DECEPTION IN CHILDREN WITH AND WITHOUT SEVERE CONDUCT PROBLEMS

by

Megan K. Brunet

A thesis submitted in conformity with the requirements for the degree of Doctor of Philosophy
Department of Human Development and Applied Psychology
Ontario Institute for Studies in Education of the
University of Toronto

© Megan K. Brunet 2013
ABSTRACT

Deception is not only part of daily life for adults, but it is also part of typical development throughout childhood. Research has shown that the ability to deceive improves with age and has been found to be related to the development of cognitive skills such as executive functioning processes, theory of mind, and intelligence. However for some children, lie-telling becomes problematic and atypical. For children with conduct problems, deception is one of the most common presenting symptoms and has been found to be pervasive across childhood and into adolescence. While most studies analyze the lying behaviours of these children based on parent and teacher reports, no studies have yet empirically evaluated the actual deceptive behaviours of children with severe conduct problems.

The current study investigated the antisocial and prosocial deception rates and abilities of children with and without severe conduct problems. Additionally, cognitive measures and parental reports of lying and parenting styles were considered in order to determine how such variables may be related to deception. A total of 66 children participated in the current study with half of the sample originating from a community agency for children with behaviour problems and the other half consisting of an age- and gender-matched control sample.

Results demonstrated that compared to their typically developing counterparts, children with conduct problems were more likely to behave antisocially by committing antisocial transgressions, and subsequently lying. These children were also less likely to tell prosocial lies.
Consistent with previous research, many cognitive measures, such as Executive Functioning (e.g., inhibition) and Theory of Mind (1st and 2nd Order) were found to be related to deception for the typically developing sample, though fewer and different cognitive measures were found to be predictive of deception within the clinical sample. Parent ratings of lie-telling frequency were not predictive of antisocial or prosocial deception, though they were predictive of antisocial lie-telling sophistication. Parenting styles were minimally predictive of deception. Results suggest that the mechanisms used by children with conduct problems during deception differ from a typically developing sample. Limitations as well as implications are discussed.
ACKNOWLEDGEMENTS

There is no doubt that this dissertation would not have been possible without the patience, support and assistance of many people. Thank you to my research supervisor, Dr. Kang Lee, for his guidance and for providing me the opportunity to integrate my clinical skills with my research interests. I would also like to thank my committee members, Dr. Leena Augimeri and Dr. Carla Cesaroni, for their feedback and support throughout the completion of my dissertation. Your expertise and contributions to this project were greatly appreciated.

No research project of this size can be completed without a team of people. I was lucky to work with many excellent research assistants who spent countless hours on this project. A huge thank you to Sarah Anderson for coordinating this work within the Lee Lab, and also to Danielle Omrin, Adrienne deBacker, Jeta Haxhimanka, Sarah Bi, Judy Duong, Amnah Khalid, Justine Thacker, and Mikkel Maharaj for their contributions. Thank you to the staff at the Child Development Institute, and to Sarah Woods and Margaret Walsh for their assistance.

Throughout the course of my degree, I was lucky enough to find support in those around me. To my friends and colleagues in the SCCP program, thank you for sharing the ups and downs of this program. To the original ‘Lee Lab Crew’, it was a pleasure working with you and I cherish the times we had together both in and out of academia.

