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Theory of Mind Deficits in Children With Intellectual Disabilities: A Test of Specificity and Uniqueness Hypotheses

Dianne Campbell

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THEORY OF MIND DEFICITS IN CHILDREN WITH INTELLECTUAL DISABILITIES: A TEST OF SPECIFICITY AND UNIQUENESS HYPOTHESES

BY

Dianne Campbell

A Thesis Submitted in Partial Fulfilment of the Requirements for the Award of Bachelor of Education with Honours at the Faculty of Education, Edith Cowan University

Date of Submission

26/11/97
Abstract

This study was designed to determine (a) whether children with intellectual disabilities have a theory of mind deficit relative to younger children of the same verbal mental age and (b) whether theory of mind in children with intellectual disabilities is domain-specific or related to other general cognitive functions. A group of 15 children with intellectual disabilities (mean age = 10;0), 15 children of average intelligence (mean age = 10;0) and 15 children of average intelligence (mean age = 6;0) matched on verbal mental age with the children with intellectual disabilities.

The children were given a series of theory of mind tasks. The children with intellectual disabilities were significantly lower on theory of mind performance from the children of average intelligence of the same age, but not from the younger children of average intelligence matched for verbal mental age. This indicates that the children with intellectual disabilities do not exhibit a theory of mind deficit relative to other children of the same verbal mental age. General cognitive functioning accounted for the difference between the groups and was significantly correlated with theory of mind performance in the group with intellectual disabilities.

It is concluded that children with intellectual disabilities do not have a deficit in theory of mind relative to younger children of the same verbal mental age, and that theory of mind in children with intellectual disabilities is not domain-specific, but is related to verbal skills and general cognitive functioning.
Declaration

I certify that this project does not, to the best of my knowledge and belief:

(i) incorporate without acknowledgement any material previously submitted for a degree or diploma in any institution of higher education;

(ii) contain any material previously published or written by another person except where due reference is made in the text; or

(iii) contain any defamatory material.

Signature: [Redacted]

Date: 3/3/98
Acknowledgments

I would like to express my most sincere thanks to my supervisor, Dr Amanda Blackmore, for all of the support, encouragement and advice that she has given me throughout the thesis preparation. Thank you also to Professor Peter Cole and Josie Hubble for their assistance in the early stages of development of this research and also my colleagues, particularly Caroline, Renee, Paula, Tracey and Narelle, and my family, especially Brendon, for their support. Thank you to Sonya Barrett for all of her assistance in obtaining children to help with the study and finally, and importantly, a big thank you to the principals, teachers, parents and children who assisted with this research. It could not have been done without any of you.
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Background

Children with intellectual disabilities are those who have a low level of intellectual functioning and poor adaptive skills (Beirne-Smith, Patton, & Ittenbach, 1994). Both of these terms are included in the definition provided by the American Association on Mental Retardation (AAMR):

Mental retardation refers to substantial limitations in present functioning. It is characterised by significantly subaverage intellectual functioning, existing concurrently with related limitations in two or more of the following applicable adaptive skill areas: communication, self-care, home living, social skills, community use, self-direction, health and safety, functional academics, leisure and work. (American Association on Mental Retardation, 1992).

Australia primarily uses the AAMR definition in describing children with intellectual disabilities, with an emphasis on a clinical/medical model to
determine symptom severity. Categories are employed in terms of IQ range. For example, children with an IQ score from 55 - 75 are classified as having a mild intellectual disability, children with an IQ score from 30 - 55 are classified as having a moderate intellectual disability, and children with an IQ score below 30 are classified as having a severe intellectual disability (Drew, Hardman & Logan, 1988). The present thesis is concerned with those in the mild to moderate range of intellectual disabilities.

More males than females are diagnosed with an intellectual disability. Children with intellectual disabilities are also more likely to live in single parent families and come from low socioeconomic status families (Beirne-Smith, Patton, & Ittenbach, 1994).

Estimates of the prevalence of intellectual disabilities vary from 0.4% to 3% of the total population (McLaren & Bryson, 1987) and most of these fall within the mild to moderate range, which is the group that is being targeted for this study.

Children with mild to moderate intellectual disabilities often have motivational and behavioural characteristics such as: a delay in developing self-regulating behaviours, difficulty in establishing and maintaining interpersonal relationships and social skill deficits (Beirne-Smith, Patton & Ittenbach, 1994).

Difficulty in establishing and maintaining interpersonal relationships and in social skills has been attributed to difficulties that children with
intellectual disabilities experience in understanding other people’s beliefs and desires (Mitchell, 1997). If a child is unable to understand another’s beliefs or desires, he or she may have difficulty seeing things from the other person’s perspective. Showing empathy with how the other person is feeling and seeing the motives for another person’s actions. All of these may lead to the child not responding in an appropriate, socially accepted manner towards another person, leading to possible conflicts or poor relationships with other children.

The growing child gradually gains an understanding of other people’s desires, beliefs and intentions. This allows him or her to interpret the behaviour of others in a meaningful way (Wellman, 1992). An understanding of beliefs and desires improves social interactions. For example, an understanding of the actions of belief and desire can be used in play situations. Children may use their knowledge of beliefs and desires to allow them to assign roles for play activities.

In other words, young children begin to develop a theory of how people’s minds work, which allows them to interpret others’ actions in terms of their beliefs and desires. This is called the child’s “theory of mind”. If a child is delayed in developing such a theory of mind then he or she is unable to attribute beliefs or desires to another person, making it very difficult for the child to understand or predict the behaviour of that person.

Children with intellectual disabilities do exhibit some social difficulties. Benson, Abbeduto, Short, Nuccio & Maas (1993) propose that it may be
because these children have a poorly developed theory of mind. The present thesis aims to explore this further.

Purpose

The purpose of the current study is to determine whether children with mild to moderate intellectual disabilities have a deficit in theory of mind and to examine some possible reasons for this. In order to investigate this, the children in this study were given a set of tasks designed to test their theory of mind. The study is designed to explore and, if possible eliminate, alternative reasons for any differences in theory of mind performance found between children with intellectual disabilities and children of average intelligence.

One such reason is that children with intellectual disabilities do not remember the details of the task as well as children of average intelligence. Children who are less able to remember the details of a scenario will perform more poorly on tasks designed to test theory of mind, not necessarily because they lack a theory of mind, but simply because of their more limited memory. Memory check questions are used in this study to ensure that students are able to remember the appropriate scenarios. This is important, as students with intellectual disabilities have been found to exhibit deficits in memory performance (Beirne-Smith, Patton & Ittenbach, 1994).

Another possible reason for poorer performance of children with intellectual disabilities on theory of mind tasks is that their level of general
cognitive functioning is lower. Therefore, a measure of cognitive functioning (Ravens Coloured Progressive Matrices [RCPM], 1990) is used in the study to determine whether or not theory of mind deficits could be attributed to general deficits in cognitive functioning, as opposed to specific theory of mind deficits (Baron-Cohen, 1991).

Therefore this study is designed to examine not only whether children with intellectual disabilities demonstrated deficits in theory of mind, but also whether that deficit can be accounted for by a more limited memory or by their generally lower level of cognitive functioning.

**Significance**

It is important to study theory of mind because theory of mind is considered to be of value in a wide variety of social situations. Mitchell (1997) describes being aware of others’ thoughts and feelings as being necessary in order to be socially accepted by others. It also allows children to avoid or defuse conflict situations with others by enabling children to see the other’s point of view and not only their own. This has particular relevance for those children with mild to moderate disabilities as they are integrated into mainstream classes for their education.

Welch-Ross (1997) describes the importance of having an understanding of others’ minds in order to engage in everyday social exchanges which contribute to the development of advanced cognitive
processes. She argues that the “skills that are required to succeed on theory of mind tasks may be necessary for engaging in particular social interactions with peers” (p. 626). These interactions include such things as making joint proposals for activities and for assigning roles during pretend play.

Mitchell (1997) states that “a conception of mind is also vital in forming friendships” (p. 6). It enables children to distinguish those with whom they should form lasting and trusting friendships. Those who have a similar outlook on life, with similar interests and desires, can be judged through children’s conception of mind.

This study is also significant in that it investigates theory of mind in a population in which there is still little research. Most of the studies on theory of mind have been conducted with autistic children. In these studies, learning disabled or intellectually disabled children have been included only as control groups (Frithe, Happe, & Siddons 1994; Happe, 1995; Charman & Baron-Cohen, 1992). Very few studies have examined children from other populations. Those that have conducted different studies have studied children with a hearing impairment, children with Down Syndrome, children with intellectual disabilities and children of average intelligence (Zelazo, Burack, Benedetto & Frye, 1996; Benson, Abbeduto, Short, Nuccio & Maas, 1993, Peterson & Siegal, 1995, Baron-Cohen, 1995).

This study is also significant because it will examine some of the possible reasons that may account for children with intellectual disabilities
having a poor theory of mind. The factors which will be examined, memory and cognitive functioning, are known to be at a poorer level in children with intellectual disabilities than children with average intelligence (Drew, Hardman & Logan, 1988; Beirne-Smith, Patton & Ittenbach, 1994). The children with intellectual disabilities may find it more difficult to remember the scenarios presented to them, which may in turn impair their ability to give correct answers to theory of mind tasks. It is also known that children with intellectual disabilities are often delayed in their general cognitive development, and therefore a poorer theory of mind performance between the children with intellectual disabilities and children of the same age with average intelligence may be explained by their overall poorer level of cognitive functioning rather than a more specific deficit in theory in mind.

