between the AD/HD ($M = .34, SD = .26$)
and non-clinical ($M = .53, SD = .30$) groups that is consistent across age, with the
former group using significantly less causal language (Research Questions 13.2/ 13.3
and 14.2/ 14.3). There was no significant development progression for either group in
their use of causal language (Research Questions 15.2/ 15.3 and Hypotheses 6.2/ 6.3)
however the marginally non-significant result for age ($p = .02$) and age x clinical group type interaction ($p = .03$) makes it worth considering reserving judgement on these latter results (Keppel, 1991). With more participants, the results may lend themselves to a similar story told by the theme variable.

With regard to the identification of GAO sequences, there was a significant main effect for clinical group type only. The main effect of clinical group type confirms that there is a significant difference between the AD/HD ($M = .18, SD = .20$) and non-clinical group ($M = .31, SD = .24$)\textsuperscript{39} such that, regardless of age, children with AD/HD identified significantly fewer structural sequences of the story than children without AD/HD (Research Questions 13.4 and 14.4). There was no evidence of a significant developmental progression for either clinical group type (Hypothesis 6.4 and Research Question 15.4).

As expected, there was a relatively small number of complete episodes identified by the children in the study overall, with the majority of the contribution coming from the 6- to 7-year-olds in the non-clinical group and one from each age group for children with AD/HD. As previously explained, the data on this variable were collapsed (no episodes vs. one or more episodes) for each clinical group type. A chi-square analysis showed no significant relation between clinical group type and identification of episodes, $\chi^2 (1, N = 78) = 4.40, p = .04$ (see Table 7.15) (Research Question 16). As was the case with the results for mental state and causal statements usage, Keppel’s (1991) discussion about the possibility of reserving judgement is also worth considering here for the marginally non-significant result of identification of episodes.

\textsuperscript{39} These are the transformed means and standard deviations. Untransformed raw means and standard deviations are as follows: AD/HD group $M = .70, SD = .85$ vs. non-clinical group $M = 1.37, SD = 1.24$
Table 7.15

Identification of Episodes by Clinical Group Type

<table>
<thead>
<tr>
<th>Group</th>
<th>No Episodes</th>
<th>One or More Episodes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-clinical (n = 41)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observed</td>
<td>32 (78%)</td>
<td>9 (22%)</td>
</tr>
<tr>
<td>Expected</td>
<td>35.2</td>
<td>5.8</td>
</tr>
<tr>
<td>AD/HD (n = 37)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observed</td>
<td>35 (94.6%)</td>
<td>2 (5.4%)</td>
</tr>
<tr>
<td>Expected</td>
<td>31.8</td>
<td>5.2</td>
</tr>
</tbody>
</table>

7.6 Stories from Line Drawings

7.6.1 Clinical Group Type Differences in Narratives

Although no group differences were expected in length of stories, analyses were conducted because of the need to correct for length of stories if group differences did exist. Table 7.16 presents the mean and standard deviation of total number of words used, number of propositions and number of items utilised in the stories for AD/HD and non-clinical children aged 4- to 5-years and 6- to 7-years, respectively. The last variable mentioned, ‘number of items used’ refers to how many line drawings the child utilised in his/her story (with a maximum of five). No child used less than three drawings in his/her story. In order to protect against a Type II error when analysing the narrative length scores, alpha was set at .10
Table 7.16

Means, Standard Deviations and ANOVA Results of AD/HD and Non-Clinical Children on Narrative Length Measures

<table>
<thead>
<tr>
<th>Narrative Length Measures</th>
<th>4- to 5-year-olds</th>
<th>6- to 7-year-olds</th>
<th>Group</th>
<th>Age</th>
<th>Interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AD/HD (n = 13)</td>
<td>Non-clinical (n = 15)</td>
<td>AD/HD (n = 24)</td>
<td>Non-clinical (n = 26)</td>
<td>F</td>
</tr>
<tr>
<td>Total Number of Words</td>
<td>62.31 (42.04)</td>
<td>67.80 (51.84)</td>
<td>60.33 (36.78)</td>
<td>85.19 (67.84)</td>
<td>1.70</td>
</tr>
<tr>
<td>Number of Propositions</td>
<td>8.62 (5.55)</td>
<td>9.87 (8.10)</td>
<td>9.08 (6.28)</td>
<td>13.19 (11.86)</td>
<td>1.66</td>
</tr>
<tr>
<td>Number of Items Used</td>
<td>4.69 (.48)</td>
<td>4.53 (.74)</td>
<td>4.67 (.70)</td>
<td>4.77 (.51)</td>
<td>.04</td>
</tr>
</tbody>
</table>
Table 7.16 shows that with alpha set at .10 there were still no main effects for clinical group type and age and no significant interactions on number of words, number of propositions and number of items used. This provides evidence that there is no significant difference between the 4- to 5-year-old AD/HD and non-clinical children and the 6- to 7-year-old AD/HD and non-clinical children on story length elements.

### 7.6.2 Internal State Terms

As expected, there was only a small number of internal state terms mentioned overall, confirming the initial decision to analyse this data as one variable, ‘internal state terms’, consisting of mental, emotion, volition and affect expression terms. Univariate analyses revealed the presence of outliers, positive skewness and positive kurtosis levels that significantly departed from 0. It was initially decided to bring the two outliers back to the 95th percentile score (Tabachnick & Fidell, 2001). The resulting skewness and kurtosis levels were greatly improved, however, due to violation of the homogeneity of variance assumption on the internal state term variable and the presence of some remaining skewness, it was decided to also perform a square root transformation on this variable (Tabachnick & Fidell, 2001). This procedure satisfied the homogeneity of variance assumption and improved the histogram for this variable.

Table 7.17 presents the results of a 2 x 2 ANOVA on the internal state term composite score using age (4- to 5-years and 6- to 7-years) and clinical group type (AD/HD and non-clinical) as the independent variables.
Table 7.17

Summary of 2-Way ANOVA Results for Performance on Internal State Term Use

<table>
<thead>
<tr>
<th>Variable (sqrt)</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>.10</td>
<td>1</td>
<td>.10</td>
<td>.48</td>
<td>.49</td>
</tr>
<tr>
<td>Clinical Group Type</td>
<td>.55</td>
<td>1</td>
<td>.55</td>
<td>2.68</td>
<td>.10</td>
</tr>
<tr>
<td>Age x C G Type</td>
<td>.05</td>
<td>1</td>
<td>.05</td>
<td>.23</td>
<td>.64</td>
</tr>
<tr>
<td>Error</td>
<td>15.22</td>
<td>74</td>
<td>.21</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As can be seen from Table 7.17, there were no significant main effects for age or clinical group type and no significant interaction. Results indicate therefore that there is no evidence to suggest there is a significant developmental progression for either clinical group type on the use of internal state terms in their narratives (Hypothesis 7 and Research Question 19) and no difference between the AD/HD and non-clinical groups in their use of internal state terms during this task (Research Questions 17 and 18).

7.6.3 Narrative Structure

As expected there was a relatively small number of mental/ emotional and action/ behaviour causal statements utilised in the children’s narratives, confirming the initial decision to create a composite score for these two causal statement variables by adding them together (‘causal statements’ variable)^30.

---

^30 Pearson’s product-moment correlation coefficient was calculated between the two causal statement variables: \( r = .50, p < .001. \)
Table 7.18 presents the mean and standard deviation of the two narrative structure component scores for AD/HD and non-clinical children aged 4- to 5-years and 6- to 7-years, respectively.

Table 7.18

<table>
<thead>
<tr>
<th>Narrative Structure Components</th>
<th>4- to 5-year-olds</th>
<th>6- to 7-year-olds</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AD/HD (n=13)</td>
<td>Non-clinical (n=15)</td>
</tr>
<tr>
<td>Plot Structure</td>
<td>1.38 .65</td>
<td>1.80 .86</td>
</tr>
<tr>
<td>Causal Statements</td>
<td>.54 1.12</td>
<td>1.20 1.82</td>
</tr>
</tbody>
</table>

Table 7.19 presents the results of two 2 x 2 ANOVAs on narrative structure components, namely, plot structure and causal statements using age (4- to 5-years and 6- to 7-years) and clinical group type (AD/HD and non-clinical) as the independent variables. The Bonferroni adjustment of alpha level was applied, $p < .03$ (.05/2) to correct for possible Type I error.
Table 7.19

*Summary of Two 2-Way ANOVA Results for Performance on Narrative Structure*

*Components*

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plot Structure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>3.41</td>
<td>1</td>
<td>3.41</td>
<td>5.31</td>
<td>.02</td>
</tr>
<tr>
<td>Group</td>
<td>4.23</td>
<td>1</td>
<td>4.23</td>
<td>6.59</td>
<td>.01</td>
</tr>
<tr>
<td>Age x Group</td>
<td>.09</td>
<td>1</td>
<td>.09</td>
<td>.14</td>
<td>.71</td>
</tr>
<tr>
<td>Error</td>
<td>47.52</td>
<td>74</td>
<td>.64</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Causal Statements</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>2.48</td>
<td>1</td>
<td>2.48</td>
<td>1.09</td>
<td>.30</td>
</tr>
<tr>
<td>Group</td>
<td>10.91</td>
<td>1</td>
<td>10.91</td>
<td>5.01</td>
<td>.02</td>
</tr>
<tr>
<td>Age x Group</td>
<td>.26</td>
<td>1</td>
<td>.26</td>
<td>.11</td>
<td>.74</td>
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<tr>
<td>Error</td>
<td>169.13</td>
<td>74</td>
<td>2.29</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Results for plot structure showed a significant main effect for both age and clinical group type. The main effect of clinical group type confirms that there is a significant difference between the AD/HD ($M = 1.62, SD = .79$) and non-clinical group ($M = 2.12, SD = .84$) that is consistent across age, with the former group producing narratives that were significantly less structured (Research Questions 20.1 and 21.1). Also, the main effect of age confirms the presence of a developmental progression in both groups. There is a significant difference between the 4- to 5-year-olds ($M = 1.61, SD = .79$) and the 6- to 7-year-olds ($M = 2.04, SD = .86$) that is consistent across clinical group type, with the younger group producing narratives that
were significantly less structured than the older group (Hypothesis 8.1 and Research Question 22.1).