I would like to thank my incredible family for their love and support over the past few years. To my parents, who never missed an opportunity to tell me that they are proud of me - I cannot thank you enough. To my sisters, thank you for taking time from your busy lives to listen to my stresses and to celebrate my achievements. Finally, to my husband, who is the most patient and understanding person I know. Oliver: I would not have been able to complete this without your support. I am lucky to have you by my side.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABSTRACT</td>
<td>II</td>
</tr>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>IV</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>IX</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>X</td>
</tr>
<tr>
<td>LIST OF APPENDICES</td>
<td>XI</td>
</tr>
<tr>
<td>CHAPTER 1: INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>General Overview</td>
<td>1</td>
</tr>
<tr>
<td>Definition of Lie-telling</td>
<td>2</td>
</tr>
<tr>
<td>Researching Deception</td>
<td>2</td>
</tr>
<tr>
<td>Research on Antisocial Lie-telling</td>
<td>3</td>
</tr>
<tr>
<td>Research on Prosocial Lie-Telling</td>
<td>5</td>
</tr>
<tr>
<td>Explanations of the Developmental Trends in Deception</td>
<td>6</td>
</tr>
<tr>
<td>Executive Functioning Skills and Deception</td>
<td>6</td>
</tr>
<tr>
<td>Theory of Mind Understanding and Deception</td>
<td>8</td>
</tr>
<tr>
<td>General Intelligence and Deception</td>
<td>10</td>
</tr>
<tr>
<td>Parenting Styles and Deception</td>
<td>10</td>
</tr>
<tr>
<td>Summary of Typical Trajectories of Deception</td>
<td>13</td>
</tr>
<tr>
<td>Deception in Atypical Populations</td>
<td>13</td>
</tr>
<tr>
<td>Conduct Disorder</td>
<td>15</td>
</tr>
<tr>
<td>Conduct Disorder vs. Conduct Problems</td>
<td>16</td>
</tr>
<tr>
<td>Deception and Conduct Problems</td>
<td>17</td>
</tr>
<tr>
<td>Cognitive Processes and Conduct Problems</td>
<td>18</td>
</tr>
<tr>
<td>Executive Functioning and Conduct Problems</td>
<td>18</td>
</tr>
<tr>
<td>Theory of Mind and Conduct Problems</td>
<td>19</td>
</tr>
<tr>
<td>IQ and Conduct Problems</td>
<td>19</td>
</tr>
<tr>
<td>Parenting, Deceit, and Conduct Problems</td>
<td>20</td>
</tr>
<tr>
<td>Implications for Deception in Children with Conduct Problems</td>
<td>21</td>
</tr>
<tr>
<td>Current Study</td>
<td>22</td>
</tr>
<tr>
<td>Hypotheses</td>
<td>22</td>
</tr>
<tr>
<td>Hypotheses related to Deceptive Behaviours</td>
<td>22</td>
</tr>
<tr>
<td>Hypotheses related to Cognitive Functioning and Deception</td>
<td>23</td>
</tr>
<tr>
<td>Hypotheses related to Parent Ratings and Deception</td>
<td>24</td>
</tr>
<tr>
<td>CHAPTER 2: METHODS</td>
<td>25</td>
</tr>
<tr>
<td>Participants</td>
<td>25</td>
</tr>
<tr>
<td>Establishing Clinically Significant Behaviour Problems</td>
<td>26</td>
</tr>
<tr>
<td>Setting</td>
<td>29</td>
</tr>
<tr>
<td>Design and Procedure</td>
<td>30</td>
</tr>
<tr>
<td>Deception Scenarios</td>
<td>31</td>
</tr>
</tbody>
</table>
Antisocial Lie-telling Scenario............................................................... 31
Prosocial Lie-telling Scenario................................................................. 33
Cognitive Tasks................................................................................................... 35
Executive Functioning tasks................................................................. 35
  Inhibition tasks............................................................................ 35
  Working Memory task................................................................. 37
Theory of mind tasks.................................................................................... 38
  First Order Theory of Mind task.................................................. 38
  Second Order Theory of Mind tasks............................................ 38
Intelligence tasks............................................................................................ 39
Parent Questionnaires......................................................................................... 41
  Parent Ratings of Children’s Behaviour........................................... 41
  Child Behavior Checklist............................................................... 41
  Antisocial Process Screening Device (APSD).............................. 41
  Lie-telling Questionnaire............................................................ 42
  Rating of Parenting Styles............................................................ 42

CHAPTER 3: RESULTS……………………..……………………..………………………… 44
Deception Rates by Age and Gender................................................................. 44
Coding......................................................................................................... 44
Considerations in Analyses........................................................................... 45
Antisocial Lie-telling Behaviour................................................................. 46
  Transgressing and Antisocial Lie-Telling. ........................................ 46
  Sophistication of children’s antisocial lies (Verbal Leakage)......... 47
Prosocial Lie-telling Behaviour................................................................. 48
  Initial prosocial lie-telling............................................................... 48
  Sophistication of children’s prosocial lies...................................... 49
Anti- and Prosocial Lie-telling Group Performance...................................... 49
Summary........................................................................................................... 51

Cognitive Measures......................................................................................... 53
Considerations in Analyses........................................................................... 53
Executive Functioning Skills........................................................................ 54
  Executive Functioning Composite.................................................. 54
  Individual Executive Functioning Measures .................................... 54
  Word-Colour Stroop........................................................................ 55
  Day-Night Stroop........................................................................... 56
  Digit Span......................................................................................... 56
Theory of Mind Understanding........................................................................ 57
  Theory of Mind Composite.............................................................. 57
  Individual Theory of Mind Measures............................................... 58
  1st Order Theory of Mind task....................................................... 58
  2nd Order ToM tasks...................................................................... 59
Intelligence....................................................................................................... 60
  IQ Composite.................................................................................. 60
  Individual IQ Measures. ................................................................. 60
# LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table 2.1.1. Coding Scheme for Education Levels</td>
<td>26</td>
</tr>
<tr>
<td>Table 2.1.2. Means and Standard Deviations of T-scores for the DSM Scales of the Child Behavior Checklist</td>
<td>28</td>
</tr>
<tr>
<td>Table 2.1.3. Means and Standard Deviations for the Antisocial Process Screening Device</td>
<td>29</td>
</tr>
<tr>
<td>Table 3.1.1. Coding for the Sophistication of Prosocial Lying</td>
<td>45</td>
</tr>
<tr>
<td>Table 3.2.1. Means and Standard Deviations of Executive Functioning Z-Scores</td>
<td>55</td>
</tr>
<tr>
<td>Table 3.2.2. Means and Standard Deviations of Theory of Mind Z-Scores</td>
<td>58</td>
</tr>
<tr>
<td>Table 3.2.3. Means and Standard Deviations of IQ Z-Scores</td>
<td>61</td>
</tr>
<tr>
<td>Table 3.2.4. Correlation Matrix among Individual Cognitive Measures for the CP Sample</td>
<td>63</td>
</tr>
<tr>
<td>Table 3.2.5. Correlation Matrix among Individual Cognitive Measures for the TD Sample</td>
<td>64</td>
</tr>
<tr>
<td>Table 3.2.6. Fisher Scores for the Correlations of the Individual Cognitive Measures for the CP Sample</td>
<td>65</td>
</tr>
<tr>
<td>Table 3.2.7. Fisher Scores for the Correlations of the Individual Cognitive Measures for the TD Sample</td>
<td>66</td>
</tr>
<tr>
<td>Table 3.2.8. Fisher Score differences between the CP and TD samples</td>
<td>67</td>
</tr>
<tr>
<td>Table 3.4.1. Results from the Factor Analysis for the Lie-Telling Questionnaire</td>
<td>87</td>
</tr>
<tr>
<td>Table 3.4.2. Means and Standard Deviations of the Lie-Telling Questionnaire</td>
<td>88</td>
</tr>
<tr>
<td>Table 3.5.1. Means and Standard Deviations of the Parenting Styles Questionnaire</td>
<td>93</td>
</tr>
<tr>
<td>Table 4.1. Summary of Hypotheses and Findings</td>
<td>99</td>
</tr>
<tr>
<td>Table 4.2. Summary of Significant Predictors of Antisocial Lying by Sample</td>
<td>102</td>
</tr>
<tr>
<td>Table 4.3. Summary of Significant Predictors of Prosocial Lying by Sample</td>
<td>105</td>
</tr>
</tbody>
</table>
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 2.1. Room design at the Child Development Research Lab</td>
<td>29</td>
</tr>
<tr>
<td>Figure 3.1. Overall deceptive behaviours across lie-telling scenarios</td>
<td>50</td>
</tr>
</tbody>
</table>
# LIST OF APPENDICES