The evidence suggests that more research needs to be undertaken to determine whether individuals with an intellectual disability show evidence of theory of mind deficits and whether these deficits have some relation to other areas of cognitive functioning. This research is also deemed to be important from a social skills aspect, as having a theory of mind may be a key to some deficiencies experienced in this area by children with intellectual disabilities.
Definitions of Terms

Several key terms will be used a number of times in this thesis, and therefore definitions of these terms are given below. These terms will be discussed in greater detail in the literature review.

Beliefs

Beliefs are defined more broadly in the literature on theory of mind than the general use of the term. Theory of mind proponents state that beliefs are such things as knowing (having a true belief), guessing (having a belief that may or may not be true), surmising (having a belief that may or may not be true), doubting (having a belief that may be false) and being sure (having a true belief). True beliefs are rooted in reality rather than fantasy. False beliefs occur when a person has an inaccurate conviction about a situation (Wellman, 1992).

Desires

Desires are also defined in a broader manner in the theory of mind literature than the generally accepted term. Desires are said to be such things as wishes (a short term desire), preferences (a desire for a particular item/situation), goals (a long term desire) and hopes (a desire for the future). Because desires are not outwardly visible, they must be inferred by the observer.
**Intentions**

An intentional action is one where a person decides on a course of action deliberately. Both beliefs and desires are needed to provide explanations for intentional actions. For example, if a person desires (wants) a biscuit and they believe that a biscuit is located in a cookie jar, their intentional act will be to go to the cookie jar to get a biscuit.

**Specificity**

The specificity hypothesis refers to the claims made by some researchers (Tager-Flusberg, 1992; Swettenham, 1996; Charman & Baron-Cohen, 1992; Leslie, 1992; Baron-Cohen, 1991) that theory of mind is a cognitive function in its own right, separate from other normally developing cognitive functions, such as language, executive function, and memory.

**Uniqueness**

The uniqueness hypothesis refers to the claim made by some researchers (Happe, 1995; Swettenham, 1996; Baron-Cohen, 1995; Ozonoff & Miller, 1995; and Charman & Baron-Cohen, 1992) that a theory of mind deficit is only found in children with autism, and is not found in any other population, not even in children with intellectual disabilities.
Overview

The following chapter deals with relevant literature on theory of mind, its development in normal children and its development in children with disabilities. It also describes some of the possible reasons for theory of mind deficits in children with intellectual disabilities, in particular, memory and cognitive functioning and how these are to be assessed in this study. All of the tasks that are used to assess theory of mind in children are described in detail and the relevance of these tasks to theory of mind is discussed. The theoretical framework that is adopted for this study is also presented, followed by the research questions that were addressed for this study.

The next chapter is the method chapter. This chapter describes the participants of the study and their relevant characteristics. The procedure that is to be used will also be detailed. Following the method chapter is the results chapter. This chapter describes the results obtained from the study, whether there were any differences between the groups on theory of mind performance and whether or not these differences could be accounted for by memory and/or general cognitive functioning.

Following the results chapter is the discussion chapter. This chapter seeks to discuss the results in the context of other research, explain possible reasons for the results obtained and discuss implications of the results for future research and education of students with disabilities.
Chapter II

LITERATURE REVIEW

This chapter explains what theory of mind is, identifies relevant literature on theory of mind and discusses some of the issues in the theory of mind area. It also explains the normal development of theory of mind and its development in individuals from other populations. Other factors which may account for a theory of mind deficit in individuals are also explored.

What is Theory of Mind?

Theory of mind refers to "... the capacity to attribute mental states to oneself and to others and to interpret behaviour in terms of mental states" (Baron-Cohen, 1995, p. 55). For example, suppose there are two children, Tommy and Keith. If Tommy goes to the biscuit tin which is kept in the cupboard, Keith would be displaying a theory of mind if he assumed that Tommy wants a biscuit and that his actions are explained by this unobservable desire. This is an example of theory of mind because the actions of Tommy are being interpreted in terms of a mental state that cannot possibly be observed. On the other hand, if Tommy went to the biscuit tin to look for a biscuit, but Keith knew that the biscuits were still in the shopping basket and
had not yet been put away, Keith would display a theory of mind if he was aware that Tommy held a false belief. Theory of mind is deemed to be a theory because it allows people to predict another person’s behaviour from an unobservable source. A theory of mind is used in everyday social interactions between people. It allows people to understand the desires and beliefs of others.

The underpinnings of theory of mind begin with Flavell’s work on the perspective-taking abilities of young children as early as 1958. Investigators such as Wellman, Premack and Woodruff, Bretherton and Beeghly and Leslie, who published in the 1980s and 1990s, were concerned with the commonsense understanding with which the mind brings order to the social events which surround people (Flavell, Miller & Miller, 1993). This commonsense understanding has been termed “folk psychology”.

More recently this work has become more restricted by theorists in a theory-based approach which refers to a “. . . more abstract, causal-explanatory system that allows the child to explain and predict behaviour by referring to unobservable mental states such as beliefs and desires” (Flavell, Miller & Miller, 1993, p. 101). Current theorists propose that children have coherent concepts about the mind and behaviour and how the two are interrelated. This is still a relatively new field of study and a great deal more is still to be learnt about the development of a theory of mind, who does or does not have a theory of mind, and the usefulness of having a theory of mind in
today’s society. The relevance of this subject to education is also still under study, but there may be implications for the teaching of social skills to children, particularly children with disabilities who have shown some deficits or delays in this area.

**Development of Theory of Mind in the Normal Population**

There is evidence that children begin to develop a theory of mind from 3 or 4 years of age. This is a basic theory of mind, which, according to Wellman (1992), develops in complexity as the child’s development progresses. Mitchell (1997) provides the evidence that theory of mind begins at this age by explaining that children who cannot acknowledge a false belief lack a theory of mind. He states that the children that cannot acknowledge a false belief are unable to distinguish correctly between belief and reality and therefore do not display the underlying cognitive competence that is necessary to distinguish another person’s false belief. Once a child is able to distinguish between belief and reality he or she is able to understand false beliefs more easily and begin to obtain a theory of mind.

Flavell, Miller and Miller (1993) state that the first thing a child needs to obtain a theory of mind, is to have awareness that there is such a thing as a mind and that humans think. An example that they give of this is when an infant attempts to communicate with other people rather than with inanimate objects. They state that infants do not infer mental states, but rather assume
that the other person will respond to them. Although the infant has an emerging awareness of the mind, he or she is not yet able to apply this knowledge with any skill.

At around 2 or 3 years of age, the infant recognises that the mind has a relationship with behaviour, objects and events. This is sometimes called a perspective-taking ability. For example, the child may manipulate the environment to hide an object so that another person cannot see it. The 2-year-old who has taken her baby brother’s dummy may hide it behind her back when her mother enters the room, so that her mother cannot see that she has taken it. Here the child is able to differentiate between her own point of view and the point of view of another person. This is considered to be an important precursor to theory of mind abilities, and one which must be present before the child can be said to have a theory of mind.

The proposed beginning of theory of mind development at around 3 or 4 years of age, centres around the notion of a person’s belief and the fact that people can hold false beliefs. When children realise that a false belief can be held by another person (or themselves), they are beginning to develop a theory of how minds work (Mitchell, 1997). As an example of false beliefs, consider the following scenario. Jennifer had some lollies and put them in a box and left the room. The lollies were moved from the box to a cupboard, while Jennifer was away. When Jennifer returned to the room she would look for the lollies in the box because she holds a false belief that the lollies are where she
left them. Children below the age of 3, normally have difficulty with this problem and state that Jennifer will look in the cupboard because that is where the lollies really are. Children at this age fail to appreciate that Jennifer will look for the lollies in the last place that she saw them, rather than in their new location, and that therefore Jennifer holds a false belief. The understanding of one person’s false belief, which is acquired by children aged 3 or 4, is often known as a first-order false belief (Baron-Cohen, 1995).

The final stage of theory of mind development centres around the second-order false belief tasks. In order to conduct a more difficult test of false belief, Baron-Cohen (1995) devised a second-order false belief task. This task involves a person being able to understand nested beliefs. That is the person must understand one person’s beliefs about another person’s beliefs. For example, “Anne thinks that Sally thinks . . .”. Second-order false belief tasks are able to be understood by normally developing 6-7 year olds. From this age onwards, the theory of mind of the child grows in complexity and is refined. Higher order beliefs (ie third and fourth-order beliefs) are not considered in this study as they are too advanced for the participants of the study.

**Development of a Theory of Mind in Other Populations**

Much less research has been conducted on theory of mind development in individuals from other populations than the normal population. Populations
which have been studied include children with Down Syndrome, children with a hearing impairment, children with intellectual disabilities and children with a vision impairment. These studies however are very limited, as there are generally only one or two studies which focus on each of these disabilities.

As there has not been much research on other populations there is little evidence from these populations as to their theory of mind development. Therefore there is debate as to the extent to which children with intellectual disabilities, in particular, have a theory of mind deficit beyond what would be expected given their general cognitive functioning or intelligence. Theories relevant to this debate and research evidence are discussed in the following sections.

**Uniqueness**

Some theorists (Leslie, 1992) suggest that a theory of mind may never or rarely be achieved by people in one population, specifically children with autism. It is suggested that deficits in theory of mind performance may be attributed to a deficit in one area of social cognition. These theorists propose that a deficit in theory of mind is unique to children with autism and that no other population exhibits such deficits.

Another theory of development in other populations proposes that children who have a developmental delay will also experience a delay in the development of a theory of mind (Baron-Cohen, 1991). This means that if a
child is delayed in other areas of his or her development, such as a child with intellectual disabilities, then it is likely that he or she will exhibit a delay in the attainment of theory of mind as well. Such a child’s theory of mind will be slower to develop when compared with average children of the same mental age.