With regard to the use of causal statements, there was a significant main effect for clinical group type only, confirming that there is a significant difference between the AD/HD ($M = .70, SD = 1.08$) and non-clinical group ($M = 1.51, SD = 1.80$) that is consistent across age. In particular, children with AD/HD used significantly fewer causal statements in their narratives than the non-AD/HD children (Research Questions 20.2 and 21.2). There was no evidence of a developmental progression for either clinical group type (Hypothesis 8.2 and Research Question 22.2).

7.7 Summary

The current chapter has provided a comprehensive evaluation of ToM development in young children with AD/HD (HI and C) utilising a larger sample size than previous research in this area, specifically around the critical age periods of first and second order ToM development. Further, the study stringently ensured no significant differences existed between the AD/HD and non-clinical groups on age, sex, intellectual functioning and language functioning variables by setting alpha at .10 to avoid a Type II error. The study also displayed strength through the thorough procedure of ensuring the diagnoses of the children in the AD/HD group were correct. This chapter has also provided an examination of the developmental progression of ToM in young children with AD/HD, and has utilised both traditional and narrative ToM tasks, employing both quantitative and qualitative research methods.

Overall, findings showed that, on the First Order ToM Measure, no significant differences emerged between the performance of the 4- to 5-year-olds in the clinical and non-clinical groups. Conversely, for the 6- to 7-year-olds, a significant difference
was detected with children in the AD/HD group performing significantly more poorly than their non-clinical counterparts. On the Second Order ToM Measure, children in the AD/HD group demonstrated significantly poorer performance when compared to their non-AD/HD counterparts. With regard to the narrative task based on *A Boy, a Dog, and a Frog*, findings showed that children with AD/HD, regardless of age, performed significantly more poorly on those measures requiring the child to ‘move beyond grasping the general gist of the story’. Performance on the line drawings task evidenced no significant differences regarding the appropriate use of internal state terms between the clinical group types but did show a difference relating to the use of plot structure and causal statements with children in the AD/HD group performing more poorly in each case.
CHAPTER 8
DISCUSSION

8.1 Introduction

The central concerns of the present research have been fourfold, namely: a) to examine ToM development in young children diagnosed with AD/HD, with particular reference to the two Subtypes HI and C, as compared with that evidenced by a same-age sample of normally developing children; b) to conduct this investigation using a larger clinical grouping of 4- to 5-year-olds and 6- to 7-year-olds, since these ages correspond to the critical age periods of the attainment of first and second order ToM understanding, respectively, than has hitherto been the case; c) to identify any ToM developmental progression for the two clinical groups; and, d) to utilise a comprehensive ToM battery which incorporates both traditional first and second order tasks and narrative tasks.

The intent of this chapter is to discuss the key findings of this investigation in relation to these aims and in the light of previous knowledge and research in this area. The significance of the current research is highlighted with a discussion of its strengths, whilst the interpretations offered are qualified by a consideration of its limitations. Finally, the implications of these findings for future research, theory and clinical practice are summarised.

The results of the present study add to the growing body of research examining ToM development in clinical populations. Overall, the findings of the present research have shown that children diagnosed with AD/HD-HI or AD/HD-C experience significant difficulty in attaining a level of ToM understanding comparable
to that of same-aged normally developing children. Generally speaking, this deficit is evidenced irrespective of ToM task type, that is, performance is significantly poorer for this former group across activities based on both traditional and narrative based methodologies.

8.2 First and Second Order Traditional ToM Measures

8.2.1 First Order Findings

On the First Order ToM Measure, no significant differences emerged between the performance of the 4- to 5-year-old clinical and non-clinical groups. This finding significantly contributes to the existing small number of disparate findings regarding the performance of children with AD/HD on traditional first order ToM tasks (Buitelaar et al., 1996; Buitelaar et al., 1999; Strange, 1999) by providing methodologically sound results focusing on AD/HD children aged 4- to 5-years only. Conversely, for the 6- to 7-year-olds, a significant difference was detected, with children in the AD/HD group performing significantly more poorly than their non-clinical counterparts. This finding was a consequence of children in the non-clinical group, but not in the clinical group, manifesting a significant age difference between the 4- to 5-year-olds and the 6- to 7-year-olds, and hence showing a developmental progression. The lack of developmental progression on ToM understanding for the children with AD/HD subsequently adversely affected the 6- to 7-year-old AD/HD children’s performance. The finding of no significant difference in first order task performance at the 4- to 5-year-old level, yet the contrary finding of a significant difference at the 6- to 7-year-old level between the clinical versus non-clinical groups,
based on a significant younger to older age group progression in performance for the non-clinical group but not the clinical group, whose performance across the respective age groups remained static, represents a unique contribution of the present study.  

8.2.2 Second Order Findings

On the Second Order ToM Measure, children in the AD/HD group demonstrated significantly poorer performance overall when compared to their non-AD/HD counterparts, in keeping with findings by Buitelaar et al. (1996; 1999) and Strange (1999). Unlike previous research however, this outcome of the present study is based on a larger clinical group of children within the critical age period for the attainment of second order belief understanding. A further important addition to the literature has been the finding that the 6- to 7-year-old children in the AD/HD group also experienced significantly more difficulty with regard to the quality of their responses to the justification questions. Specifically, they experienced more difficulty taking into account the beliefs held by the characters when trying to accurately ‘sum up’ a situation, with just over 40 percent not taking into account any of the beliefs of the characters for the two stories in their justification responses. In fact, nearly 90 percent of the children with AD/HD were operating on a zero or first order justification level to try and make sense of the events in the second order ToM tasks, further confirming a lack of developmental progression in ToM understanding.

31 It is interesting to note that there was no difference between the 4- to 5-year-old AD/HD and non-AD/HD groups in first order ToM performance, however the 6- to 7-year-old children with AD/HD had significantly more difficulty than their same age non-AD/HD counterparts on the first and second order tasks. It could be concluded that no difficulty in ToM ability is present in 4- to 5-year-old children with AD/HD, and it is after this age, for some reason, that they begin to ‘fall behind’ in their development of a ToM. However, in light of the results from the narrative ToM tasks, this conclusion is extremely unlikely. Instead, one possibility may be that the traditional first order ToM tasks were not as sensitive as the narrative ToM tasks.
Apart from Buitelaar et al.'s (1996) case study, previous research with children with AD/HD has not separately reported on this important component of the second order task.

### 8.3 Narrative Measures

Thus far, research using a generative narrative approach to ToM understanding in children with AD/HD has not yet been conducted. Hence, findings from the present study based on the use of this methodology within this particular context could be considered of some importance. With regard to the narrative tasks, as a starting point, no significant differences existed between the clinical and non-clinical groups on narrative length variables.

#### 8.3.1 A Boy, a Dog, and a Frog Wordless Picture Book

#### 8.3.1.1 Internal State Terms Findings: Use of Volition, Affect Expression, Emotion, and Mental State Terms

Overall, no significant difference between the AD/HD group and the non-clinical group on their appropriate usage of *volition* terms was found. However there was a significant difference between the groups, regardless of age, in their use of *affect expression* and *emotion* terms, with the 4- to 5 and 6- to 7-year-old non-clinical groups producing significantly more appropriate terms of this type in their stories. Findings relating to the comparative usage of *mental state* terms by both clinical and non-clinical groups posed an interpretation difficulty due to the fact that, firstly, the
marginally non-significant result fell between the initial alpha level and the adjusted alpha level (Keppel, 1991). Secondly, the results from the mental state reference probed responses showed that children in the AD/HD group made significantly fewer appropriate references to characters’ mental states when probed. Further research is required to help solve this seeming conundrum.

Milch-Reich et al. (1999) note that the detection of cognitive and emotional on-line\textsuperscript{32} cues assist in the on-line organisation of the social event in which they occur, allowing the child access to a more comprehensive representation of the ongoing social event. Overall, the above narrative findings, and probed response findings for internal states below, suggest that children with AD/HD experience significantly more difficulty in attaining a comprehensive representation of ongoing social events.

The findings also suggest that children with AD/HD are at the level of operating proficiently as ‘desire psychologists’ (see Wellman, 1993) in their interpersonal relations, as evidenced by the volition results. However, this mentalistic level of functioning is a basic one equally accessible to children as young as two years of age thereby implying, perhaps, a limited ability on the part of children in the AD/HD group to reflect in an age appropriate manner on the content of their own mind or on that of another. Wellman puts it this way:

Simple desires...and beliefs...are intentional constructs in the sense that they are about some “object”...However...all intentional states need not be representational... Simple desires are intentional but not representational. A simple desire psychology, therefore, resting essentially on a conception of internal states directed toward obtainment of objects in the world, is quite

\textsuperscript{32} Milch-Reich et al. (1999, p. 413) note that “the term “on-line” refers to real time, ongoing internal representation of the dynamic stream of incoming social cues.” They accessed children’s on-line social processes by asking them to tell a story from consecutive drawings of unfolding social situations.
different from a belief-desire psychology that rests centrally, if not wholly, on a conception of internal cognitive states representing truths about the world. (Wellman, 1991, p. 212)

8.3.1.2 Probed Response Findings I: Internal State Terms (emotional reference, emotional explanation, and mental state reference)

Probed response findings showed a significant main effect for age and clinical group type, with the 6- to 7-year-olds performing significantly better overall than the 4- to 5-year-olds, and the non-clinical group performing significantly better than the AD/HD group in making appropriate references to characters’ emotions and mental states when asked, and in providing appropriate explanations of the story characters’ emotional states when asked. Moreover, an informal ‘eye-balling’ of these results, and the previous internal state term results (Section 8.2.1.1), would seem to indicate that the normally developing children in the 4- to 5-year age group were already producing one-third more to twice as many appropriate internal state terms as their AD/HD counterparts, as well as using either the same number or a greater number of internal state terms as the children in the older, 6- to 7-years AD/HD group.