<table>
<thead>
<tr>
<th>Appendix</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appendix A. Ethics Approval Letter</td>
<td>125</td>
</tr>
<tr>
<td>Appendix B. Consent Form</td>
<td>126</td>
</tr>
<tr>
<td>Appendix C. Child Assent Form</td>
<td>128</td>
</tr>
<tr>
<td>Appendix D. Debriefing Procedure</td>
<td>129</td>
</tr>
</tbody>
</table>
CHAPTER 1: INTRODUCTION

1.1 General Overview

While many may prefer to not admit it, lying is a frequent and normal behaviour that everyone exhibits from time to time. From politicians who may deceive to win votes, to parents who lie to their child to get them to behave, to children who deny a transgression to avoid punishment, lie-telling is part of the typical human experience. Though it may be challenging to discern the actual amount of lie-telling that individuals enact on a regular basis, it has been reported that adults tend to lie 1 to 2 times daily in various interactions and for a diverse assortment of prosocial or self-serving purposes (DePaulo, Kashy, Kirkendol, Wyer, & Epstein, 1996).

In addition to occurring frequently within the adult population, antisocial and prosocial deception has been found to be a part of the typical developmental process. Research also suggests that as children age, their propensity and ability to deceive increases (Talwar and Lee, 2008). Furthermore, lying in a typical population appears to be a marker for cognitive development as it has been found to be related to various cognitive processes (Evans & Lee, 2011; Talwar & Lee, 2002a, 2008).

Though all children will lie from time to time, some children will lie habitually for primarily antisocial reasons. Frequent and persistent lie telling in childhood is associated with significant behavioural problems and is one of the earliest presenting symptoms of Conduct Disorder (Gervais, Tremblay, Desmarais-Gervais, & Vitaro, 2000). The actual lie-telling behaviours of these children, however, have yet to be systematically explored. Children with conduct problems may display deficits in the cognitive processes involved in deceit, yet how their cognitive skills may be associated with lie-telling is currently unknown. Through a
comprehensive review of the literature pertaining to deception in a typically developing population, we may begin to comprehend the mechanisms underlying deception among children that experience behavioural challenges.

1.2. Definition of Lie-telling

While a basic definition of a lie could be ‘an untrue statement’, the concept of lying appears to be far more complex and has captivated the minds of scholars and researchers for generations. While definitions of lies vary slightly in research literature, many themes are apparent and most researchers agree that lying involves the following three components: (1) the statement is false (2) the speaker knows the statement is false and (3) the speaker intends to deceive the recipient (Coleman & Kay, 1981; Lee & Ross, 1997). Ruffman and colleagues described an ‘ABC’ definition of lie-telling, where the liar acts deceptively, leading to a false belief in the lie recipient, where the lie teller is conscious that what they are saying is false (Ruffman, Olson, Ash, & Keenan, 1993). Thus, for the purposes of the present discussion, a lie is defined as a statement that differs from the truth and is intended to deceive another person.

1.3. Researching Deception

The investigation of lie-telling in a systematic and empirical way provides many challenges. While some studies have attempted to rely upon self-reports from adults (e.g., DePaulo et al., 1996), the reliability of confessed liars must be questioned. When considering the lie-telling behaviours of children, parents are often asked to estimate how frequently their children lie (e.g., Engels, Finkenauer, & van Kooten, 2006; Stouthamer-Loeber, 1986). The accuracy of this approach, however, may be questionable as parents may only be able to report unsophisticated or poorly-planned lies. Recent research has thus shifted to understand the multifaceted nature of deception by examining its origins. Extensive research has established that
deception is a developmental phenomenon, and thus, studies related to the development of lie-telling in children are of critical importance.