A great deal of research (Happe, 1995; Swettenham, 1996; Baron-Cohen, 1995; Ozonoff & Miller, 1995; Charman & Baron-Cohen, 1992) suggests that theory of mind deficits are unique to autistic children. This means that the deficit found in autistic children is beyond what could reasonably be assumed to be a developmental delay. This uniqueness hypothesis has in turn led to the hypothesis that a theory of mind deficiency is one of the underlying causes of the social difficulties faced by individuals with autism. There is however a great deal of debate among researchers on this issue, as some researchers (Zelazo, Burack, Benedetto & Frye, 1996, Tager-Flusberg & Sullivan, 1994, Ozonoff, Pennington & Rogers, 1991) state that other populations may be affected in a social functioning manner by theory of mind deficits, even if these are not as severe as those experienced by autistic children.

The first half of Table 1 summarises the main studies that have reported deficits in the theory of mind abilities of autistic children relative to various control groups, and have concluded that theory of mind deficits are unique to
Table 1. *Studies that examined the Uniqueness Hypothesis.*

<table>
<thead>
<tr>
<th>Author/s</th>
<th>Groups</th>
<th>Results</th>
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<tr>
<td><strong>Studies Supporting Uniqueness Hypothesis</strong></td>
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<tr>
<td>Swettenham (1996)</td>
<td>8 Autistic (10:9)</td>
<td>Autistic group significantly poorer than the other groups at theory of mind transfer tasks.</td>
</tr>
<tr>
<td></td>
<td>8 Down Syndrome (11:9)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8 Average (3:5)</td>
<td></td>
</tr>
<tr>
<td>Happe (1995)</td>
<td>70 Autistic (12:1)</td>
<td>Significantly more average (58%) and intellectually disabled (56%) than autistic (20%) children performed theory of mind tasks correctly.</td>
</tr>
<tr>
<td></td>
<td>34 Intellectually Disabled (12:3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>70 Average (4:0)</td>
<td></td>
</tr>
<tr>
<td>Charman, Baron-Cohen (1992)</td>
<td>17 Autistic (13:6)</td>
<td>Average and intellectually disabled children performed significantly better on theory of mind tasks than the autistic group.</td>
</tr>
<tr>
<td></td>
<td>14 Intellectually Disabled (14:5)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20 Average (4:4)</td>
<td></td>
</tr>
<tr>
<td>Baron-Cohen (1989)</td>
<td>10 Autistic (15:3)</td>
<td>Significantly more average (90%) and Down Syndrome (60%) than autistic (0%) children passed second-order theory of mind tasks.</td>
</tr>
<tr>
<td></td>
<td>10 Down Syndrome (14:3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10 Average (7:5)</td>
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<tr>
<td><strong>Studies Not Supporting Uniqueness Hypothesis</strong></td>
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<td></td>
<td>12 Average (5:1)</td>
<td></td>
</tr>
<tr>
<td>Tager-Flusberg &amp; Sullivan, (1994)</td>
<td>28 Autistic (16:11)</td>
<td>No difference found between the autistic and intellectually disabled groups on false belief tasks.</td>
</tr>
<tr>
<td></td>
<td>28 Intellectually Disabled (12:5)</td>
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<td></td>
<td>18 Average (9:1)</td>
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<td></td>
<td>16 Average (6:8)</td>
<td></td>
</tr>
<tr>
<td>Ozonoff, Pennington &amp; Rogers, (1991)</td>
<td>23 Autistic (12:1)</td>
<td>Autistic group performed same as average group on first-order theory of mind tasks.</td>
</tr>
<tr>
<td></td>
<td>20 Average (12:4)</td>
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</table>
the autistic group. The bottom half of Table 1 shows the main studies that
have found deficits in children from other populations and drawn conclusions
that children from other populations displayed theory of mind deficits and that
therefore theory of mind deficits are not unique to children with autism.

Swettenham (1996) used computer aids in his study to test and teach
theory of mind to a group of children with autism, a group with Down
Syndrome and a group of average intelligence. The participants for this study
were selected on the basis of having failed on three theory of mind tasks in an
initial assessment. Swettenham found that all of the students could pass theory
of mind tasks after instruction using the computers, but that the autistic
children could not pass distant transfer tasks (generalise their knowledge). He
suggests that the children with autism could have developed an alternative
strategy for passing the computer based theory of mind tasks, that they were
then unable to transfer to different situations.

Baron-Cohen (1989), Charman & Baron-Cohen (1992), and Happé
(1995) examined similar groups in their studies. All of the studies compared
three groups: children with autism, children with intellectual disabilities and
children of average intelligence. All three studies reported that the children
with autism performed at a much poorer level than either of the other two
groups.

On the other hand, Tager-Flusberg & Sullivan (1994) and Ozonoff,
Pennington & Rogers (1991) included autistic students in their studies, and
found no significant difference between their theory of mind performance and that of children with intellectual disabilities and average control groups. Ozonoff, Pennington, & Rogers used participants who were close in age. They used autistic students who were high functioning and therefore may have been more socially adept than their lower functioning peers.

Zelazo et al. (1996) found that adults with Down Syndrome performed more poorly on theory of mind tasks than 5-year-old children of average intelligence matched on mental age. They conclude that “deficits in theory of mind cannot invariably produce autistic behaviour, because people with Down Syndrome present a distinctive behavioural and social profile” (p. 483). There is some concern, however, in regards to the severity of the disabled group’s disability and the ages of the participants in the study. It is difficult to interpret a comparison between groups of such different ages. Although they are matched for mental age, they must surely be widely different in other ways. The theory of mind task is also not age appropriate for the 22-year-old adults with Down Syndrome, although it is the kind of task that a 5-year-old may be given in school. A number of other factors could also account for the deficit, such as the strangeness of the task, unfamiliarity with a test situation, language deficits and motivation. Using a closer mental age match would at least reduce some of these effects.

One study dealt specifically with intellectual disabilities. Benson, Abbeduto, Short, Nuccio, & Maas (1993) conducted a study using adolescents
with intellectual disabilities and children of average intelligence. They used 16 adolescents with an intellectual disability and a mean chronological age of 17;5 and 16 children of average intelligence and a mean chronological age of 6;8. The participants were matched on non-verbal mental age. One first-order and one second-order false belief story were used to test for theory of mind performance. Benson et al. found that the adolescents with intellectual disabilities performed worse than the students who were matched for mental age, and that the children with intellectual disabilities performed better on first-order, but not second-order tasks.

However, they also reported some limitations of the study. The students were matched on non-verbal mental age. Benson, et al. (1993) discussed that by not controlling for linguistic ability, they were not taking the students' language abilities or lack thereof into account. They also used only one first-order and one second-order task to draw their conclusions. They noted that they should have used a greater number of similar tasks in order to obtain an accurate representation of the students' performance on theory of mind tasks.

In summary, although some authors have argued that a theory of mind deficit is a characteristic unique to autistic children, others have presented evidence that children with intellectual disabilities do not differ in theory of mind performance from autistic children, and are significantly poorer than children of average intelligence matched on mental age. However, these
studies have a number of limitations, including questionable mental age matches and failure to account for verbal skills. Therefore, the question of whether children with intellectual disabilities have a significant deficit in theory of mind relative to the normal population still remains open.

Specificity

There is debate among researchers as to whether or not theory of mind is a domain-specific function. Theory of mind may be regarded as domain-specific if a child can have normal or near normal functions in other domains of cognition, such as executive control functions, memory and language ability, but nevertheless exhibits deficits in theory of mind itself. Children with intellectual disabilities already exhibit a developmental delay in cognitive areas (Zigler & Hodapp, 1986), and it may be possible that a deficit in theory of mind is attributable to this delay, rather than to a specific delay in theory of mind itself.

A hypothesis has been made about the specificity of theory of mind functions (Tager-Flusberg, 1992; Swettenham, 1996; Charman & Baron-Cohen, 1992, Leslie, 1992 & Baron-Cohen, 1991). The specificity hypothesis states that theory of mind functions are separate from normally developing cognitive functions. This means that theory of mind develops in an individual manner, rather than developing alongside other more general cognitive
functions. Conversely theory of mind may not develop where other cognitive functions develop at a normal rate.

Table 2 summarises the main studies that have examined cognitive functioning in relation to the theory of mind abilities of children of various populations. Some of the studies have found that general cognitive functioning is not a factor in the theory of mind abilities of the children examined, while others found that general cognitive functioning is a factor. The studies that have found general cognitive functioning to be a significant factor in the theory of mind abilities of the children examined concluded that the specificity hypothesis could not be supported, while those that found general cognitive functioning not to be a factor, determined that theory of mind was a domain-specific function.

Swettenham (1996), in a study described earlier, found that although the children with autism were able to pass the set theory of mind tasks after the teaching session, they were not able to generalise these skills to different scenarios, whereas the other groups could. The fact that the children with autism were not able to generalise the knowledge they had been taught, suggests a specific deficit in this area. The fact that they were able to devise alternative strategies to pass the tasks suggests that the theory of mind function is separate to other normally developing cognitive functions.