8.3.1.3 Probed Response Findings II: Alternative Title and Story Elaboration

Findings pertaining to the generation of an alternative title for the story showed no significant difference overall between the AD/HD group and the non-clinical group. This outcome infers that children in the clinical group were as able as their non-clinical counterparts to extract the ‘gist’ of the story and to reflect that grasp of the story’s content in their spontaneously produced title. However, a difference was demonstrated by the two groups when it came to providing an appropriate elaboration
of the story’s ending by moving beyond the last scene of the story in order to infer the actions, thoughts, and feelings of the characters, with children in the AD/HD group performing more poorly than the normally developing comparison group on this task.

8.3.1.4 Narrative Structure Findings: Causal Statements, GAO Sequences, Episodes and Theme

Findings for causal statements usage showed that, overall, children in the AD/HD group used significantly fewer appropriate causal statements than did children in the non-clinical group. Remaining findings for age and age x group interaction fell between the initial and adjusted alpha levels leaving the option open to consider reserving judgement on these findings until further research is conducted (Keppel, 1991). In spite of this caveat, it can be stated that findings of the current study showed that the younger children with AD/HD certainly used significantly fewer causal statements than their non AD/HD counterparts and possibly still did so at the age of 6- to 7-years. Not only do these findings concur with similar results in the current study, wherein both the younger and the older age group of children with AD/HD experienced significantly more difficulty with providing appropriate explanations of the story characters’ emotional states, they also correspond with the findings of Lorch et al. (1999) and Milch-Reich et al. (1999) which showed that children with AD/HD aged between 7 to11 and 6 to 10, respectively, experienced considerable difficulty processing the causal structure of stories, displayed less sensitivity to the causal connections among events in stories, and included fewer causal relations in their story narrations. The present study’s findings has made a contribution to this research domain by demonstrating that children in a younger
AD/HD group than that previously studied, to wit, the 4- to 5-year-olds, also make much less use of causal statements than is deemed to be age appropriate.

GAO sequences usage showed that, overall, the AD/HD group identified significantly fewer sequences than did the non-AD/HD group. This major finding implies that children in the AD/HD group, aged from 4- to 7-years of age, have yet to fully acquire the narrative conventions of explaining behaviour in terms of goal plans, or to recognise the importance of orienting a story’s listener. This seeming deficit on the part of the AD/HD group has emerged despite the rather unique advantage proffered by *A Boy, a Dog, and a Frog*, namely, the continual presence of the sought-after frog, thereby providing the story-teller with an explicit goal object (see Munger, 1989, cited in Trabasso & Nickels, 1992).

Since causal statements and GAO sequences assist in organising and giving meaning to a child’s own, and another’s, ongoing experiences (cf. Braunwald, 1997; Capps, et al., 2000; Caron, 1997; Trabasso & Nickels, 1992), limitations in this regard would result in the problematic conduct of socially appropriate interchanges with people (Braunwald, 1997) and the appropriate explanation of human behaviour from an intentional stance (Trabasso & Nickels, 1992; Polkinghorne, 1988). As Lorch, et al. (1999, p. 282) note:

Those children who have trouble making and/or using the connections between events in stories may also have difficulty perceiving cause and effect in other contexts. Because causal connections help form events into a coherent whole, trouble using these connections may have implications for both the achievement problems and the peer difficulties frequently noted among these children (with ADHD). For example, children with this type of difficulty may misattribute other children’s actions and may fail to make the connection between their own actions and the consequences of those actions.
It seemed that explicitly identifying complete episodes was a difficult task overall for the children in the study (approximately 20% of children in the non-clinical group and 5% of children in the AD/HD group identified one or more complete episode out of a possible 5). This may have been a reflection of the exploratory episode framework and coding structure developed for this story using the causal network model as a general guide (Trabasso & Nickels, 1992; Trabasso & van den Broek, 1985). However it is worth considering the fact that the majority of identified episodes came from the older 6- to 7-year age group and research on narration has indicated that although 5- and 6-year-old children are beginning to incorporate goals into their chronologically sequenced stories, it is not until children are aged 7 or 8 that tangible efforts are first made to conform their stories to the episodic structure, that is, causally related, goal-based, problem-resolution episodes with reference to characters’ internal states (Botvin & Sutton-Smith, 1977). It may be that this variable would be more useful and discriminative with children who are older, approximately 8 years and beyond, and the GAO sequences variable more informative and sufficient for the age range of the children in the current study. Again, more research is required to clarify this.

With regard to the variable, theme, the 4- to 5-year-old children in the AD/HD group performed significantly more poorly than their non-AD/HD counterparts. This difference, however, was not observed at the 6- to 7-year-old level with children in both the clinical and non-clinical groups demonstrating a similar level of theme identification within this age grouping. Further, a developmental progression, in the form of a significant age difference, was evidenced by the AD/HD group, however the non-clinical group remained at the same high level across the two age groups with their theme identification.
Overall, findings based on the ‘alternative title’ and ‘theme’ responses suggest that children in the AD/HD group performed, or eventually performed, as well as those in the non-clinical group in gleaning the ‘overall gist’ of a story. This is in line with findings by Tannock et al. (1993) whose work examined the performance of children diagnosed with AD/HD on a story re-telling task. They found that whilst children in the AD/HD group performed poorly on such elements as the cohesion and organisation of the stories they re-told, they performed as well as their non-AD/HD counterparts in extracting the main idea from the stories. For everyday interpersonal functioning, the current findings suggest that, although children with AD/HD would most likely be able to ascertain the general idea of what was happening, their comparatively more limited intentional resources (e.g., causality, internal state terms) essential for interpreting the subtleties of social interactions, would go some way towards explaining the social awkwardness and pervasive interpersonal difficulties these children frequently encounter (cf. Clark et al., 1988; DuPaul et al., 2001; Grenell et al., 1987; Guevremont & Dumas, 1994).

Finally, apart from the probed responses for internal state terms, there was no evidence of a developmental progression on the wordless picture book variables for the non-clinical group. At first glance this finding seems an aberrant one since some form of developmental change from 4- through to 7-years of age would be expected in the normally developing group as a consequence of the emergence of more detailed processes of thinking (see Astington, 1990, p. 168). Upon reflection, this finding may be nothing more than an artefact of the kind of story chosen. It is possible that the content matter of *A Boy, a Dog, and a Frog* was so simple that it did not really lend itself to a more progressively complex interpretation and was readily mastered by both the younger and older children in the non-clinical group. The initial intention
behind selecting such simplicity of storyline was to make the tale easily accessible to both the AD/HD and non-clinical groups. However, it appears that providing a simple, accessible story seemingly resulted in no age group differences being recorded between the performance of the 4- to 5-year-old and the 6- to 7-year-olds in the normally developing group with regard to the wordless picture book responses, probed responses for internal state terms excepted. Whilst the results of these two age groups in the non-clinical group remained at the same high level, there were very few occasions in which the children with AD/HD showed a significant growth in ToM related narrative thinking, despite the simple storyline, as shown by the consistently significantly lower results.

8.3.2 Stories from Line Drawings

8.3.2.1 Internal State Terms Findings: Use of Volition, Affect Expression, Emotion, and Mental State Terms

For the internal state terms variable, there was no significant difference found between the AD/HD group and the non-clinical group in terms of their appropriate usage. Further, children overall, irrespective of age group or clinical group type, made few references to the characters’ mental or emotional states in their responses. These findings are at variance with those emerging from the wordless picture book. In an effort to explain this discrepancy, a post-hoc analysis of the requirements inherent in the line drawing task was conducted. A main requirement of the task is to incorporate five separate, unrelated objects (girl, cat, bag, turtle, ball), into a story. As opposed to the wordless picture book task whose linear structure is reflected in its logical
sequencing of drawings, no story structure is supplied for the line drawings task. Consequently, children may have been compelled to focus on the more immediate issue of integrating five fairly disparate objects into some sort of story, any story, at the expense of the ‘internal dynamics’ of the story and its characters. As well, a girl was the only human protagonist portrayed in the drawings which could have posed some difficulty for the males across both groups in their attempts to identify with the inner life of this character. Finally, the differing narrative methodologies yielded very different story lengths – on average, the wordless picture book stories were approximately four times longer than the line drawing stories. Whilst the former method had a ‘fixed length’ in terms of telling a story from sequenced pictures, no such framework existed for the latter task resulting in the generation of significantly shorter stories overall and therefore possibly fewer opportunities to consider and state the inner lives of the characters.

8.3.2.2 Narrative Structure Findings: Causal Statements and Plot Structure

Children in the AD/HD group, overall, i) used significantly fewer causal statements, and ii) produced fewer narratives with well developed plot structures, than did children in the non-clinical group. The first finding concurs with the finding coming from the wordless picture book narrative structure measure of the use of causal statements as detailed above in Section 8.2.1.4 and previous findings (cf. Lorch et al., 1999; Milch-Reich et al., 1999). Plot structure responses showed that within both the clinical and non-clinical groups, the older age group produced significantly more, well developed stories than did the younger age group.
8.4 What Part Might Inner Speech or Self-Talk Play in the Above Findings?