Children begin to conceptually understand deception early in their development. By age 4, children are able to indicate that all lies may not be equal, as they tend to rate white lies, or lies told for another’s benefit, more positively than antisocial, or self-serving, lies (Bussey, 1999; Strichartz & Burton, 1990). By age 7, children generally categorize truths and lies consistently, but tend to rate prosocial lies more negatively than 9 or 11 year olds (Xu, Bao, Fu, Talwar, & Lee, 2010). In early adolescence, children develop an increased understanding of deception and are able to integrate ideas of factuality, belief, and intent with the expected “social conventions and communicative rules” of specific situations (Lee & Ross, 1997, p. 259). Such an understanding leads to the development of sophisticated judgements derived from both their experience and their understanding of social expectations relating to deception. Findings are mixed regarding whether or not children’s ratings of truths and lies do indeed predict deception. While the classification of lies does not appear to be associated with actual behaviour (Talwar & Lee, 2008; Talwar, Lee, Bala, & Lindsay, 2002), there is some evidence to suggest that children’s moral evaluations of lies will predict their actual lie-telling behaviour in some situations (Talwar & Lee, 2008; Xu, et al., 2010). The current lack of consistent evidence suggests that the optimal way to investigate deception in children is through experimental studies that directly measure such behaviours.

1.3.1. Research on Antisocial Lie-telling

Some of the earliest observations of deception in young children were made by Charles Darwin (1877), who noted that his 2-year-old son was motivated to conceal his transgressions by lying. Years later, Hartshone and May (1928) investigated lie-telling through ground-breaking
studies where children and adolescents were observed during acts of cheating and lying in various situations. A resurgence of interest in the development of deceit and lying in children has occurred over the past 30 years, with findings confirming Darwin’s observations that children as young as 2-years-old are able to tell lies to hide their own transgressions (Evans & Lee, 2013; Lewis, Stanger & Sullivan, 1989; Polak & Harris, 1999; Talwar & Lee, 2002a, 2008). Research has also demonstrated that the frequency of lying behaviour tends to increase across childhood (Evans & Lee, 2013; Talwar & Lee, 2002a; Wilson, Smith & Ross, 2003). While children may begin to deceive at a young age, they tend to have difficulty maintaining their lies until around the age of 7 (Talwar & Lee, 2002a; 2008). Children develop the cognitive capacity to tell more sophisticated lies during middle childhood, but are also able to weigh the social consequences of committing minor transgression and telling a lie. By adolescence, research has found that children are less likely to commit a minor transgression, though if they do, they are more likely to confess or tell the truth concerning their misdeed (Evans & Lee, 2011; Pipe & Wilson, 1994; Talwar, Gordon & Lee, 2007).

Such findings have typically been investigated using a ‘Temptation Resistance Paradigm’, where the child is asked not to peek at or touch a toy in an experimenter’s absence, with their behaviours being covertly recorded via hidden camera. Upon the experimenter’s return, children are asked whether or not they peeked at the toy, thus providing an opportunity for them to either lie or tell the truth. In such situations, the majority of children will peek at the toy (70-90%), with most of the peekers denying their transgression or lying (e.g., Talwar & Lee, 2002a; Talwar, Gordon et al., 2007). Following the initial opportunity to deceive, children are often asked additional follow up questions (such as the identity of the toy) to determine if they are able to
answer in a manner consistent with the initial false denial of peeking in order to avoid incriminating themselves.

1.3.2. Research on Prosocial Lie-Telling

Research considering prosocial lie-telling behaviours, or lies that are told to protect or benefit another person, has established that most children will tell prosocial lies with aim of protecting another’s feelings. A developmental trajectory has been established in that older children (elementary age) are more likely to tell prosocial lies than younger children (preschool age; Popliger, Talwar, & Crossman, 2011; Talwar, Murphy & Lee, 2007), with the rate of prosocial lying continually increasing from late childhood into adolescence.

The investigation of prosocial lies utilizes creative methodologies to determine if children will tell white lies in various scenarios. For example, Talwar and Lee (2002b) examined children’s prosocial lying in a paradigm referred to as the ‘Reverse Rouge’ task. In this design, a research assistant with a conspicuous mark of red lipstick on his or her nose asked child participants if they appeared ready for a photograph. Additional studies have adopted an ‘Undesirable Gift’ task, where the child is given an unwanted gift (e.g., a bar of soap) and asked if they like it (Popliger, et al., 2011; Talwar, Murphy, et al., 2007). These studies have demonstrated that the majority of children (~80%) will tell a prosocial lie in their endorsement of liking the prize, with rates of false, prosocial statements increasing with age. Further, children are often asked follow-up questions related to why they liked about the prize and what they would do with it, in order to establish if the children are able to maintain their initial prosocial lie.