Leslie (1992) conducted a study involving autistic children, children with Down Syndrome and children of average intelligence. He used a false
Table 2. *Studies that examined the Specificity Hypothesis.*

<table>
<thead>
<tr>
<th>Author</th>
<th>Group</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Studies supporting the specificity hypothesis</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swettenham (1996)</td>
<td>8 Autistic (10;9) 8 Down Syndrome (11;9) 8 Average (3;5)</td>
<td>Autistic children were impaired in generalising theory of mind performance, but not in other functions relative to the other groups.</td>
</tr>
<tr>
<td>Charman &amp; Baron-Cohen, (1992)</td>
<td>17 Autistic (13;6) 14 Intellectually Disabled (14;5) 20 Average (4;4)</td>
<td>Autistic children were able to understand false non-mental representations, but were unable to understand false mental representations.</td>
</tr>
<tr>
<td>Leslie, (1992)</td>
<td>Autistic (13;8) Down Syndrome (12;6) Average (4;0)</td>
<td>The children with autism performed at a lower level on theory of mind tasks, but at an average level on other cognitive tasks.</td>
</tr>
<tr>
<td>Baron-Cohen, (1989)</td>
<td>10 Autistic (15;3) 10 Down Syndrome (14;3) 10 Average (7;5)</td>
<td>Autistic children not impaired in ability to recognise simple relationships, animate-inanimate distinctions and simple reciprocity, but impaired in theory of mind performance.</td>
</tr>
<tr>
<td><strong>Studies not supporting the specificity hypothesis</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zelazo, Burack, Benedetto &amp; Frye, (1996)</td>
<td>12 Down Syndrome (22;7) 12 Average (5;1)</td>
<td>A significant relationship between theory of mind task performance and alternative task (card sorting) found for the Down Syndrome group.</td>
</tr>
<tr>
<td>Peterson &amp; Siegal, (1995)</td>
<td>26 Deaf (10;7)</td>
<td>Deaf children’s difficulty on theory of mind tasks is possibly attributed to their difficulty with language, not a specific deficit in this area.</td>
</tr>
<tr>
<td>Klin, Volkmar &amp; Sparrow, (1992)</td>
<td>29 Autistic (4;3) 29 Intellectually Disabled (4;0)</td>
<td>Other social deficits besides theory of mind found in children with autism. Therefore theory of mind cannot be a specific cognitive function.</td>
</tr>
</tbody>
</table>
belief task to assess the children’s theory of mind, and a picture sequencing
task to compare the children’s ability to understand mental and physical
events. The children with autism demonstrated poor results on the false belief
task and mental state stories, relative to the children with Down syndrome and
the children of average intelligence.

Baron-Cohen (1989) and Charman and Baron-Cohen (1992) conducted
similar studies involving children with autism, children with intellectual
disabilities and children of average intelligence. In their studies they included
tests of cognitive function. These tests consisted of using non-mental false
representations, tests for understanding of reciprocity and tests for
understanding of animate-inanimate objects. Both of these studies found that
children with autism were impaired in their theory of mind while having other
cognitive functions such as recall of previous states, and person permanence
intact. This finding led to these researchers to conclude that the theory of
mind attainment is a specific cognitive domain, independent of other cognitive
domains.

On the other hand, there is also evidence that theory of mind is not in
itself a specific domain, but that deficits on theory of mind tasks are closely
related to deficits in other areas of cognitive functioning.

Zelazo et al. (1996) found a significant relationship between theory of
mind and non-social rule use, as measured by a card sorting task, in children
with Down Syndrome. This means that the students who performed poorly on
the theory of mind tasks also performed poorly on the card sorting task. They postulated that “difficulties in theory of mind may depend on more general difficulties in flexible reasoning, such as the ability to use a higher order rule” (p. 479)

Peterson and Siegal (1995) conducted a study with 26 children with hearing impairments aged 8 to 13 years of age. Peterson and Siegal discuss the reasons for the deaf children’s difficulty as possibly being attributed to their difficulty with language. They also state that the neurological explanation given (specificity hypothesis) in the case of autism is unlikely to be the same reason for the deaf children’s difficulty on these tasks. They conclude that a better explanation is needed to explain the similar difficulty in theory of mind tasks observed in deaf children.

Sparrevohn and Howie (1995) tested two groups of autistic children on theory of mind tasks in order to ascertain if there was a developmental progression of any sort. They tested high functioning autistic students and low functioning autistic students to determine if there was a difference in theory of mind task performance between the groups, and if this could be explained by overall functioning of the individual. Their results showed that there was a hierarchical pattern of performance across the tasks, suggesting a developmental sequence of theory of mind ability, rather than a specific deficit in this area, and that the development is extremely slow in children with autism. There was also evidence to suggest that verbal ability of the children
contributed to their success on theory of mind tasks. These findings are inconsistent with the hypothesis that theory of mind functions are specific to a cognitive domain.

Klin, Volkmar and Sparrow (1992) studied a group of children with autism and a group of children with intellectual disabilities. These groups were matched for mental age. Klin et al. used the Vineland Adaptive Behaviour Scales to assess the social competence and social behaviours displayed by both of these groups. Their results indicated that social deficits in children with autism are pervasive and primary (occur early in the developmental sequence) and are not limited to deficits in theory of mind performance. The autistic children performed well on some areas of the Vineland test such as motor skills, but poorly on verbal ability. The children with intellectual disabilities performed as expected, given their lower level of general cognitive functioning, on the social, motor and verbal skills tested by the Vineland Adaptive Behaviour Scales. These findings do not support the specificity hypothesis made in regards to theory of mind deficits, as the autistic group performed poorly in a number of areas.

The authors of the studies have reported that the children displayed deficits in theory of mind task performance and also displayed deficits in other areas of cognitive functions. Because the children have demonstrated a deficit in another area of cognitive functioning which is of the same severity as the deficit in the theory of mind area, the researchers have concluded that theory
of mind functions are directly related to cognitive functions in all other areas as well. This means that a child will most likely have a deficit in theory of mind if he or she has a deficit in general cognitive functioning. From this finding, Zelazo et al., Benedetto and Frye, Sparrevohn and Howie, Klin, Volkmar and Sparrow, and Peterson and Siegal, have stated that the specificity hypothesis made by some researchers is unable to be supported by their studies.

There is evidence both for and against the specificity hypothesis in theory of mind. Therefore it is unclear whether or not theory of mind is or is not a specific cognitive domain. Previous studies have attempted to control for general cognitive functioning. The current study will also attempt to provide evidence either for or against the specificity hypothesis by using a measure of cognitive functioning which has not as yet been used by other researchers, as well as controlling for verbal ability by using a verbal mental age matching test.

**Testing Theory of Mind**

The tasks undertaken for this study are similar to those used to test for children's theory of mind in a number of other studies (Baron-Cohen, 1995; Hobson, 1993; Zelazo et al. 1996; Frith, Happe & Siddons, 1994; Happe, 1995).
Baron-Cohen (1995) describes one example of a first-order theory of mind task as one in which the child must think about another person's false belief on viewing a Smarties packet which is shown to contain pencils. Children demonstrate a theory of mind if they can state that another person would be deceived by the packaging of a Smarties packet if that person was not shown what the real contents were (in this case, pencils). This is a theory of mind task because the child must utilise what he or she knows about the other person's beliefs (even if they are false) to predict the other person's behaviour. This is only one example of a first-order false belief task.

Hobson (1993) describes another first-order theory of mind task, but with a more complex verbal story line. It is known as the Sally-Anne task. There are two characters, Sally who hides a marble and Anne who is out of the room at the time. The questions to the child are focused on Anne’s beliefs about the whereabouts of the marble. From the age of 3 or 4 years, children state that Anne will look for the marble where she last saw it, because they understand that Anne did not see Sally hide it and therefore that Anne must have a false belief about the marble’s location. Before this age, children state that Anne will look for the marble in its correct location, because they do not take into account her lack of knowledge about the whereabouts of the marble and consequent false belief.

Sparrevohn and Howie (1995) describe a second-order theory of mind task as one in which a child must determine how two people will think. For
example, “Anne thinks that Sally thinks . . .”. Therefore if a child shows an ability to take into account the beliefs or desires of two people, then that child is demonstrating an understanding of second-order false belief.

In order to be able to perform theory of mind tasks, it is necessary for the child to be able to see something from another’s perspective. If the child is unable to see something from another’s perspective, then he or she would not reasonably be able to perform theory of mind tasks because they demand perspective-taking ability. A perspective-taking task has been described in Donaldson (1978). This task deals with the “. . . child not appreciate(ing) that what he sees is relative to his own position; he takes it to represent absolute truth or reality . . .” (Donaldson, 1978, p. 20). The Policeman Task (Donaldson, 1978, p. 21) involves a naughty boy hiding from a policeman behind four walls. Props are used to demonstrate this to the child. A simplified version of this perspective-taking task could be used to determine if the child has the pre-requisite ability to succeed on theory of mind tasks. However this has not been taken into account in any of the previous theory of mind studies. If the child is unable to pass this task, it can reasonably be assumed that he or she will have difficulty on the more challenging theory of mind tasks.

In the present study, both children with intellectual disabilities and children of average intelligence of the same age are given theory of mind tasks to ensure that the theory of mind tasks used in the study are able to detect
developmental differences. A difference is expected to be found between the
children of average intelligence matched for chronological age and the
children with intellectual disabilities.

**Memory and Theory of Mind**

Norman (1982) states that “to remember is to have managed three
things successfully: the acquisition, retention, and retrieval of information”.
This has implications for students who have intellectual disabilities. Students
with intellectual disabilities have been found to have more limited memory
than children without intellectual disabilities. The greater the intellectual
deficit, the greater the memory deficit (Drew, Hardman & Logan, 1988).
These deficits have been attributed to several factors, relating to all of
Norman’s requirements for memory. These include an inability to focus on
relevant stimuli, inefficient rehearsal strategies, and an inability to benefit from
incidental learning cues (Drew, Hardman & Logan, 1988).