As previously stated, when categorising the children’s responses to the questions ‘tell me what the frog is thinking?’ and ‘tell me what the boy is thinking?’ in the present study, it became apparent that the correct answers contained ‘levels of richness’ that were not being tapped into by the ToM analysis underway. To illustrate, children were shown a picture of the frog sitting on a rock by himself after the boy had walked off home, and before the frog follows the boy’s footprints (see Figure 8.1 for picture from A Boy, a Dog, and a Frog wordless picture book). They were then

![Image](image_url)

*Figure 8.1 Picture from A Boy, a Dog, and a Frog (Mayer, 1967)*
asked: ‘tell me what the frog is thinking’. One child responded ‘That he’ll never see
him again’; a second child said ‘I wish I could have gone home with him’; a third
child said ‘I should go to him, I’ll follow his footprints’. All three children made an
appropriate reference to the frog’s mental state, yet the last two responses both
contain an extra dimension, a richness of explanation, which the first lacks. This
richness of explanation seemed to entail ‘crawling into the skin’ of the character, and
hence the child de-centering to produce the character’s thoughts in the form of inner
speech.

According to Bivens and Hagstrom (1992), this type of self-talk is commonly
depicted in children’s books and is directed toward plot action, goal attainment,
attitudes, and emotions on the part of the story’s characters. Analysis of the quality of
responses, as in the illustration above, led to an awareness that significantly more
children in the non-clinical group as compared with those in the clinical group used
this form of self-talk in their response to the query about what the story characters
were thinking. Within the non-clinical group, this type of response came primarily
from the 6- to 7-year-olds, and the 3 children who used inner speech in the AD/HD
group were all from the older, 6- to 7-years age range.

Bivens and Hagstrom (1992, pp. 163-164), working within a literary texts
context, point to the expansion of the traditional definition of private speech, which is
limited to audible speech-to-self, in order to encompass “…talk directed to the self
which is marked in the text as self-talk, thoughts given as self-talk, and reported self-
talk or thoughts” within this literary framework. Moreover, this form of private
speech in children’s literature “… may demonstrate how the “thinking” of the
characters relates to past and future action in the story as a theme is developed.”
This expanded definition of private speech to include self-talk in the service of self-regulation reflects Vygotsky’s concept of inner speech as *self-talk as thoughts*. For Vygotsky (1962), private speech emerges from the child’s verbal interactions within the social milieu, where language is first used by others to control and regulate the child’s behaviour (Berk, 1992; Furrow, 1992). The child then turns social speech toward the self (private speech) to guide his/her thought processes and control his/her own behaviour. With increasing age, private speech goes ‘underground’, lessening in audibility as it takes on a self-regulating function and is transformed into silent inner speech, or verbal thought, which has less reliance on concrete reality by enabling flexible abstract thinking, and the mental representation of relationships. Between the ages of 3 and 6 private speech becomes differentiated from social speech, peaks in frequency, and is then internalised as inner speech.

Vygotsky argued that the most significant attainment in cognitive development during early childhood is use of language not just for communication with others, but as a tool of thought – a means for directing one’s own attention and behaviour. This internalisation of language reorganises the child’s thinking, permitting higher mental functions (for example; planning, executive functioning and behavioural self-regulation) to emerge. Berk (1992) notes the “movement from private speech to inner speech – the silent dialogues we carry on with ourselves that are the essence of conscious mental activity – is a matter of internalisation of an originally communicative function... At the endpoint of this internalisation process (is) the complete fusion of language and thought” (p. 21). Morin and Everett (1990, p. 342) state that inner speech is an essential process in the development of an advanced cognitive self, its acquisition paralleling a state of increased self and other awareness:

... the advanced self, based on self-esteem, covertness of thoughts and images, and the awareness of other’s perspectives, requires more sophisticated cognitions and social
awareness that develop later in childhood... we would say that inner speech is probably one of the most important cognitive processes needed in the development of the cognitive self.

While used as a self-regulating tool, inner speech is also used in other circumstances of a more social nature such as play and general comments about feelings (Rubin, 1979; Rubin & Dyck, 1980). Berk (1992) notes that, with regard to these types of findings, a substantial number of investigators have concluded, in line with Flavell's early speculations, that private and inner speech...

... are a multifunctional phenomenon. Fuson (1979) enumerated three functions: a regulating function, an emotional/expressive function, and a fantasy/role play function. Speculating about the developmental significance of non-regulatory speech forms, Rubin (1979) suggested, in line with Mead's (1934) theory, that very young children's commentary about their actions and feelings may enhance awareness of their own separate existences. Their fantasy utterances may provide practice for person-to-person communicative encounters. (Berk, 1992, p. 42)

8.4.1 Inner Speech and Children Diagnosed with AD/HD

Glenwick and Burka (1975) maintained that the development of private and inner speech was an important mediator in the development of a reflective tempo and role-taking skill since: "By talking to oneself one should be better able to decenter and hence to reach correct conclusions on measures of perspective-taking and reflectivity" (p. 550). Following on from this line of thinking, research has been conducted over the years into the private and inner speech of impulsive and hyperactive children (see review by Berk. 1992). Recent perspectives on AD/HD, including Barkley's (1997b) hybrid model, have emphasised the centrality of the self-regulatory deficits in the

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White (1965) has also suggested that the internalisation of language serves to inhibit first available responses to a stimulus so that advanced cognitive processing, rather than associative processing, can occur.
disorder as demonstrated by the difficulties encountered with inhibition, organization, regulation and goal-directed behaviour by children diagnosed with AD/HD (see Barkley, 1998). In his model, Barkley emphasises the importance on the internalisation of speech in the development of self-regulation and notes that:

For those with AD/HD, the model stipulates that the privatisation of speech should be less mature or advanced than it is in others of the same age. This should result in greater public speech (excessive talking), less reflection before acting, less organised and rule-oriented self-speech, and a diminished influence of self-directed speech in controlling one’s own behaviour. (Barkley, 1997a, p. 81)

Findings in support of Barkley’s claim have come from researchers such as Winsler (1998) who showed that, because the self-regulatory deficits of the disorder are an obstacle to task success, children with AD/HD use task-relevant utterances over a longer developmental period and are delayed in their attainment of inner speech in consequence. Findings such as this support Berk’s (1992) earlier insistence of a bi-directional feedback system\(^\text{34}\), rather than a causal path:

...while private speech is a key element in children’s mastery over behaviour, it is also possible that children’s gradually maturing capacities to sustain attention and inhibit distracting bodily movements are critical factors that permit them to move in the direction of more mature, internalised private speech forms. Research suggesting that children with AD/HD experience an extended developmental period of externalised, task-relevant private speech lends credence to this possibility. (p.47)

\(^{34}\text{It should be noted that, despite this reciprocity, initial primacy within this bi-directional focus is given to behavioural (motor) inhibition in Barkley’s (1997b) AD/HD model.}\)
8.4.2 Inner Speech and the Current Findings: Social-Cognitive Context and Clinical Implications

Given the paucity of information regarding the inner speech of children with AD/HD in a social-cognitive context, the findings of the current study related to this area are important, especially since inner speech is not only significant to academic-cognitive problem solving contexts, but is a *multifunctional phenomenon* (Flavell, Botkin, Fry, Wright, & Jarvis, 1968). It is significant in: increasing self and other awareness (Morin & Everett, 1990); the ability to decenter and adopt another's point of view (Glenwick & Burka, 1975); and, social circumstances (Rubin, 1979).

Broadly consistent with the findings of previous studies of inner speech ability of children with AD/HD in an academic-cognitive context (e.g., Berk & Potts, 1991), the children in the current sample were found to be significantly deficient in their usage of inner speech compared to the non-clinical group. Further, although, due to the exploratory nature of the investigation, developmental differences were not analysed, the current findings suggest a developmental delay in the movement toward internalisation of speech for the AD/HD group. Further research is required to help elucidate on the development, developmental significance and variation across developmental periods of inner speech in children with AD/HD in a more social-cognitive context. Finally, the current study provides a possible starting point for the further development of a methodological framework in which to investigate inner speech development in a social-cognitive context.
8.4.2.1 Clinical Implications

As has been suggested through the research on children with AD/HD in academic-cognitive contexts, it is not enough to simply work on the inner speech component\(^{35}\), as a ‘bi-directional’ system seems to be in operation (Barkley, 1997b; Berk, 1992). This means that the child’s self-regulatory system (behavioural inhibition) also needs to be addressed, with one possible way being through the use of psychostimulant medication supplemented by behavioural intervention (Berk & Potts, 1991). However, for interventions focusing specifically on social-cognitive development, it is proposed that work on inner speech and the self-regulatory system alone would be inadequate to bring about improvements in the child’s social-cognitive functioning and that an added area to be addressed is exposing the child to extensive, meaningful social contact and interaction (Glenwick & Burka, 1975) through the use of such methodologies as cue cards/written script programs (Charlop-Christy & Kelso, 2003), video modelling (Nikopoulos & Keenan, 2003) and training peers, along with the child, to interact socially with the child in natural play settings (McGrath, Bosch, Sullivan, & Fuqua, 2003). These types of methodologies should allow the child ample opportunities in which to practice real-life social interactions and engage in social conversation in an unjudging environment. Working on these three components: inner speech, self-regulation (behavioural inhibition), and real-life social interactions, should provide a child with AD/HD a significant increase in

\(^{35}\) Providing intervention in the area of internalising private speech could take the form of maximising opportunities for children to talk to themselves, with the idea being that with sufficient experience in guiding behaviour with speech, children’s overt private speech will naturally and eventually internalise (Berk & Winsler, 1995; Winsler, Diaz, McCarthy, Atencio, & Adams Chabay, 1999). Other interventions have been suggested by Morin and Everett (1990), Meichenbaum and Goodman (1971) and Sigel’s (1982) notion of ‘distancing’. Also, Winsler et al. (1999) note that interventions designed to scaffold children’s internalisation of private speech along with a cognitive behavioural approach would be fruitful.
his/her skills to successfully navigate himself/herself through the social-cognitive aspects of his/her daily life, and thus potentially improve his/her ToM ability. Research is needed to test this intervention proposal.