Thus, in considering recent research that empirically studies deception by creating naturalistic situations where a participant may choose to tell the truth or a lie, lie-telling trajectories within the typical population have emerged. Though some variability exists, research
has generally established that by adolescence, *antisocial lying tends to decrease while prosocial lying tends to increase.*

### 1.4. Explanations of the Developmental Trends in Deception

Many theorize that the quality of a child’s lie is restricted to the extent of their cognitive abilities (e.g., Talwar & Lee, 2002a). To deceive successfully, children must inhibit the truth by withholding incriminating evidence, remembering the falsehoods they have described, and utilizing the verbal skills necessary to create a lie. Extensive research supports the notion that it is more difficult to deceive than to tell the truth. Neuroimaging studies investigating the neural correlates of lie-telling have revealed increased neuronal activation during deception as compared to during the act of telling the truth in cortical areas involved when utilizing executive functioning skills (Ding, Gao, Fu, & Lee, 2013; Langleben et al., 2002). Thus, lies require increased mental effort and are therefore more cognitively demanding than telling the truth.

Given the cognitive resources required to deceive, it is interesting to consider how the development of specific cognitive skills may be related to deceptive behaviour and how successful one may be at deceiving another.

#### 1.4.1. Executive Functioning Skills and Deception

Research has explored how higher-order cognitive processes, such as memory and inhibition, may be utilized in the act of deception. These processes are typically referred to as ‘executive functioning skills’, which are neurologically-based mechanisms that engage mental control, self-regulation, and involve goal-directed behaviour (Séguin & Zelazo, 2005; Zelazo & Muller, 2002). Processes such as inhibition (withholding a dominant response to display an alternative response) and working memory (holding information in mind and manipulating it) assist in many of our daily interactions (Zelazo & Muller, 2002). These executive functioning
skills continue to develop and become increasingly more refined and complex throughout childhood and into early adulthood.

As the development of deceptive abilities in children seem to develop alongside executive function skills (Carlson, Moses, & Hix, 1998; Hala & Russell 2001), the relation between the two has been investigated empirically. Results have provided a deeper understanding of how lie-telling may develop. Specifically, inhibitory control, or the ability to suppress a response, has been found to be consistently related to deception. Carlson et al. (1998) found that 3-year-olds who had greater success on inhibitory control tasks were also more adept at deceiving others by pointing to the wrong location of a hidden object. Evans and colleagues found that higher inhibitory control skills in 4-year-olds were related to their ability to maintain lies and make verbal statements consistent with physical evidence (Evans, Xu, & Lee, 2011). The connection between inhibition and deception has also been found to be related to the denial of transgressions in middle childhood (Talwar & Lee, 2008), and the ability to tell sophisticated lies in adolescence (Evans & Lee, 2011).

In addition to inhibitory control, working memory skills have also been investigated when analyzing the lie-telling abilities of children. While one may assume that working memory must be activated in order to tell a lie, research demonstrating this relationship has been limited. Evans and Lee (2011) found support for the idea that working memory is related to deception, as children with weaker working memory were more likely to incriminate themselves when lying by divulging information they should not have known. Talwar and Lee (2008), on the other hand, failed to find a significant relationship between working memory and children’s lie-telling.

However, research on executive functioning skills has also purported that these skills do not develop in isolation but rather, are inter-related. Thus, it is difficult to tease apart the
individual contributions of different executive functioning skills as they may be simultaneously activated. Conclusions regarding the individual impact of executive functioning skills should be considered cautiously and additional research is needed to clarify potential unique relationships between specific processes and deception.

1.4.2. Theory of Mind Understanding and Deception

Kloo and Perner (2008) stated that Theory of Mind (ToM) is “the ability to impute mental states, such as beliefs, desires, and intentions, to oneself and to others, and to predict other people’s behaviour on the basis of their mental states” (p. 122). However, the concept of ‘mental states’ is complex, with early understanding of this notion beginning to develop in the preschool years and improving rapidly in early childhood. The crucial form of ToM that seems to develop is the understanding that one can have a false belief, or can hold an idea that differs from reality. This concept is commonly referred to as 1st Order ToM (e.g., Talwar & Lee, 2002). As increased awareness of mental states develop, children begin to recognize that in addition to having different mental representations, we can make inferences regarding the mental states based on another’s mental state (e.g., ‘Peter knows that Mary thinks it’s raining’). These second-order beliefs (2nd Order ToM) are thought to begin developing around age 6 and continue into middle childhood (Hogrefe, Wimmer, & Perner, 1986; Sullivan, Zaitchik, & Tager-Flusberg, 1994).

Talwar, Gordon, et al. (2007) stated that “lying, in essence, is theory of mind in action” (p. 804). Given that telling a successful lie requires an individual to create or instil a false belief in another person (Ruffman, et al., 1993), the definition of lying itself seems to imply that ToM is involved. The act of deception appears to be an early indication that children have developed an understanding of factual and false beliefs (Chandler, Fritz, & Hala, 1989; Hala, Chandler, &
Fritz, 1991; Peskin, 1992; Ruffman et al., 1993; Sodian, Taylor, Harris, & Perner, 1991). In fact, Polak and Harris (1999) found that 3- and 5-year-olds that comprehend the concept of false beliefs were more likely to deny committing a transgression than children who had not yet developed this understanding. Talwar and Lee (2002a) confirmed this finding and demonstrated that initial false denials require the child to represent a belief that differs from reality. Evidence therefore suggests that 1st Order ToM processing is related to a child’s initial denials concerning transgressions.