A number of studies have investigated memory and its relation to
theory of mind. Benson, Abeduto, Short, Nuccio and Maas (1993) conducted
a study with 16 children with intellectual disabilities and 16 children of
average intelligence, using both first and second-order scenarios. Benson, et
al. were able to determine whether or not the students were able to follow the
scenarios by asking content questions throughout the testing. They found that
“... the poor performance of the (children with intellectual disabilities) was not due to their inability to follow the critical events of the stories” (p. 430).

Charman and Baron-Cohen (1992) studied 17 children with autism (mean age 13;6), 14 children with intellectual disabilities (mean age 14;5) and 20 children of average ability (mean age 5;1). They used a false belief test with the children. They also asked questions to determine whether the students understood the task and could remember past events. Charman and Baron-Cohen found that memory was not a factor in the results that they obtained, as the children had no difficulty remembering the tasks and the questions put to them by the researchers.

On the other hand, Welch-Ross (1997) conducted a study 40 children who ranged in age from 3 years, 6 months to 4 years, 6 months. These children were required to discuss three past events with their mothers and complete a set of theory of mind tasks. Welch-Ross found that the children’s theory of mind scores were related positively to their memory responses, independent of their age and linguistic ability.

As children with intellectual disabilities may have poorer memory functions than children of average intelligence, it is important to include memory check questions in any study of their theory of mind to determine whether memory is a significant factor in theory of mind performance.
Theoretical Framework

The purpose of this study is to determine whether or not individuals with an intellectual disability perform more poorly on theory of mind tasks than age-matched children of average intelligence and verbal age-matched younger children of average intelligence. The study also investigates whether deficits in memory or in cognitive functioning can account for any deficits in theory of mind performance.

The research was conducted within the framework of the uniqueness and specificity hypotheses.

The uniqueness hypothesis was tested as follows. If theory of mind in children with intellectual disabilities develops at the same rate as their intellectual development, then their performance on theory of mind tasks should be comparable to the theory of mind performance of children of a younger chronological age matched on verbal mental age (Baron-Cohen, 1995). This is shown on the right hand side of Figure 1. However, if children with intellectual disabilities perform significantly more poorly on theory of mind tasks than younger children of the same verbal mental age, then this would provide evidence of a deficit in theory of mind in children with intellectual disabilities, similar to that already reported in children with autism. It would suggest that children with autism are not unique in showing a deficit in theory of mind, relative to their cognitive level, but that children with
intellectual disabilities show the same pattern. This is shown on the left hand side of Figure 1.

Figure 1. Possible results of the present study in terms of the uniqueness hypothesis.

Note: ID group - children with intellectual disabilities.

MA group - children of average intelligence matched on verbal mental age.
The specificity hypothesis refers to the hypothesis that theory of mind functions are domain-specific and therefore separate from other normally developing cognitive functions. In the present study, this will be tested as follows. If a difference is found between the children with intellectual disabilities and the children of average intelligence matched for verbal mental age, then it will be necessary to determine whether the difference is due to theory of mind deficits or to general cognitive functioning. To do this a test of general cognitive functioning will be used as a covariate (see Figure 2). If there is still a significant difference after the covariate has been applied, then the results can be said to be consistent with the specificity hypothesis mentioned previously because this difference could not be accounted for by a generally poor level of cognitive functioning. (See the left side of Figure 2.). However, if there is no longer any significant difference found between the children with intellectual disabilities and the children of average intelligence when general cognitive functioning is used as a covariate, the results are inconsistent with the specificity hypothesis because any difference that was originally found can be accounted for by a generally lower level of cognitive functioning. (see the right side of Figure 2).
If there is a significant difference between the ID and MA groups

Performance on theory of mind tasks with performance on cognitive function task used as a covariate

Significant Difference between the ID and MA groups

Cognitive functioning does not account for the difference between the ID and MA groups

Consistent with Specificity Hypothesis

No Significant Difference between the ID and MA groups

Cognitive functioning does account for the difference between the ID and MA groups

Inconsistent with Specificity Hypothesis

Note: ID group - children with intellectual disabilities.

MA group - children of average intelligence matched on verbal mental age.

Figure 2. Possible results of the present study in terms of specificity hypothesis.


**Research Questions**

The research questions that will be addressed in this study are as follows:

(1) Do children with intellectual disabilities perform more poorly than (a) chronological age-matched children and (b) verbal mental age-matched children, on theory of mind tasks?

(2) If there are differences between the children with intellectual disabilities and either of the other groups in theory of mind, can these differences be accounted for by cognitive functioning as measured by Ravens Coloured Progressive Matrices?

(3) If there are differences between the children with intellectual disabilities and either of the other groups in theory of mind, can these differences be accounted for by differences in the children’s memory for the details of the task?
Chapter III

METHODOLOGY

Participants

The participants for this study were 45 children drawn from three populations. These populations were: children with intellectual disabilities who were drawn from Education Support Centres (ES group), children of average intellectual ability matched on chronological age with the children with intellectual disabilities (CA group) and children of average intellectual ability, matched on verbal skills with the children with intellectual disabilities (MA group). There were 15 children in each group.

As shown in Table 3, the ages of the ES and CA groups were about 10 years of age but, whereas the ES group had a mean Peabody Standard Score of 61, the CA group had a mean Peabody Standard Score of 97, which is about average. The MA group, though only about 6 years of age, obtained the same level of raw score on the Peabody Picture Vocabulary Test as the ES group.

The children with intellectual disabilities were drawn from five Education Support Centres and Units in the Perth Metropolitan area. The children in the other two groups were drawn from five state primary schools on the same sites as the Education Support Centres and Units. All of the schools
used for this study were located in areas which can be described as middle
socio-economic status areas.

Table 3.

*Characteristics of Children Participating in the Study.*

<table>
<thead>
<tr>
<th>Group</th>
<th>ES group</th>
<th>CA group</th>
<th>MA group</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Sex</td>
<td>11:4</td>
<td>11:4</td>
<td>11:4</td>
</tr>
<tr>
<td>M:F</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>10;0 (0;4)</td>
<td>10;0 (0;4)</td>
<td>6;0 (0;4)</td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>9;6 - 10;7</td>
<td>9;7 - 10;9,</td>
<td>5;6 - 6;5</td>
</tr>
<tr>
<td>Range</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Verbal Mental Age</td>
<td>5;8</td>
<td>9;8</td>
<td>6;1</td>
</tr>
<tr>
<td>Peabody Raw Score Mean (SD)</td>
<td>72 (15)</td>
<td>104 (8)</td>
<td>69 (10)</td>
</tr>
<tr>
<td>Peabody Standard Score Mean (SD)</td>
<td>61 (14)</td>
<td>97 (10)</td>
<td>99 (13)</td>
</tr>
<tr>
<td>Ravens Raw Score Mean (SD)</td>
<td>17.3 (5.3)</td>
<td>29.7 (2.3)</td>
<td>16.5 (3.6)</td>
</tr>
</tbody>
</table>
Research Design

The independent variable for this study was group (ES group, CA group and MA group). The dependent variables were the children's level of performance on four theory of mind tasks. Cognitive function was used as a covariate.

Tests and Materials

Tests

The Peabody Picture Vocabulary Test-Revised (PPVT-R) (Dunn & Dunn, 1981) was used as an indicator of children's general verbal ability. The PPVT-R tests “receptive vocabulary” and gives a “quick estimate of one major aspect of verbal ability for subjects who have grown up in a standard English-speaking environment” (Dunn & Dunn, 1981, p. 2). The test does not require reading or speech. In terms of validity, the PPVT-R correlates (a) most highly with other measures of vocabulary, (b) moderately well with other tests of scholastic aptitude, and (c) reasonably with school achievement measured concurrently and less well predictively (Dunn & Dunn, 1981, pp. 67-68). The PPVT-R takes only 10 minutes to administer, compared with the Weschler Intelligence Scale for Children (WISC) which take well over an hour to administer to each child. The PPVT-R is a quick and reliable way of estimating verbal mental age. It was, therefore, considered to be an
appropriate test on which to match children of average ability with older children with an intellectual disability.

Raven’s Coloured Progressive Matrices (RCPM) (Raven, Court & Raven, 1990), was used to assess the children’s nonverbal cognitive ability. The RCPM tests “the ability to form creative new insights or the ability to form high level, largely nonverbal, constructs which make it easy to think about complex issues” (Raven, Court & Raven, 1990, p. 33). Studies have related performance on the Coloured Progressive Matrices to Piagetian classification, spatial and reasoning abilities and simultaneous processing (Raven, Court & Raven, 1990, p. 33). The RCPM has correlations of .6 to .7 with intelligence tests designed to be culturally fair. This test was used in this study as a measure of cognitive functioning.

**Materials**

The following materials were required for the perspective and theory of mind tasks:

- two soft toys (a bear and an elephant)
- four blocks of different colours (blue, red, yellow, green)
- a large smarties tube
- three dolls
- a basket
- a box
• a bucket
• a marble

Procedure

The tasks were given to the children on an individual basis in a quiet room. Each child was withdrawn from regular classroom activities for one session of approximately 25 minutes. Each child was first given the PPVT-R and the RCPM. Each of these tests was administered according to the standard procedure outlined in each of the test manuals.

The children were then given a perspective task, and three theory of Mind (ToM) tasks. (See Appendices B to E for the complete scripts used to administer these tasks.)