8.5 Why No Developmental Progression?

On the narrative tasks, apart from a) the internal state probed responses for the wordless picture book, and b) the plot structure for the line drawings, there was no evidence produced of any age changes reflecting a developmental progression within either the AD/HD group or the non-clinical group. Upon reflection, the particular characteristics pertaining to a) and b) above which may have resulted in these tasks being more responsive to age changes, could reside in their requirement for the child to produce responses of increasing sophistication or complexity. The probed responses for the wordless picture book push the child to thoughtfully consider internal states and explanations with prompting and the plot structure variable of the line drawings tasks is categorised according to the level of story structure complexity. The emphasis on the results of these variables seems to be more about a qualitative difference rather than a quantitative difference. Follow-on studies might do well to design a wordless picture book incorporating a story with a gamut of simple to complex cognitions, emotions and narrative structure components in a more robust effort to elicit the presence of any age changes in a younger age group such as the one employed in this study.
8.6 Strengths, Limitations and Future Directions

The present study has assisted in providing some clarification of recent research findings and provided a comprehensive and comparative evaluation of ToM development in young children with AD/HD that has hitherto been lacking in the literature. This was achieved by successfully addressing the aims of the present study, namely:

a) Examining ToM development in young children diagnosed with AD/HD Subtypes HI or C only. An obvious strength of the current research has been the recognition of the importance of, and the stringent emphasis on, not only ensuring the current sample of young children were diagnosed with AD/HD, but that AD/HD Subtypes were specified as opposed to previous studies’ general lack of acknowledgment of the critical nature of these distinctions. Care was taken to ensure that no prior differences existed with regard to the levels of intellectual and language functioning which might have had an impact on the traditional and narrative task responses.

One of the initial goals of this research was to also test the idea that children with AD/HD-I would experience less difficulty with ToM task performance compared to children with AD/HD-HI and AD/HD-C (Petrovski, 1999). However, despite recruiting efforts, there were only a handful of children who met the criteria for AD/HD-I. Follow-on studies might expand this Subtypes approach by including a group of AD/HD-I children, particularly in light of Dyck et al.’s (2001) finding of no significant difference in ToM performance between a group of children with AD/HD-I and a group of normally developing children, and Perner et al.’s (2002) recent anecdotal report based on their observation that four children in their study, deemed to
be ‘at risk’ for an AD/HD-I diagnosis, displayed more difficulties on the ToM tasks compared to children ‘at risk’ for the other two Subtypes.

b) Utilising a larger sample size of 37 children diagnosed with AD/HD which not only exceeds that employed by previous researchers working in this area, but more importantly, the children were drawn specifically from within the critical age periods of first and second order ToM attainment, between 4- to 7-years of age. A larger sample size concentrated in age within the four year period regarded as critical in the development of ToM understanding resulted in a more pronounced sensitivity to the detection of different levels of ToM attainment both within and between the two clinical group types. These considerations, accompanied by methodological rigour, have assisted in providing some clarification to previous disparate findings on ToM development in young children with AD/HD.

c) Examining the age changes as reflected in a developmental progression of ToM attainment in young children with AD/HD, which has not been forthcoming until now. Although a cross-sectional design was employed in the present study, useful data were gathered concerning the comparative ToM functioning of children with AD/HD and without this disorder within an age-related context. Importantly, despite a well-planned and well-executed methodology incorporating both a battery of traditional first and second order ToM tasks and a range of narrative ToM associated tasks, children in the AD/HD group generally failed to show any marked improvements in their performance with increasing age. Future research might consider employing a longitudinal design to test the replicability of these results.

d) As mentioned in c) above, utilising a comprehensive range of traditional first and second order tasks and ToM related narrative tasks. Previous research examining ToM development in children with AD/HD has employed a traditional
approach only. Additionally, the present study used a series of composite scores based on performance across a number of ToM tasks which provides a more representative index of ToM ability (Fahie & Symons, 2003; Lalonde & Chandler, 1995). Apart from Buitelaar et al's (1999) study, no other studies examining ToM development in children with AD/HD have incorporated this methodology. Further, the current research adds to previous findings by also employing a narrative approach, a valuable methodology for examining ToM development in clinical groups (cf. Capps et al., 2000). The present study’s combining of a traditional ToM approach with a narrative approach in order to gather the most comprehensive and robust data possible is a unique one and represents a methodological advance over studies which have employed a traditional approach only when examining ToM development in young children with AD/HD.

Given that there are no previous reports on the generative narrative abilities of children with AD/HD with the aim of gaining insight into their ToM understanding, the current findings provide a unique and important contribution to the small body of literature on ToM and children with AD/HD. In particular, the introduction of the line drawings task was an attempt to gain a better understanding of these children’s ToM performance when generated within a more spontaneous framework typical of the unpredictable day-to-day social interaction context within which the child usually operates. However, reservations do exist at this stage regarding the benefits of its use in eliciting internal state terms when compared to the more frequently used wordless picture book. Follow-on research might investigate the use of narrative tasks that appear to be comparable to the line drawings task in terms of being less structured, more dynamic and more spontaneously demanding, but which may also have the potential to generate lengthier utterances. Consideration could also be given to the
way the task is administered in order to attain longer stories. For example, Craig and Baron-Cohen (2000) used a spontaneous story-telling method to assess imaginative ability in children with autism or Asperger’s Syndrome and, unlike the present line drawings task, they encouraged participants to produce as long a story as they could by prompting them with, ‘And what else could happen?’

Whilst advocating the usefulness of a narrative approach to ToM research, there is no suggestion that the traditional approach to ToM understanding should be discarded. Rather, much can be learnt from this latter approach regarding the necessity of employing a precise and rigorous methodology in the explanatory pursuit of such mentalistic concerns. As previously stated, determining the precise boundaries of a child’s concept of ToM requires the construction of experimental tasks that put the strain on those features likely to be critical (Astoning & Olson, 1995). A narrative approach based on such traditional experimental rigour could generate a wordless picture book which would allow for standardisation of responses, would meet criteria relating to test reliability and validity, and would provide normative data for comparison purposes.

A small number of findings in the current study carried with them the caveat to consider suspending judgement until more research was conducted as the result fell between the initial and adjusted alpha levels (Keppel, 1991). Whilst this may seem like a limitation of the current research, it was deemed to be a more considered approach toward the findings of those particular variables, rather than possibly making inaccurate claims. Also, in a small number of analyses, there was a violation of an assumption relating to inferential statistics resulting in data transformation and the need to collapse variables. Unfortunately, the need to collapse the causal statements data for the wordless picture book did not allow for a separate
investigation of the children’s ability to utilise mental/emotional causal statements and action/behaviour causal statements in their narratives. Further research is needed to understand the exact nature of these children’s explanatory difficulties.

8.7 Clinical Implications and Concluding Comments

The present investigation found that during the critical age periods for first and second order ToM development, children diagnosed with either AD/HD-HI or AD/HD-C generally perform more poorly than their non-clinical counterparts on traditional and narrative ToM tasks. Furthermore, findings primarily showed main effects for age and diagnosis but no interactions, suggesting a developmental lag hypothesis similar to the one espoused by Dodge, Murphy and Buchsbaum (1984) for aggressive children and Barkley (1997b) for AD/HD children. The findings gleaned from the present study have assisted in more specifically delineating the social-cognitive difficulties experienced by children with AD/HD and can ultimately aid these children in having the potential long-term negative impact of relationship difficulties lessened by informing caregivers and developing effective interventions.

Based on the comparative self-talk deficit evidenced by the children in the AD/HD group, improved ToM attainment may be achieved by working on the development of inner speech, improving self-regulation, as well as by allowing the child ample opportunities in which to practice real-life social interactions and engage in social conversation. This emphasis on real-life social contexts has also recently been advocated by researchers such as Milch-Reich et al. (1999) and Cole (2001) in an attempt to assist children with AD/HD in their social thinking development.
Intervention programs to enhance ToM development might also benefit from incorporating aspects of *mindfulness* techniques to assist children with AD/HD. Mindfulness training facilitates individuals to mindfully attend to what is coming into their awareness by reducing the ‘autopilot’ response, increasing awareness within oneself and others, and noticing what one is doing in one’s environment and why (Winton, 2002). The procedure has been shown to be significantly useful in reducing non-compliance and increasing self-control in children with AD/HD (Singh & Singh, 2002) and may also be a very useful strategy in assisting with their ToM development. Mindful techniques were also taught to the parents of the children with AD/HD in a ‘mindful parenting program’ devised by Singh and Singh. This suggests the need for future intervention programs to include, where appropriate, work with parents to enable them to model and provide accurate feedback of desired thinking and actions in their child’s ‘real-life’, natural environment.

Another approach that has gained momentum in seeking to facilitate children’s social-cognitive and ‘meaning-making’ development is narrative *co-construction*. Findings from the present study were based mainly on ‘narration’ and although co-construction and narration are two different concepts, the observed interest and involvement these children expressed, in particular, with the wordless picture book task, suggest that co-construction may be a worthwhile pursuit in facilitating these children’s ToM development. In Guajardo and Watson’s (2002) co-construction study, small groups of children (3 to 4) were exposed to approximately 15 sessions of a storyteller reading a children’s storybook whilst highlighting and discussing episodes containing mental references, false beliefs, deception, and appearance-reality

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36 As outlined in the footnote at the end of Chapter 2, Sperry and Sperry (1996) point out the difference in research on narrative between co-construction and narration, with the former being episodes of talk between an adult and child/children for instance, and the latter being speech by children in response to a researcher’s request to ‘tell me a story’.
situations, and then leading the children in a related activity. Results showed narrative discourse to facilitate ToM development by manipulating children’s exposure to social discourse, which was centred naturally around the storybooks.

Further support for the contention that a narrative-based intervention would assist children to attain an age-appropriate ToM understanding comes from Wright Cassidy et al. (1998) who maintain that “narratives read to children may provide important “training” for children in the task of understanding others’ behaviours through the ascription of mental states...foster(ing) the development of theory of mind because it provides a context in which mental states are discussed. Children are provided with information about the relationship between beliefs, desires, and behaviour. They can inquire and reflect on the relationship between people’s mental states and their actions” (pp. 463-464).