However, 1st Order ToM processes do not conclusively explain how children may or may not be able to feign ignorance with subsequent questioning. This factor evoked interest in the relation between 2nd Order ToM and lie-telling. In consideration of how children may respond to follow-up questions relating to their lies, higher 2nd Order ToM skills have been found to be significantly related to the ability to maintain one’s lies throughout childhood (Talwar, Gordon, et al., 2007; Talwar & Lee, 2008). To this end, the development of 1st Order ToM may impact whether or not one initially lies, and 2nd Order ToM appears to determine the sophistication and possibly, the success of one’s lies.

While research has documented the development of specific executive functions and ToM in early childhood, one cannot claim that they occur in isolation. Indeed, extensive analyses have established strong correlations between false-belief tasks and executive functioning processes such as inhibition and working memory (Carlson, Mandell & Williams, 2004; Carlson, Moses & Breton, 2002; Hughes, 1998). Sabbagh and colleagues found that certain executive functioning skills predict the development of ToM processes across cultures, demonstrating that this is a universal developmental trajectory (Sabbagh, Xu, Carlson, Moses, & Lee, 2006). Such results support ideas that executive functions are considered pre-requisites for false beliefs (e.g.,
Perner, Lang, & Klooo, 2002), with additional studies providing evidence that the unique combination of inhibition and working memory may contribute to success on false belief tasks. When considering deception, lie-telling is not strictly contingent upon rudimentary ToM understanding or the ability to inhibit or remember one’s response, but instead constitutes a combination of several factors that allow for the execution and maintenance of a lie. Such findings are crucial to consider when investigating the mechanisms underlying cognitive processes and deception.

1.4.3. General Intelligence and Deception

When considering general cognitive abilities or intellectual capacity, there are limited studies exploring how lie telling may be related to an adult or child’s general intelligence (or Intelligence Quotient (IQ)). Of the existing studies, many findings are either outdated or conflicting. While some results describe an association between truthfulness in children and higher IQ scores (Rutter, 1967), such conclusions arose from results obtained from questionnaire and teacher ratings of a child’s deception. Further, the degree to which ‘intelligence’ and ‘honesty’ both elicit positive judgements and potentially bias ratings cannot be accounted for. More recent findings have revealed that children with higher IQ scores were more likely to tell an antisocial lie (Lewis & Crossman, 2003, as cited in Talwar & Crossman, 2011; Pauls & Crost, 2005), though literature connecting intelligence and deception is somewhat limited. The degree that intelligence may be related to cognitive processes such as executive functioning and ToM tasks (Hughes, 1998) must be considered, as intelligence may generally impact the cognitive functions that are related to the execution of effective lies.

1.4.4. Parenting Styles and Deception

Parents are typically the earliest and most impactful socializing agents for young children.
Thus, it follows that the parental encouragement or discouragement of deception may influence the frequency of a child’s lie-telling behaviour. While Stouthamer-Loeber and Loeber (1986) found that poor supervision, discipline, and rejection were related to increased rates of deception, ratings of lying constituted parental and educator responses to a single question and were not obtained through empirical methods. Other studies have postulated that children exposed to harsher parenting styles tend to develop more sophisticated deceptive strategies in an attempt to avoid punishment (Stouthamer-Loeber, 1986). Talwar and Lee (2011) found that students who received corporal punishment at a school in western Africa presented higher rates of deception and were better at lying than children who were not exposed to such punishments. Alternatively, more warm and positive parenting environments have been associated with increased prosocial lie-telling (Popliger, et al., 2011). Though empirical research in this area is somewhat limited, evidence suggests that parenting approaches may influence the development of deception in children.

When considering parenting styles, foundational work by Baumrind (1966, 1967) must be explored. She believed that the heterogeneity of parenting techniques relied upon two independent factors. First, warmth (or responsiveness), involves characteristics such as nurturance, emotional expression, and positive reinforcement. Secondly, control (or demandingness) refers to demands, control, or expectations placed upon the child by the parents (Baumrind, 1967; Desjardins, et al., 2008). Baumrind posits that the combination of these factors creates four different parenting styles: Authoritative, Authoritarian, Permissive, and Uninvolved. Though these parenting categories can be further subdivided into more specific subcategories containing variations of warmth and control within each typology (e.g., Baumrind, Larzelere, & Owens, 2010), these main categories will be discussed for simplicity as well as for ease of
comparison across research. Each of the four parenting styles will be discussed in turn.

Firstly, authoritative parenting, which consists of a high degree of control and warmth, relies upon a balance between discipline and nurture. This particular parenting approach tends to be flexible and responsive to children’s needs (Baumrind, 1971). Research has found that authoritative parenting has the strongest association with positive outcomes for children, through allowing for the development of effective and adaptive social skills (Clawson & Robila, 2001; Lamborn, Mounts, Steinburg, & Dornbusch, 1991; Rinaldi & Howe, 2012), and school successes (Weiss & Schwartz, 1996).

Second, authoritarian parenting, which is considered to be highly focused upon control and less on warmth, relies on power assertion and discipline to enforce demands (Legace-Séguin & d’Entremont, 2006). Extensive research has demonstrated adverse effects of authoritarian parenting, such as low self-reliance and self-concept (Lamborn et al., 1991), with some researchers suggesting that this parenting style may contribute to displays of aggression (as described by Hoffman, 1975).