The perspective and theory of mind tasks were tape recorded. These tasks were administered as follows:

Perspective Task

This task has been modified from the “Policeman Task” described by Donaldson (1978). Each child was shown two soft toys and four blocks of various colours. The toys were arranged opposite each other and two blocks were placed in front of each toy. The child was asked if the teddy could see all of the blocks and if the elephant could see all of the blocks. A screen was placed in the middle of the toys, as shown in Figure 3, leaving two blocks and
one toy on either side of the screen. The child was then asked the following eight questions:

1. Can the teddy see the blue block?
2. Can the teddy see the red block?
3. Can the teddy see the yellow block?
4. Can the teddy see the green block?
5. Can the elephant see the blue block?
6. Can the elephant see the red block?
7. Can the elephant see the yellow block?
8. Can the elephant see the green block?

Figure 3.

Arrangement of materials for the Perspective-taking Task.
**Smarties False Belief Task.** (Baron-Cohen, 1995).

Each child was shown a Smarties container and asked, “What do you think is in here?” The child was then shown that the tube actually contained pencils. The experimenter then closed the tube and asked the child two first-order false belief questions. These were: “When I first showed you this tube what did you think was in here?” and “If (name of classmate) comes in who hasn’t seen inside the tube, what will he/she think is inside here?” A memory check question was also asked: “What is really in the tube?”

**Sally-Anne False Belief Task.** (Hobson, 1993).

In this task, two dolls, Sally and Anne were introduced. As shown in Figure 4, there was a basket in front of Sally and a box in front of Anne. The child was shown Sally placing a marble into her basket. Sally was then moved out of sight (see Figure 4, steps 1 and 2). Then the child was shown Anne transferring the marble from Sally’s basket into her box, where it was hidden from view by a lid being placed on the box (see Figure 4, step 3). As shown in Figure 4, step 4, the experimenter then brought Sally back into view and asked the child the first order false belief question: “Where will Sally look for her marble?”
Figure 4.

Sequence of events in the Sally-Anne Task (Taken from Baron-Cohen, 1995, p. 70).
Two extra questions were used to test the child’s memory of the events and language used: “Where is the marble really?” and “Where was the marble at the beginning?”

_Sally-Anne-Ben Task_ (Second order false belief)

In this modified version of the Sally Anne test, three dolls were used. The first doll, Sally, had a basket in front of her, the second doll, Anne, had a box in front of her, and the third doll, Ben, had a bucket in front of him. The child was shown Sally placing the marble into her basket and moved out of sight (see Figure 5, steps 1 and 2). The child was then shown Anne moving the marble from Sally’s basket and placing it into her box (Figure 5, steps 3 and 4). Anne was then moved out of sight. The child was then shown Ben moving the marble from Anne’s box and placing it into the bucket where it was hidden from view by a lid covering the bucket (Figure 5, step 5).

The experimenter then brought Sally back into view and the child was asked one first-order false belief question: “Where will Sally look for her marble?” (Figure 5, step 6). Then Anne was brought back into view and the second first-order false belief question “Where will Anne look for the marble?” was asked (Figure 5, step 7). The child was then asked the second-order false belief question: “Where does Anne think that Sally would look for the marble?” (Figure 5, step 8). The memory questions asked for this task were: “Where did Sally put the marble?” and “Where did Anne put the marble?”
Figure 5. Sequence of events in the Sally-Anne Ben Task (Modified from Baron-Cohen, 1995, p. 70).
Ethical Considerations

Parents of participants in this study were assured that all personal information would be kept confidential. Identification numbers and not names were used on all forms. Parental and school approval was obtained before any testing occurred (see Appendix A for consent form). Testing was carried out by the researcher with no-one else present. All taped and written information was kept in a safe and secure location with access available only to the experimenter. All data will be destroyed after 5 years. The children responded positively to all of the tasks used in this study.
Chapter IV

RESULTS

This chapter deals with the results of the study. First there is a section on the scoring of the data and how this was done. This is followed by a report of the differences found between the groups on theory of mind performance and an analysis of the particular theory of mind tasks on which a difference was found. How general cognitive function and memory are related to theory of mind performance will then be examined, followed by a conclusion to draw all of the results together.

The statistical computer package, SPSS for Windows, Version 6.1, was used for all analyses in this study. An alpha level of .05 was set for all analyses in the study.

Scoring

The first task given to the children was the perspective-taking task. This task was included to establish basic perspective-taking ability, which is a prerequisite for the theory of mind tasks in the study. This task was completed by all children with 100% accuracy. Therefore the results of this task will not be included in the remaining data analysis.
The responses to the second task, the Smarties Task, in which each child was required to answer two first order false belief questions, were assigned a score of 1 if they got both questions correct and a score of 0 if they did not. The third task asked the children only one first order false belief question and was assigned a score of 1 if the answer was correct and a score of 0 if it was not. The fourth task required the children to answer two first order questions and a second order false belief question. Each of these questions were scored as 1 if the answer was correct and 0 if it was not.

In order to analyse the data for this study, first of all, the scores on all of the theory of mind tasks were summed for each child (see Table 4). This method of scoring and analysis has been used by previous researchers (Ozonoff & Miller, 1995; Sparrevohn & Howie, 1994; Happe, 1995).

**Difference in Theory of Mind Performance**

The differences among the groups on the theory of mind tasks were determined by examining the average total score for each of the groups (see Figure 6). When all of the scores for the theory of mind tasks were totalled, the MA group obtained a mean score of 3.6 ($SD = 1.2$), the ES group obtained a mean score of 2.8 ($SD = 1.7$) and the CA group obtained a mean score of 4.6 ($SD = 0.6$), out of a possible 5.
Table 4. *Obtaining the total theory of mind score.*

<table>
<thead>
<tr>
<th>Task</th>
<th>Order of Question</th>
<th>Question</th>
<th>Possible Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>First</td>
<td>“When I first showed you this tube what did you think was in here?” [1] [4] [7]</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“If (name of classmate) comes in who hasn’t seen inside the tube, what will he/she think is inside here?”</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>First</td>
<td>“Where will Sally look for her marble?”</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>First</td>
<td>“Where will Sally look for her marble?”</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>First</td>
<td>“Where will Anne look for the marble?”</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Second</td>
<td>“Where would Anne think that Sally would look for the marble?”</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Total</strong></td>
<td><strong>5</strong></td>
</tr>
</tbody>
</table>
Figure 6. Total theory of mind scores for each group.

An ANOVA was conducted in order to determine whether there were any significant differences among the three groups. The results of the ANOVA indicated that there was a significant difference, $F(2, 42) = 7.36$, $p = .002$. Tukey’s HSD tests were then applied to the data to determine where the difference lay. The only significant difference between the groups was between the ES group and the CA group, ($p = .001$). The difference between the MA group and the ES group was not significant ($p = .22$), and the difference between the MA group and the CA group was not significant ($p = .10$). The effect size for the ANOVA was .26. This means that 26% of the variance in the children’s theory of mind scores can be accounted for by group.
In summary, overall on the theory of mind tasks, children with intellectual disabilities were not significantly poorer in performance than the MA group but functioned at a significantly lower level than the CA group.

**Theory of Mind Tasks on which a Difference was Found**

Given the overall difference between the ES group and the CA group, the separate tasks were analysed to determine on which of them a difference in performance between the groups occurred. Figure 7 shows the percentage correct that each group obtained for each of the five false belief questions. The ES group demonstrate lowest performance across all of the tasks, followed by the MA group and then the CA group.

![Bar chart](image_url)

**Figure 7.** Performance of each group on each task.
A chi square analysis was conducted on each of the tasks separately to determine if there were any differences between tasks. The results of these analyses are presented in Table 5.

Using the chi square analyses, a significant difference was found between groups for task 4 first-order false belief questions 1 and 2. Both of these tasks required an answer that was of the first order, in preparation for the more difficult second order questions. There were no significant differences between groups for any of the other tasks.

<table>
<thead>
<tr>
<th>Task</th>
<th>Order of Question</th>
<th>$\chi^2$</th>
<th>$P$</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>first order</td>
<td>3.84</td>
<td>.14</td>
</tr>
<tr>
<td>3</td>
<td>first order</td>
<td>3.34</td>
<td>.19</td>
</tr>
<tr>
<td>4</td>
<td>first order</td>
<td>8.90</td>
<td>.01</td>
</tr>
<tr>
<td>4</td>
<td>first order</td>
<td>9.51</td>
<td>.01</td>
</tr>
<tr>
<td>4</td>
<td>second order</td>
<td>5.04</td>
<td>.08</td>
</tr>
</tbody>
</table>

Table 5. Chi Square Analysis of Group Differences for each Task.
In summary, the children with intellectual disabilities performed more poorly on task 4 first order questions, but the difference on the second order false belief task did not reach significance.

**Cognitive Functioning**

A general low level of cognitive functioning is a possible reason that may account for the poorer performance of children with intellectual disabilities on theory of mind tasks. The scores from the Raven’s Coloured Progressive Matrices [RCPM] (Raven, Court & Raven, 1990) were used as a covariate to determine whether general cognitive functioning could account for the results.

When the effects of cognitive functioning were statistically controlled using an ANCOVA, there was no significant difference between the groups on theory of mind score, $F(2, 44) = 3.04, p = .06$. The effect size for the ANCOVA was .13. This means that when cognitive functioning is taken into account 13% of the variance in the children’s theory of mind scores can be accounted for by group.

A correlation between RCPM and the children’s total theory of mind scores revealed a significant relationship for the overall sample, $r(43) = 0.61$, $p < 0.001$. However, when correlation coefficients were calculated for each group separately, the relationship between the RCPM and the children’s total theory of mind scores was significant only for the ES group, $r(13) = 0.76$, $p = \ldots$
0.001, and not for the CA group, $r (13) = 0.29, p = 0.29$, or for the MA group, $r (13) = 0.08, p = 0.77$. This difference could be due to the restricted range of RCPM scores in the CA group (27 - 34) compared with the wider range of scores in the ES group (9 - 27). However, restriction of range does not account for the low correlation in the MA group (11 - 23). Figure 8 shows the relationship between RCPM scores and total theory of mind scores for each group.