The results of the present study have clarified and extended the limited body of knowledge concerning the ToM development in children with AD/HD aged between 4- to 7-years as compared with the level of development attained by their normally developing peers. In general, the findings of the present research have clearly and robustly shown that, during the critical age periods of ToM development, children diagnosed with either AD/HD-HI or AD/HD-C perform more poorly on those tasks designed to elicit a ToM understanding than do their non-clinical counterparts of the same age. In response to these overall findings, ideas for future research directions have been proposed, and interventions to assist in age-appropriate ToM attainment have been discussed, in an effort to provide some practical assistance to children such as those in the AD/HD group in the present study, so that they may more successfully enter a community of minds and engage in satisfying, meaningful interactions with others, and within themselves.
REFERENCES


APPENDICES
APPENDIX A

DSM-IV-TR Diagnostic Criteria for AD/HD

A. Either (1) or (2):

(1) six (or more) of the following symptoms of inattention have persisted for at least 6 months to a degree that is maladaptive and inconsistent with developmental level:

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

(2) six (or more) of the following symptoms of hyperactive-impulsivity have persisted for at least 6 months to a degree that is maladaptive and inconsistent with developmental level:

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

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

B. Some hyperactive-impulsive or inattentive symptoms that caused impairment were present before age 7 years.

C. Some impairment from the symptoms is present in two or more settings (e.g., at school [or work] and at home).
D. There must be clear evidence of clinically significant impairment in social, academic, or occupational functioning.

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

_Code_ based on type:

314.01 **Attention-Deficit/Hyperactivity Disorder, Combined Type**: if both Criteria A1 and A2 are met for the past 6 months

314.00 **Attention-Deficit/Hyperactivity Disorder, Predominantly Inattentive Type**: if Criterion A1 is met but Criterion A2 is not met for the past 6 months

314.01 **Attention-Deficit/Hyperactivity Disorder, Predominantly Hyperactive-Impulsive Type**: if Criterion A2 is met but Criterion A1 is not met for the past 6 months

Coding note: For individuals (especially adolescents and adults) who currently have symptoms that no longer meet full criteria, “In Partial Remission” should be specified.
APPENDIX B

Advertising Flyer, Magazine Advertisement, Newspaper Articles and Letters regarding Current Research
Dear Parent/s,

The **University of Western Sydney, Macarthur** is currently conducting a study into:

1) **The development of social understanding and social communication in young children with ADD (with & without hyperactivity).**

2) **The impact of social understanding and social communication on interactions with other children.**

We are looking for **children with ADD (with & without hyperactivity) aged 4 to 8 years** to be a part of the research. It will only take up a small amount of your child’s time. There will be a number of tasks examining social understanding and communication, and the **Test of Variables of Attention (TOVA)** will also be administered.

The TOVA is an objective, standardised, visual continuous performance test designed for use with children with attention deficit disorders, measuring their levels of attention and impulse control. **A report of the TOVA results will be provided at no cost to you, thereby eliminating the usual consultation fee of approximately $100.**

If you would like your child to be part of this research or you would like to find out more about it, please call **Pandora Petrovski** (head researcher) on (02)95344159 or Dr Gaye Gleeson on (02)97726266 by December 7, 1998.
UNIVERSITY OF WESTERN SYDNEY
Macarthur

4 to 8-YEAR-OLD CHILDREN WITH ADHD WANTED

FOR STUDY INTO SOCIAL UNDERSTANDING
includes free test of attention (TQVA) report for each child

CAN YOU HELP US?

PHONE NOW FOR DETAILS
PANDORA PETROVSKI: (02)9772 6491
MACARTHUR ASSESSMENT CENTRE

Advertisement in *Sydney's Child* Magazine, October 1998
Call for help with ADD study

THE Macarthur area has one of the highest rates of attention deficit disorder (ADD) and parents are invited to volunteer their children for a new study. About 3.72 children in a thousand are on ADD medication in NSW but the average figures for Camden and Campbelltown are 8.33 and 5.45 respectively.

She is looking for children aged four to eight years who have been diagnosed with ADD (with and without hyperactivity). All information will be kept confidential. Pandora Petrovski will study how children with ADD develop socially and relate to other children.

University of Western Sydney Macarthur, Campbelltown PhD student Pandora Petrovski will study how children with ADD develop socially and relate to other children.

Details: Pandora on (02) 9772 6491.


A STUDENT from the University of Western Sydney Macarthur is conducting research on children suffering from Attention Deficit Disorder (ADD).

Pandora Petrovski is interested in the way children with ADD develop socially and their relationships with other children.

The PhD student is looking for children between four and eight who have been diagnosed with ADD to be part of her study. It will not take long and will include administrating the Test of Variables of Attention, a regarded test for ADD which measures the child's levels of attention and impulse control.

The test normally costs about $100, but Ms Petrovski will provide the results free.

Details: Ms Petrovksi on 9772 6491.

Article in Fairfield Advance Newspaper, September 8 1998

MORE children in the Macarthur area are being treated for Attention Deficit Disorder (ADD) each year.

In fact, Macarthur has one of the highest incidence of ADD in NSW, with more than eight children per 1000 at Camden receiving medication and more than five at Campbelltown, the state average is fewer than four children per 1000.

Now a University of Western Sydney Macarthur student, Pandora Petrovski, is looking into the way in which children with ADD develop socially, in order to help develop more effective programs for them.

So she is looking for volunteers, children with ADD aged between 4 and 8.

Details: Pandora on (02) 9772 6491.

(Note: Original letter to Learning Difficulties Coalition of NSW on letterhead)

Pandora Petrovski  
Department of Psychology  
University of Western Sydney, Macarthur  
PO BOX 555  
Campbelltown NSW 2560  
Email: p.petrovski@uws.edu.au

May 27, 1998

Joy Toll  
President  
Learning Difficulties Coalition of NSW Inc  
PO Box 472  
Sutherland NSW 2232

Dear Joy,

I am a PhD candidate at the University of Western Sydney, Macarthur under the supervision of Dr Gaye Gleeson. My thesis topic is about the development of social thinking and social interactions in children with Attention Deficit Hyperactivity Disorder (AD/HD) as compared to children without this disorder. I am writing to ask for your assistance in gaining participants for the study by distributing my flyer (enclosed) with your next newsletter.

As you are aware, children with AD/HD often experience significant problems with social interactions. These problems may be caused, in part, with their difficulty in attributing mental and feeling states appropriately to others during everyday social interactions. This misinterpretation of another child’s intentions could lead to difficulties in initiating and maintaining friendships, and dealing appropriately with the resolution of conflict. Further, I will be exploring through narrative, pragmatic communication skills and executive function processes of young children with AD/HD.

The study has been designed within the age range and capabilities of the children. It is also designed to be enjoyable and requires only a short amount of time. The results of this study will aid in the understanding of and relationships between, the social cognition, social communication, and executive function processes of young children with AD/HD.

I would be able to print off the flyers at university and deliver them to you. If you would like to discuss any aspect of this study further please feel free to call me on (02)95344159. Your assistance with this study would be greatly appreciated.

Yours Sincerely,

Pandora Petrovski.
(Note: Original letter to Burnside Children and Family Services on letterhead)

Pandora Petrovski  
Department of Psychology  
University of Western Sydney, Macarthur  
PO BOX 555  
Campbelltown NSW 2560  
Email: p.petrovski@uws.edu.au

September 2, 1998

Jillian Cunningham  
Burnside  
PO Box 6866  
Parramatta NSW 2150

Dear Jillian,

Following our recent discussion, I am now sending you some information about my research and some flyers. As I mentioned during our conversation, I am a PhD candidate at the University of Western Sydney, Macarthur under the supervision of Dr Gaye Gleeson. My thesis topic is about the development of social thinking and social interactions in children with Attention Deficit Hyperactivity Disorder (AD/HD) as compared to children without this disorder. I am writing to ask if Burnside could distribute my flyer at their courses on ‘parenting a child with AD/HD’.

As you are aware, children with AD/HD often experience significant problems with social interactions. These problems may be caused, in part, with their difficulty in attributing mental and feeling states appropriately to others during everyday social interactions. This misinterpretation of another child’s intentions could lead to difficulties in initiating and maintaining friendships, and dealing appropriately with the resolution of conflict. Further, I will be exploring through narrative, pragmatic communication skills and executive function processes of young children with AD/HD.

The study has been designed within the age range and capabilities of the children. It is also designed to be enjoyable and requires only a short amount of time. The results of this study will aid in the understanding of and relationships between, the social cognition, social communication, and executive function processes of young children with AD/HD.

If you would like to discuss any aspect of this study further please feel free to call me on (02)95344159. Your assistance with this study would be greatly appreciated.

Yours Sincerely,

Pandora Petrovski.
(Note: Original letter to paediatricians on letterhead)

Pandora Petrovski  
Department of Psychology  
University of Western Sydney, Macarthur  
PO BOX 555  
Campbelltown NSW 2560  
Email: p.petrovski@uws.edu.au

September 7, 1998

Dear Dr .........................,  

Thank you for agreeing to distribute my flyer at your office, it is greatly appreciated. As I mentioned during our telephone conversation last week, I am a PhD candidate at the University of Western Sydney, Macarthur under the supervision of Dr Gaye Gleeson. My thesis topic is about the development of social thinking and social interactions in children with Attention Deficit Hyperactivity Disorder (AD/HD) as compared to children without this disorder.

As you are aware, children with AD/HD often experience significant problems with social interactions. These problems may be caused, in part, with their difficulty in attributing mental and feeling states appropriately to others during everyday social interactions. This misinterpretation of another child’s intentions could lead to difficulties in initiating and maintaining friendships, and dealing appropriately with the resolution of conflict. Further, I will be exploring through narrative, pragmatic communication skills and executive function processes of young children with AD/HD.