Permissive parenting, which is low in control and high in warmth, does not appropriately limit children’s behaviour as parental demands tend to be low. Though more responsive than authoritarian parents, children with permissive parents tend to show poor social adjustment, be rebellious and impulsive in nature, and have lower levels of academic success (Baumrind, 1966; Lamborn et al. 1991).

Finally, uninvolved parenting features low levels of control and warmth, which can have obvious negative consequences as these parents tend to be unengaged and unresponsive to their children. Most research considering this parenting style primarily focusses upon adolescents (e.g., Baumrind et al., 2010; Lamborn et al., 1991). For the current study, we will not consider
uninvolved parenting and will instead focus upon the impact of authoritative, authoritarian and permissive parenting styles.

Currently, the effect of parenting styles on discouraging antisocial lies and encouraging prosocial deception is somewhat speculative. Though some evidence suggests that parenting styles may be related to children’s actual lie-telling behaviours (e.g., Popliger et al., 2011), findings are limited and require further support through systematic evaluation.

1.4.5. Summary of Typical Trajectories of Deception

A large body of research exists that describes how deception typically develops in children. Lie-telling is undoubtedly a developmental process that increases in frequency and sophistication as children age. By adolescence, individuals tend to tell fewer antisocial lies and more prosocial lies. Furthermore, studies have uncovered correlations between the development of lying behaviours and improvements in cognitive processes, such as EF, ToM and intelligence. Consider of the effect of parenting styles on deception has revealed limited results and warrants further investigation.

1.5. Deception in Atypical Populations

Most studies analyzing the development of deceptive skills do so by considering typically developing populations. Such research has shed light upon the trajectories of lie-telling within a typical sample, but little explanation is given for children who do not follow such an expected trajectory. Further, many questions are raised concerning children who may show weakness in certain cognitive processes that are considered to be related to deception in a typical population.

Research concerning deception in atypical populations has been limited, with few studies inquiring how cognitive factors may effect deception. Li and colleagues found that children with Autism Spectrum Disorder (ASD) told antisocial and prosocial lies at rates comparable to a
typical sample (Li, Kelley, Evans, & Lee, 2011), though Talwar et al., (2012) concluded that children with ASD told fewer antisocial lies. However, both studies found that children with ASD told less sophisticated lies overall. Both studies also found that Theory of Mind was weaker in the ASD sample and predicted deception for the typical sample, and Talwar et al. (2012) found that Theory of Mind was marginally related to deception for the ASD sample. Therefore, it is currently unclear if Theory of Mind significantly predicts deception in children with ASD as these children may rely on cognitive strategies that differ from a typical sample.

A study conducted by Rasmussen and colleagues (2008) considered deception in children with Fetal Alcohol Spectrum Disorder (FASD). They found that children with FASD were significantly more likely to commit a minor transgression than non-FASD children, and were more skilled in hiding their transgression and not incriminating themselves. The authors suggest that children with FASD may adopt lying as a strategy to hide their transgression from a younger age thus becoming more proficient at telling lies earlier than their typically-developing peers. The potential impact of executive functioning and theory of mind skills however, were not investigated and it is currently unknown if deficits may be related to lying within an FASD population.

One facet of deception oriented research that currently lacks evidence is in relation to children with Conduct Disorder. Though deceit is one of the diagnostic criteria of Conduct Disorder (American Psychiatric Association, 2000) and is one of the most commonly presented symptoms (Gervais et al., 2000), few empirical studies exist that highlight how these behaviours develop. In order to consider the most appropriate way to investigate deception in this clinical population, a comprehensive understanding of Conduct Disorder and behavioural problems based upon research to date is necessary.
1.6 Conduct Disorder

Extensive research has demonstrated that Disruptive Behaviour Disorders, such as Conduct Disorder (CD) and Oppositional Defiant Disorder (ODD), are some of the most commonly diagnosed conditions in child inpatient and outpatient mental health centers in North America (American Psychiatric Association, 2000). Estimates suggest that CD and ODD affect up to 10% of the population, with a higher prevalence among males (Kazdin, 1997).

The DSM-IV-TR lists the diagnostic criteria for Conduct Disorder as “a repetitive and persistent pattern of behaviour in which the basic rights of others or major age-appropriate societal norms or rules are violated” (American Psychiatric Association, 2000, pg. 98). The ‘patterns of behaviour’ fall into 4 categories: 1) Aggression towards people and animals, 2) Destruction of property, 3) Deceit and theft, and 4) Serious rule violations, with 15 different symptomatic behaviours listed within these categories. To meet diagnostic criteria, individuals only need to display 3 different symptoms over the past 12 months, and thus the manifestation and presentation of CD can vary greatly between individuals.

CD symptomology manifests either in childhood (before age 10) or adolescence, with childhood-onset considered to be more serious and more predictive of negative long-term outcomes (Clarizio, 1997). Individuals with CD are at risk for developing other mental health disorders such as Antisocial Personality Disorder (Herrenkohl et al., 2010; Kosterman, et al. 2010; Lahey, Loeber, Burke, & Appelgate, 2005). Further, there are significant social and societal repercussions associated with CD as these individuals are also at risk for school drop-out (Farmer, 1995), unemployment (Fergusson & Horwood, 1998), and involvement in criminal activity (Fergusson, Horwood, & Ridder, 2005; Herrenkohl et al., 2010). It is estimated that individuals with CD use approximately ten times more social and criminal justice services than
individuals without a diagnosis (Scott, Knapp, Henderson, & Maughan, 2004). It is therefore critical for individuals with CD to be identified as early as possible and for effective interventions to be administered.