In summary, because there was no significant difference between the groups when cognitive functioning was taken into account, the ES group's poorer performance on theory of mind tasks in general may be said to be accounted for by their generally lower level of cognitive functioning.

![Figure 8. Scatterplot of RCPM scores and total theory of mind scores for each group.](image-url)
Memory Performance

Another factor that may account for the difference on theory of mind performance between the ES group and CA group is their difference in memory. In order to control for this, questions were asked throughout all of the tasks in regard to recall of factual information. These questions were related to the recall of single events that occurred throughout the tasks.

All of the children achieved 100% accuracy on the memory questions. Memory therefore could not account for any differences in the children’s performance on theory of mind tasks.

Conclusion

The results obtained from the data show that there was a significant difference between the ES and CA groups on theory of mind performance, but no significant difference between the ES and MA groups. A lower level of cognitive functioning in the ES group accounted for the difference between the ES and CA groups on theory of mind performance, indicating a delay in general cognitive functioning, rather than a deficit in theory of mind. Memory could not account for differences in theory of mind performance.
Chapter V

DISCUSSION

The main aim of this study was to investigate whether or not a difference was evident between the three groups, children with intellectual disabilities (ES group), children of average intelligence of the same age as the children with intellectual disabilities (CA group) and children of average intelligence matched for verbal mental age (MA group), when tested for theory of mind task performance and whether this difference could be accounted for by memory difficulties and/or general cognitive functioning. The following chapter discusses the results which were obtained for this study and the significance and application of the findings.

_Evidence Regarding the Uniqueness Hypothesis_

The first research question of this study dealt with determining whether the ES group performed more poorly than the CA group and the MA group on theory of mind tasks. If a significant difference was found between the ES and MA groups on theory of mind performance, the results would be inconsistent with the uniqueness hypothesis which relates to theory of mind deficits being found only in children with autism and not in children with intellectual
disabilities. If there was not a significant difference between the ES group and MA group on theory of mind performance, the results would be consistent with the uniqueness hypothesis in that the children with intellectual disabilities show no evidence of a deficit like that of autistic children. As the ES group already display an intellectual disability, a significant difference between the CA and ES group was expected.

As expected, a significant difference was found between the ES group and the CA group on theory of mind performance. The difference found in this study is one which would be expected, being between the children with and without intellectual disabilities of the same age. The ES group would obviously perform more poorly than the children of average intelligence of the same age as they already display a developmental delay relative to this group.

However, no significant difference was found between the ES group and the MA group. The failure to find a difference between the ES and MA groups is consistent with results found in several other studies (Happe, 1995; Charman & Baron-Cohen, 1992; Baron-Cohen, 1989). These researchers have argued that children with intellectual disabilities do not display a deficit in theory of mind, such as that found in children with autism. This study failed to find a deficit in theory of mind for ES group and therefore is consistent with this argument. The ES group in this study did not exhibit any deficit in theory of mind performance that would not have otherwise been expected, given their developmental delay.
Happe (1995) found that 41% of children with intellectual disabilities tested failed similar theory of mind tasks to those used in the current study. This percentage is comparable to the 44% of children matched on mental age who also failed the tasks in her study. In the present study, 44% of children with intellectual disabilities failed similar false belief tasks but only 28% of the MA group failed false belief tasks. Like the present study, Happe attempted to match the children with intellectual disabilities to a group of children of average intelligence matched on verbal mental age. However, her subject characteristics state that the children with intellectual disabilities had a verbal mental age of 6;2 whereas the younger children of average intelligence had a verbal mental age of only 4;3—a difference of nearly two years. In the present study the mental age match was much closer, with the ES group having a verbal mental age of 5;8 and the MA group having a verbal mental age of 6;1. This may account for the higher proportion of MA matched children in the present study who succeeded in the theory of mind tasks.

Charman and Baron-Cohen (1992) also found that children with intellectual disabilities did not differ in their performance on theory of mind tasks when compared to 4-year-old children matched on mental age. The tasks used to test for theory of mind performance were similar to those used in the present study.

Another study that used a similar method to the present study was conducted by Baron-Cohen (1989). He found that 90% of children with
average intelligence matched for mental age and 60% of children with Down Syndrome passed false belief tasks. These are similar results to those found in the present study which indicated that 72% of children of average intelligence matched for mental age, and 56% of children with intellectual disabilities passed theory of mind tasks. Baron-Cohen argues that the proportion of children with Down Syndrome who passed the false belief theory of mind tasks is not a low enough figure to say that a deficit in theory of mind exists.

Only one study has found a deficit in theory of mind in children with intellectual disabilities. Zelazo, Burack, Benedetto and Frye (1996) found evidence that theory of mind deficits are demonstrated by children with intellectual disabilities relative to mental age matched children of average intelligence. Compared to the present study, however, Zelazo et al. used adults with severe intellectual disabilities who varied widely in chronological age from their 5-year-old mental age matched group. This is a possible reason for the differences found in theory of mind performance.

The present study is inconsistent with previous research in failing to find evidence that children with mild to moderate intellectual disabilities show a deficit in theory of mind relative to children of average intelligence matched for mental age.
Evidence Regarding the Specificity Hypothesis

The second research question deals with whether or not general cognitive functioning can account for any differences in theory of mind performance. When cognitive functioning was taken into account, by using scores from the Raven's Coloured Progressive Matrices (Raven, Court & Raven, 1990) as a covariate, no differences were found between the groups. This is consistent with the results of Zelazo, Burack, Benedetto and Frye (1996) and Klin, Volkmar and Sparrow (1992). Both of these studies investigated children with intellectual disabilities.

Zelazo et al. (1996) matched 22-year-old adults with Down Syndrome and 5-year-old children of average intelligence on mental age. They found that the difference in performance on theory of mind tasks was equivalent to the difference found between the groups on a rule use task. Zelazo et al. used a rule-use task as an alternative cognitive functioning test to determine whether or not theory of mind functions were domain-specific. The present study used the RCPM as a test of cognitive functioning and found it correlated significantly with theory of mind performance of children with intellectual disabilities, and that any differences between groups could be explained by the child's level of cognitive functioning.

Klin, Volkmar and Sparrow (1992) tested the specificity hypothesis made by some researchers by comparing the participants' scores on a socialisation and motor skills test. The researchers found that the children
with intellectual disabilities displayed early social and motor skills at a level that would be expected, given their developmental delay. The researchers stated that as there was no evidence of a greater deficit in one particular area of social skill attainment, that specificity (or a domain-specific function) could not be supported by their study. Where Klin et al. (1992) used social cognition to test for specificity, the present study has used general cognitive functioning in the form of the RCPM, which tests problem solving and spatial abilities, rather than other social abilities.

These findings indicate that theory of mind development in children with intellectual disabilities is consistent with their development in other areas of cognition.

In contrast to these findings, other researchers (Charman & Baron-Cohen, 1992; Leslie, 1992; Baron-Cohen, 1991) have found evidence for the domain-specificity of theory of mind functions in children with intellectual disabilities. All of these studies, however, have used a different measure, other than general cognitive functioning, with which to draw their conclusions. For example, Charman and Baron-Cohen used a comparison between false belief tests and false drawing tests to obtain their results, Leslie used a picture-sequencing task to compare with theory of mind performance, and Baron-Cohen used tests of relationship recognition, simple reciprocity and understanding of animate-inanimate distinction to compare with theory of mind performance. These measures do test other cognitive functions, but do
not specifically test general cognitive functioning. In addition to different tests used to determine specificity, the children with intellectual disabilities participating in these studies were a lot older than the children of average intelligence matched for mental age. This may have had some bearing on the results of these studies.

In the present study, when correlations between the students' total theory of mind scores and the RCPM scores were calculated, the overall correlation showed that general cognitive functioning was a significant factor in theory of mind performance. However, when correlations were performed for the individual groups, only the ES group showed that general cognitive functioning was a significant factor in theory of mind performance. The other two groups displayed non-significant correlations between these factors. A possible explanation for the CA groups’ non-significant finding was their restricted range of RCPM scores. However, this is not the case for the MA group. It is difficult to account for the non-significant finding for this group.

However, as far as the children with intellectual disabilities are concerned, the present study shows that any delays in theory of mind can be adequately accounted for by more general functions such as their verbal mental age and general cognitive functioning.
Cognitive Functions Used During Testing

Given that performance on theory of mind tasks by children with intellectual disabilities appears not to be a separate function, but related to general cognitive functioning, the question arises as to what general cognitive functions are used during the completion of such tasks. When performing theory of mind tasks, children with intellectual disabilities use a number of different cognitive functions. Some of the more obvious of these are language (verbal ability) and memory. Memory will be discussed further in the following section.

In order to understand the tasks and what is required of them, the children with intellectual disabilities need to draw on their linguistic ability. They must be able to understand the structure of the sentences (syntax), the meaning behind the words (semantics) and the purpose of the language (pragmatics). These skills are required to interpret the scenarios that are presented to them, understand the questions asked, interpret what is required of them in terms of an answer, and have the ability to communicate a response back to the researcher. Language ability in the present study was controlled for by matching the students on verbal mental age using the Peabody Picture Vocabulary test.