The study has been designed within the age range and capabilities of the children. It is also designed to be enjoyable and requires only a short amount of time. The results of this study will aid in the understanding of and relationships between, the social cognition, social communication, and executive function processes of young children with AD/HD.

If you would like to discuss any aspect of this study further please feel free to call me on (02)95344159.

Yours Sincerely,

Pandora Petrovski.
APPENDIX C

Pictures from *A Boy, a Dog, and a Frog* (Mayer, 1967) Wordless

Picture Book used for Probing and Story Elaboration Variable
Characters chosen for probing: Boy and Frog

Character chosen for probing: Frog
Characters chosen for probing: Boy and Frog

Character chosen for probing: Frog

Last page of book shown to child for story elaboration variable.
APPENDIX D

Drawings used for Line Drawings Task
APPENDIX E

Photographs used for Appearance-Reality Task
Girl – Neutral Expression

Girl – Mean Expression

Girl – Nice Expression

Note: Original photographs were larger and in colour.
Note: Original photographs were larger and in colour.
APPENDIX F

Scripts for First Order ToM Tasks
**Unexpected Transfer Task**

What colour is this cupboard? What colour is this cupboard?

This is Matthew and this is his mum. Which one is Matthew? Which one is his mum?

Matthew and his mum have just returned from a shopping trip. She bought sultanas for a cake. Matthew is helping his mum put away the things. He asks her, where should I put the sultanas? In the blue cupboard, says his mum. Matthew puts the sultanas in the blue cupboard (put sultanas in cupboard). Matthew remembers exactly where he put the sultanas so that he could come back and get some later. He loves sultanas. Then he leaves for the playground (Matthew is removed). Mum starts to prepare the cake and takes the sultanas out of the blue cupboard. She puts some of them into the cake mixture and then she does not put them back into the blue, but into the green cupboard (put sultanas in the green cupboard). Now she realises that she forgot to buy eggs. So she goes to her neighbour for some eggs (Mum is removed). Matthew is coming back from the playground, hungry, and he wants to get some sultanas.

Control questions:
1) Did Matthew see the sultanas being moved?
2) Where did the sultanas used to be?
3) Where are they at the moment?

Belief Questions (counterbalanced):
1) Where will Matthew think the sultanas are when he comes back?
2) Where will Matthew first look for the sultanas when he comes back in?
**Deceptive Box Task**

(Children are shown a small, closed rice-bubbles box).

Representational change: What do you think is inside this box?

(The children are then shown the true contents of the box – pencils)

Now what did you think is inside this box?

Representational Change Belief Question: What did you think was inside this box before we took the top off?

(Introduce ‘Harry the kangaroo’ puppet)

Now, Harry hasn’t seen inside this box.

Belief Question: What will Harry think is inside this closed box before we take the top off?

Appearance-Reality: Appearance – Does it look like this box has pencils in it or does it look like it has rice bubbles in it?

Reality – What’s really inside this box? Are there really pencils inside it, or are there really rice bubbles inside it?
Deception Task with Child Involvement

I’ve got two containers here. What colour is this one? What colour is this one?

Oh, here comes Harry. Look he as some pencils and he is putting them into the purple container. Now Harry is leaving because he forgot to get some paper to draw on, so he is going to go and find some paper and then come back to get his pencils.

(Harry leaves the scene)

Now Harry has gone. I want you to help me play a trick on Harry. Let’s hide the pencils from him. Where shall we hide them? You choose a spot.

(If child does not choose blue container, encourage to do so)

Ok, we’ll hide them in the blue container.

Control Questions:
  1) Where did Harry put the pencils before he left the room?
  2) Where are the pencils now?
  3) Did Harry see us move the pencils?

Belief Questions (counterbalanced):
  1) Where will Harry first look for the pencils?
  2) Where will Harry think the pencils are when he comes in?
**Appearance-Reality Task**

(The stories are balanced in the following way: participant 1 – means story/boy and nice story/girl; participant 2 – nice story boy/ and mean story/girl; participant 3 – mean story/girl and nice story/boy; participant 4 – nice story/girl and mean story/boy, and then back to the beginning)

Now we are going to look at some pictures of children and hear some stories about them. You need to listen carefully to remember the stories.

**Story 1:**
(Show picture of neutral face)

I have a story about this boy/girl. His/her name is Andrew/Kelly. Andrew/Kelly is a very mean boy/girl. He/she always does mean things. When Andrew/Kelly is at school, he/she scribbles all over the other children’s school work. He/she teases and hits other children. That’s pretty mean, isn’t it?

One day, Andrew/Kelly had an accident and had to have an operation on his/her face that made him/her look very nice, like this (show nice photograph) for just a little while. The operation only changed his/her face and nothing else. Now Andrew/Kelly looks like this (point to the photograph). Now Andrew/Kelly looks like a very nice kid because of his/her operation. He/she still does really mean things like he/she always did, but now his/her face looks nice. So the operation changed his/her face, didn’t it? It didn’t change anything else though, just his/her face.

**Appearance Question:** When you look at Andrew/Kelly right now, does he/she look like a mean kid or does he/she look like a nice kid?

**Reality Question:** Is Andrew/Kelly really and truly a mean kid or really and truly a nice kid?

**Memory question:** (Show neutral picture). What did Andrew/Kelly do at school? Do you remember what he/she did in the story I told you?

**Story 2:**
(Show picture of neutral face)

I have a story about this boy/girl. His/her name is Andrew/Kelly. Andrew/Kelly is a very nice boy/girl. He/she always does nice things. When Andrew/Kelly is at school, he/she helps other children with their school work. He/she always shares his/her games and toys with the other children. That’s pretty nice isn’t it?

One day, Andrew/Kelly had an accident and had to have an operation on his/her face that made him/her look very mean, like this (show mean photograph) for just a little while. The operation only changed his/her face and nothing else. Now Andrew/Kelly looks like this (point to the photograph). Now Andrew/Kelly looks like a very mean kid because of his/her operation. He/she still does really nice things like he/she always did, but now his/her face looks mean. So the operation changed his/her face, didn’t it? It didn’t change anything else though, just his/her face.
Appearance Question: When you look at Andrew/Kelly right now, does he/she look like a nice kid or does he/she look like a mean kid?

Reality Question: Is Andrew/Kelly really and truly a nice kid or really and truly a mean kid?

Memory Question: (Show neutral picture). What did Andrew/Kelly do at school? Do you remember what he/she did in the story I told you?
**Sally-Anne Task**

This is Sally and this is Anne.

Which one is Sally? Which one is Anne?

Sally has a marble in her container. Sally leaves the room and while she is out, Anne takes the marble and puts it in her container. Here comes Sally.

Belief Question: Where will Sally first look for her marble?

Control Questions:
1) Where is the marble really?
2) Where was the marble in the beginning?
APPENDIX G

Scripts for Second Order ToM Tasks
**Second Order False Belief – Village Task**

This is Matthew and this is Joanne. They live in this suburb.

Which one is Matthew? Which one is Joanne?

Here they are in the park. Along comes the ice-cream man. Matthew would like to buy an ice-cream but he has left his money at home. He is very sad. Don’t worry says the ice-cream man, you can go home and get your money and buy some ice-cream later. I’ll be in the park all afternoon. Oh good says Matthew, I’ll be back in the afternoon to buy an ice-cream.

Prompt Question 1: Where did the ice-cream man say to Matthew he would be all afternoon?

So Matthew goes home. He lives in this house. Now, the ice-cream man says, I am going to drive my van to the church to see if I can sell my ice-creams outside there.

Prompt Question 2: Where did the ice-cream man say he was going?

Prompt Question 3: Did Matthew hear that?

The ice-cream man drives over to the church. On his way he passes Matthew’s house. Matthew sees him and says, where are you going? The ice-cream man says, I’m going to sell some ice-cream outside the church. So off he drives to the church.

Prompt Question 4: Where did the ice-cream man tell Matthew he was going?

Prompt Question 5: Does Joanne know that the ice-cream man has talked to Matthew?

Now Joanne goes home. She lives in this house. Then she goes to Matthew’s house. She knocks on the door and says, Is Matthew in? No, says his mother, he’s gone out to buy an ice-cream.

Belief Question: Where does Joanne think Matthew has gone to buy an ice-cream?

Justification Question: Why does she think he has gone to the __________?

Reality Question: Where did Matthew really go to buy his ice-cream?

Memory Question: Where was the ice-cream man in the beginning?
Second Order False Belief – Beach Task

Peter, Matthew and Joanne are at Peter’s house playing.

Which one is Peter? Which one is Matthew? Which one is Joanne?

Matthew asks Peter and Joanne, do you want to go down to the park to play ball with my other friends? No I don’t want to go, says Peter. I will go and play ball at the park, says Joanne, it sounds like fun.

Prompt Question 1: What are Matthew and Joanne going to do?

Prompt Question 2: Did Peter hear that?

I will go home to get my bat first and then I will meet you in the park, says Joanne. Joanne goes home to get her bat.

Prompt Question 3: Where did Joanne say she was going to meet Matthew?

Matthew then says to Peter, oh I forgot, I’m supposed to meet my friends down at the beach to play ball with them. I have to go and meet them there, bye.

Prompt Question 4: Where did Matthew say he was going?

Prompt Question 5: Did Joanne hear that?

Matthew leaves Peter’s house and is walking to the beach. Matthew passes Joanne’s house. Joanne sees him and says, where are you going? To play ball at the beach, says Matthew. I’m glad I know that, says Joanne.

Prompt Question 6: Where did Matthew tell Joanne he was going?

Prompt Question 7: Does Peter know that Matthew has talked to Joanne?

Now later, Peter goes over to Joanne’s house but Joanne isn’t home. Her brother says, she’s gone to play ball with some friends.

Belief Question: Where does Peter think Joanne has gone to play ball?

Justification Question: Why does he think she has gone to the __________?

Reality Question: Where did Joanne really go to play ball?