Some of the children with intellectual disabilities appeared to find these linguistic demands too heavy, and tried to make use of other aspects of the context by looking at the researcher for non-verbal cues before answering any
questions. Two students also held their hands in a hovering position over a particular choice for their answer and attempted to make eye contact with the researcher, as if to check that their answers would be correct. The researcher remained passive and straight-faced throughout the sessions in order to ensure that no non-verbal cues were given.

It was also noticed that a larger number of children with intellectual disabilities took a longer amount of time to answer questions put to them than children in the other groups. They exhibited a number of reasoning or "thinking" poses, such as holding their faces between their hands, sucking on a finger, and screwing up their faces in concentration. Although no actual timing of the children’s responses was conducted in this study, it would be interesting for future research to see if this has any relation to the children’s performance on theory of mind tasks.

The theory of mind tasks also appear to place demands on children’s sense of spatial orientation. They demonstrated this by using their hands to go through the scenario again, and also by moving their heads from side to side, as if they were putting themselves in the doll’s position. It was as if they were attempting to take the spatial orientation of the doll in order to answer the question.

These are some of the cognitive functions that may be used by children with intellectual disabilities when they are completing theory of mind tasks. Therefore both the statistical analyses in the present study, as well as the
anecdotal observations made during testing suggest that theory of mind tasks demand a number of different cognitive functions working together to give children insight into others' beliefs and desires, and to enable them to predict behaviour of others from this knowledge.

Memory

The third research question deals with whether or not memory can account for any differences on theory of mind performance. All of the participants were asked memory check questions throughout the tasks. All of these questions were answered with 100% accuracy by all groups. Therefore memory was found not to be a significant factor in the theory of mind performance.

The memory questions that were used throughout the study demanded recall of one piece of information at a time, whereas the theory of mind task demands simultaneous processing of several pieces. It is therefore possible that the memory tasks did not account for all possible memory demands.

Davis and Pratt (1995) conducted a study using forward digit span and backward digit span to determine if a memory task would predict theory of mind performance. Forward digit span tests articulatory loop capacity, which is responsible for short-term storage of verbal and spatial information. Backward digit span tests central executive capacity, which is responsible for active processing, such as encoding, retrieving and manipulating information.
Davis and Pratt found that backward digit span predicted theory of mind performance, but forward digit span did not. They found that backward digit span was a better indicator of theory of mind task performance than age and verbal skills. This would indicate that backward digit span should be used in future research to further investigate the role of memory in theory of mind task performance.

Performance on theory of mind tasks doesn’t appear to depend on articulatory loop capacity as measured by simple recall of information but does appear to depend on the ability of the central executive function to retrieve and manipulate information.

**Limitations and Suggestions for Further Research**

The tasks that were used in this study were all standard theory of mind tasks. However, the children were asked only one second-order false belief question in the study. This is a concern, as it may not have allowed for the children, particularly those in the CA group, to show true performance on these types of questions. The older children of average intelligence reached ceiling, so a more difficult theory of mind task would be appropriate for these children.

In addition, it is possible for children to guess the correct answers without really understanding second-order theory of mind. For first order questions there was a 50% chance of obtaining a correct answer by guessing,
and for the second-order questions there was a 33% chance of obtaining the correct answer by guessing. Inclusion of one or more extra second-order theory of mind tasks would have allowed for chance events to be better controlled. This was also a concern of Benson, Abeduto, Short, Nuccio and Maas (1993).

In addition, another dependent variable could have included the time taken to respond to the theory of mind questions. It was noted in this study that the children with intellectual disabilities appeared to take longer than the other groups to answer these questions. Maybe a more sensitive measure than the number of questions correctly answered could have been used to determine theory of mind performance.

Backward digit span memory checks could also have been added to the study to test for executive control function, which would have tested the children’s ability to encode, retrieve and manipulate information, rather than testing for straight recall of facts.

Using groups of different cognitive abilities for comparison would be useful for further research. The children with intellectual disabilities tested in this study were in the mild to moderate category of intellectual disability, and the children without intellectual disabilities were of average intelligence. By using groups of mild, moderate and severe intellectual disability, and children of low-average intelligence, a broader comparison of theory of mind functioning could have been achieved.
Implications for Education

The main implication of this study for education is that the children with intellectual disabilities do not appear to have a specific deficit in theory of mind performance. This is an encouraging result because teachers can teach skills in the social domain to children with intellectual disabilities with the confidence that these children do not have a particular deficit in their ability to see things from another’s point of view. If children with intellectual disabilities have difficulty learning social skills, it is most likely due to their cognitive ability and level of adaptive skills.

Swettenham (1996) attempted to teach theory of mind skills to children with Down Syndrome. The study was conducted using a group of children with Down Syndrome, with a mean age of 11;9, matched on verbal mental age with a group of children of average intelligence, with a mean age of 3;5. All of these children had previously failed theory of mind tasks. Using computer technology, the children were taught basic theory of mind scenarios. At a 3-month follow-up, all of the children were successful at completing theory of mind tasks, which differed in scenario from the originally taught tasks. As these children were close to the age at which theory of mind is supposed to exhibit itself, it is possible that they would have begun to understand this concept on their own without any training in the near future. The fact that the children had no difficulty with theory of mind concepts at a 3-month follow-up
however suggests that, once obtained, this concept is maintained by these children.

**Summary**

In summary, there is no evidence that children with intellectual disabilities have a deficit in theory of mind in the way that children with autism have. This study also does not support the specificity hypothesis made in relation to theory of mind that theory of mind functions are domain-specific and separate to other cognitive functions.

There is a need, however, for more research in this area, particularly in relation to children of different cognitive levels. There also needs to be greater investigation of the reasons for the deficit being found in certain groups, while not being found in others. By studying the causes of the deficits in these areas, researchers may be able to extend their knowledge base on theory of mind and its origins. This would in turn enable educators to better plan for the needs of their students, by being aware of factors which may affect their social learning.
REFERENCES


Appendix A

Consent Letter for Parents

Dear Parent or Guardian,

I am conducting research to find out whether children can see different people’s points of view. This is an important skill, both at school and in the community. If teachers are able to understand the child’s ability to adopt another person’s perspective, they will be able to teach them life skills which are relevant to their needs, now and in the future.

I am writing to ask for your consent to include your child in this research. If you agree, your child will be taken out of the classroom for one 30-35 minute session to a quiet room in the school, and given several tasks to complete. Children generally enjoy these sessions and treat them as games. Your child will be asked to talk about what he or she is doing and his/her comments will be audio taped. Nobody other than the researcher will listen to the tapes. No names will be reported.

If you have any questions about this research please phone Dianne Campbell on ph: 9123 4567. I will be happy to answer any questions.

Yours faithfully,

Dianne Campbell
Honours Student- Faculty of Education
Edith Cowan University

I have read the information above and any questions I asked have been answered to my satisfaction. I consent to my child - participating in the research, realising I may withdraw at any time.

Name ____________________________ Signature ____________________________ Date ____________________________
Appendix B

Script for Perspective Task

Experimenter: “Here I have a teddy bear and an elephant. Between them are four blocks. Can the teddy see all of the blocks?”
Child: (replies)
Experimenter: “Can the elephant see all of the blocks?”
Child: (replies)

(Place a screen to separate two of the blocks.)
Experimenter: “Can the teddy see the blue block?” (Point to the blue block.)
Child: (replies)
Experimenter: “Can the teddy see the red block?” (Point to the red block.)
Child: (replies)
Experimenter: “Can the teddy see the green block?” (Point to the green block.)
Child: (replies)
Experimenter: “Can the teddy see the yellow block?” (Point to the yellow block.)
Child: (replies)
Experimenter: “Can the elephant see the blue block?” (Point to the blue block.)
Child: (replies)
Experimenter: “Can the elephant see the red block?” (Point to the red block.)
Child: (replies)
Experimenter: “Can the elephant see the green block?” (Point to the green block.)
Child: (replies)
Experimenter: “Can the elephant see the yellow block?” (Point to the yellow block.)
Child: (replies)
Appendix C

Script for Smarties Task

(Show the child a smarties container.)

Experimenter: “What do you think is in here?”

Child: (replies)

(Show the child what is inside the tube.)

Experimenter: “When I first showed you this tube what did you think was in here”

Child: (replies)

Experimenter: “If (name of classmate) comes in who hasn’t seen inside the tube, what will he/she think is inside here?”

Child: (replies)

Experimenter: “What was really in the tube?”

Child: (replies)
Appendix D

Script for Sally Anne False Belief Task

Experimenter: “This is Sally and this is Anne. Sally has a basket in front of her and Anne has a box in front of her” (Demonstrate this scenario.) “Sally has a marble which she puts in her basket. Then she leaves the room. Anne moves the marble from the basket to her box. Sally then comes back into the room. Where will Sally look for her marble?”

Child: (replies)

Experimenter: “Where is the marble really?”

Child: (replies)

Experimenter: “Where was the marble at the beginning?”

Child: (replies)
Appendix E

Script for Sally/Anne/Ben False Belief Task

Experimenter: “Sally and Anne are now joined by a friend of theirs named Ben. In front of Ben there is a bucket. Sally places her marble into her basket and leaves the room. Anne then moves the marble from Sally’s basket and puts it into her box. She also leaves the room. Ben then moves the marble from Anne’s box and puts it into his bucket. Sally comes back into the room. Where will Sally look for her marble?”

Child: (replies)

Experimenter: “Anne comes back into the room. Where will Anne look for the marble?”

Child: (replies)

Experimenter: “Where would Anne think that Sally would look for the marble?”

Child: (replies)

Experimenter: “Where did Sally put the marble?”

Child: (replies)

Experimenter: “Where did Ben put the marble?”

Child: (replies)