Memory Question: Where were Joanne and Matthew going to play ball in the beginning?
APPENDIX H

Consent Form for Parents/Guardians of Children with AD/HD
UWS Macarthur
PO Box 555, Campbelltown NSW 2560 Australia

Department of Psychology
Faculty of Arts and Social Sciences

INFORMED CONSENT FORM

I,.............................................................................agree for my child.............................................................................to participate in the research project conducted by Pandora Petrovski under the supervision of Dr Gaye Gleeson investigating the development of social understanding and social communication in young children with ADD (with and without hyperactivity).

I understand that my child’s involvement in this research will require participating in three sessions lasting approximately one hour each and involving a number of social thinking and communication tasks with some responses being taped. Additionally, I understand that my child will be administered an intelligence test and the test of variables of attention (TOVA), with the TOVA results being made available to me.

I am aware that I can call Dr Gaye Gleeson on (02)9772 6266 if I have any concerns about the research project. I also understand that I am free to withdraw from this project at any time.

I understand that individual results will remain strictly confidential and give permission for the information gathered in this research to be published and/or presented at suitable conferences in a form that does not identify my child in any way.

.............................................................................
Signature of Parent
.............................................................................
Date

.............................................................................
Signature of Researcher
.............................................................................
Date

This research project has been approved by the University of Western Sydney Macarthur Ethics Review Committee (Human Subjects).
INFORMED CONSENT FORM

I……………………………………….agree for my child…………………………………… to participate in the research project conducted by Pandora Petrovski under the supervision of Dr Gaye Gleeson investigating the development of social understanding and social communication in young children with ADD (with and without hyperactivity).

I understand that my child’s involvement in this research will require participating in three sessions lasting approximately one hour each and involving a number of social thinking and communication tasks with some responses being taped. Additionally, I understand that my child will be administered an intelligence test and the test of variables of attention (TOVA), with the TOVA results being made available to me.

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.................................................... ........................................
Signature of Parent                     Date

.................................................... ........................................
Signature of Researcher               Date

This research project has been approved by the University of Western Sydney Macarthur Ethics Review Committee (Human Subjects).
APPENDIX I

Request for Information Form and Example of Letter Sent to

Professionals Regarding each Child’s Diagnosis
REQUEST FOR INFORMATION

To: ____________________________________________

________________________________________________

Regarding: ______________________________________

Date of Birth: ___________________

Address: ________________________________________

I hereby authorise any professionals who have provided a diagnosis for

the child identified above to furnish to:

Pandora Petrovski
Department of Psychology
University of Western Sydney, Macarthur
P.O.Box 555
CAMPBELLS TOWN NSW 2560

a diagnosis of attention deficit for the child that equates with the

American Psychiatric Association Diagnostic and Statistical Manual
(DSM-IV) criteria and the statement of any co-existing disorders. I

also certify that I am the above-named child’s legal guardian.

(Witness) (PRINT Parent/Legal Guardian Name)

(Date) (Parent/Legal Guardian Signature)
Dr J McDonald  
138 Queen Street  
Campbelltown NSW 2560

Dear Dr McDonald,

I am a PhD student at the University of Western Sydney, Macarthur under the supervision of Dr Gaye Gleeson. My thesis topic is the development of social thinking and social interactions in children with Attention-Deficit/Hyperactivity Disorder (AD/HD) as compared to children without this disorder.

I know how valuable your time is, but ask for your cooperation in equating your current diagnosis of ADHD for......................................................with the American Psychiatric Association Diagnostic and Statistical Manual, fourth edition (DSM-IV) criteria (including, if applicable, the statement of any co-existing disorders). This information is vital as part of my research endeavours to examine possible differences between the AD/HD subtypes outlined in the DSM-IV. All the information is strictly confidential and no individual child will be identified in my thesis or in any other report based on this research.

Please find attached parental/guardian signed consent for the release of this information, the DSM-IV criteria for AD/HD and a brief form to complete regarding the diagnosis.

A reply paid envelope has also been provided for your convenience to return the completed form. Your cooperation in this matter would be greatly appreciated.

Please contact me on (02)97726491 or Dr Gaye Gleeson on (02)97726266 if you have any questions regarding the above request.

Yours Faithfully,

Pandora Petrovski
APPENDIX J

Consent Forms for Parents/Guardians of Non-Clinical Children
Dear Parent or Guardian

My name is Pandora Petrovski and I am carrying out a study into the development of social communication and interactions in young children for my PhD in psychology with the permission of the centre director and staff. I will be attending Holsworthy Children’s Centre over the next few months to interview children about their understanding of different social situations. As well, brief tests of intelligence and attention will be given. Altogether I will see your child on two occasions at Holsworthy Children’s Centre for approximately 45 minutes per session.

Your child’s participation in this study is important as it will allow me to compare their performance with that of a child of the same age diagnosed with Attention Deficit Hyperactivity Disorder (AD/HD). This comparison will allow me to identify difficulties in social understanding experienced by AD/HD children and plan appropriate ways to help them in this regard.

Participation is voluntary and your child is free to withdraw at any time. Confidentiality is assured as results will not be kept on the premises and only I will have access to them. If you wish, I will be available to discuss your child’s performance on the intelligence and attentional tests at a time convenient to us both. A staff member will be on hand at all times during the interviews.

Also, the mothers of children with AD/HD have completed a brief questionnaire about their child’s social behaviour. Again, in order to make these results meaningful, you are asked to complete this questionnaire as well. The questionnaire will take no longer than 10 minutes of your time. It is again stressed that these responses are confidential.

If your child is willing to participate and you give your permission, please sign and detach the bottom of this sheet and return it with the completed questionnaire in the envelope provided to Holsworthy Children’s Centre by 7th September 1999.

Please feel free to contact me on 95344159 or my university supervisor Dr Gaye Gleeson on 97726266 if you have any questions regarding the study.

Thank you for your time.

Pandora Petrovski.

----------- X --------------
I give permission for my son/daughter...........................(name) to participate in the research project relating to the development of social thinking and communication, which will be carried out over the coming months by Pandora Petrovski. I understand that my child may withdraw at any time.

Signature of Parent/Guardian  Date
APPENDIX K

Table: Transformed Means, Standard Deviations and ANOVA

Results of AD/HD and Non-AD/HD Children on TOVA Variables

(inattention, impulsivity, and variability)
Data Transformations on TOVA Variables (inattention, impulsivity & variability).

As the data was negatively skewed, raw scores on the impulsivity and variability variables were transformed by reflecting the variables and then applying the base 10 logarithm of (constant – x) (Tabachnick & Fidell, 2001). For the remaining negatively skewed variable, inattention, the variable was reflected and then it was initially decided to perform a square root transformation as the data appeared moderately skewed from the histogram. This improved the shape of the distribution but did not meet the assumption of homogeneity of variance. A logarithmic transformation of the raw scores was performed but this did not greatly assist in meeting the assumption either. Therefore results between the AD/HD and non-clinical groups on this last variable were confirmed using non-parametric procedures (Mann-Whitney U test, $z = 4.41, p < .001$). In all instances, the results from the transformed data, and Mann-Whitney U test, showed the same pattern as the untransformed data. See Table K1 for details of the TOVA transformed means, standard deviations and ANOVA results.
Table K1

Transformed Means, Standard Deviations and ANOVA Results of AD/HD and Non-AD/HD Children on TOVA Variables

<table>
<thead>
<tr>
<th>Measures</th>
<th>4- to 5-year-olds</th>
<th>6-7-year-olds</th>
<th>Group</th>
<th>Age</th>
<th>Interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AD/HD (n = 13)</td>
<td>Non-clinical (n = 15)</td>
<td>AD/HD (n = 24)</td>
<td>Non-clinical (n = 26)</td>
<td>F</td>
</tr>
<tr>
<td>-sqrtnattention\textsuperscript{a,b}</td>
<td>5.34 (3.11) 3.49 (1.26)</td>
<td>6.44 (1.20) 3.92 (1.04)</td>
<td>24.48 &lt;.001</td>
<td>2.99 n.s</td>
<td>.57</td>
</tr>
<tr>
<td>-lgimpulsivity\textsuperscript{a,c}</td>
<td>1.44 (.21) 1.22 (.23)</td>
<td>1.52 (.21) 1.15 (.29)</td>
<td>25.51 &lt;.001</td>
<td>.01 n.s</td>
<td>1.81</td>
</tr>
<tr>
<td>-lgvariability\textsuperscript{a,d}</td>
<td>1.55 (.29) 1.20 (.13)</td>
<td>1.65 (.41) 1.28 (.27)</td>
<td>24.40 &lt;.001</td>
<td>1.69 n.s</td>
<td>.04</td>
</tr>
<tr>
<td>-response time</td>
<td>92.62 (18.73) 93.00 (15.33)</td>
<td>82.13 (15.85) 87.88 (15.26)</td>
<td>.65 n.s</td>
<td>4.22 n.s</td>
<td>.50</td>
</tr>
</tbody>
</table>

\textsuperscript{a}NOTE: The interpretation of a reflected variable is just the opposite of what it was. Therefore, because these variables are standardised scores, after transformation it now means that the larger the transformed mean score, the worse the performance on this measure.

\textsuperscript{b}untransformed raw mean and sd scores for inattention: 4-5yrs: AD/HD 79.54 (35.40), Non 103.33 (7.66); 6-7yrs: AD/HD 71.75 (26.08), Non 100.58 (9.21)

\textsuperscript{c}untransformed raw mean and sd scores for impulsivity: 4-5yrs: AD/HD 91.69(13.72), Non 103.07(9.68); 6-7yrs: AD/HD 85.42(16.80), Non 105.77(7.26)

\textsuperscript{d}untransformed raw mean and sd scores for variability: 4-5yrs: AD/HD 82.15(22.76), Non 107.33(4.98); 6-7yrs: AD/HD 67.79(25.95), Non 101.77 (10.31)