1.6.1. Conduct Disorder vs. Conduct Problems

Though early signs of significant conduct problems exist, accurately diagnosing CD is challenging, particularly when considering young children. Indeed, many young children (e.g., preschool age) will display some degree of aggression, rule violations, and oppositionality, and such behaviours should not be considered as clinically significant behavioural problems. Problematic symptoms, however, must be monitored and if the child continues to display severe conduct abnormalities over a significant period of time, they may potentially be at risk for developing a clinical disorder. In fact, research has established a high degree of continuity among antisocial behaviours from childhood to adolescence and potentially, into adulthood (Clarizio, 1997). Thus, behaviours such as physical aggression, petty theft, and persistent lying appear to be early symptoms or possibly, precursors, to a diagnosis of CD (Loeber, Burke, & Pardini, 2009; Ostrov, 2006).

Given the stability of severe antisocial behaviours when left untreated and the potential personal, societal, and economic costs involved, it is essential that children displaying severe conduct problems are identified as early as possible. For this reason, research has been devoted to understanding the early symptoms of CD in childhood (Jouriles et al., 2009). Evidence-based intervention programs have been developed to effectively mitigate early problem behaviours like impulsivity and aggression (e.g., Stop Now and Plan (SNAP \textsuperscript{®}) program (Augimeri, Walsh, & Slater, 2011). Such programs tend to focus on the overt manifestations of conduct problems, including violence and fighting, as these symptoms have significant short-term consequences and
tend to be easier to identify. Further, when considering early symptomology, overt behaviours appear to be more common in young children, though with age, more covert antisocial behaviours may develop, such as theft and fire setting (Patterson, Reid, & Dishion, 1992).

1.6.2. Deception and Conduct Problems

In addition to many covert symptoms of conduct problems, frequent and persistent lie-telling may be reported from an early age and has been found to be later associated with severe conduct problems and maladjustment (Gervais, et al., 2000; Stouthamer-Loeber & Loeber, 1986; Stouthamer, 1986). Further, frequent antisocial lying is believed to be related to aggression and delinquency (Achenbach & Edelbrock, 1981; Ostrov, Ries, Stauffer, Godleski & Mullins, 2008; Stouthamer-Loeber, 1986). Lying, however, proves to be a complicated symptom of CD as extensive research has established that it is a normative developmental behaviour. How or why children with severe conduct problems divert from the typical developmental trajectory of deception is currently unknown.

The existing, albeit limited, studies on lying in children and adolescents with behavioural problems rely exclusively on hearsay reports by parents and teachers. The act of lying in children with conduct problems is thought to be associated with the development of antisocial behavior, and may be caused by an over-reliance on maladaptive social strategies, poorly-developed cognitive skills, or a lack of social understanding (Talwar & Crossman, 2011). As of yet, no empirical evidence exists documenting a relationship between deception in children with conduct problems and their cognitive abilities or social functioning. The existing literature involving hearsay reports may be informative, though such research designs are inherently problematic as they are subjective, indirect, and may be unreliable. Due to limitations in both the amount of research and the research methodologies used, our knowledge pertaining to the development of
lying behaviours in children with severe conduct problems is limited.

In addition to the uncertainty surrounding the development of maladaptive deceptive
behaviours in this population, no research has considered the ability for children with
behavioural problems to tell prosocial lies. While one may assume that this population does not
tell such lies, there is no evidence to suggest that a deficit in prosocial lying behaviours of
children with conduct problems or CD exists.

1.6.3. Cognitive Processes and Conduct Problems

Interestingly, research conducted with children with CD and severe conduct problems has
demonstrated that these children may experience deficits in some areas of cognitive functioning.
Specifically, deficits have been noted in the areas of Executive Functioning (EF), Theory of
Mind (ToM), and Intelligence (IQ).

1.6.3.1. Executive functioning (EF) and conduct problems.

Typically, as children age, they develop the EF skills that allow them to problem solve
effectively, and thus, strategies such as physical aggression are employed less frequently (Séguin
& Zelazo, 2005). Some research has demonstrated a relationship between physical aggression
and specific EF skills, such as working memory (Giancola, Mezzich, & Carter, 1998; Séguin,
demonstrated that parent and teacher ratings regarding social problems are negatively related to
EF abilities, with Séguin (2009) arguing that physically aggressive behaviours appear to be
uniquely related to EF deficits. While some studies suggest that EF skills are not solely related to
conduct problems but instead, are mediated by the presence of ADHD (Clark, Prior and Kinsella,
2000; Hummer et al., 2011; Oosterlaan, Scheres, & Sergeant, 2005), these studies do not control
for aggression and thus, additional research is required in order to confirm the relationship between conduct problems and EF skills.

1.6.3.2. Theory of Mind (ToM) and conduct problems.

As ToM understanding implies the ability to consider another’s’ perspective, it has been posited that ToM is fundamental in the formation of an empathetic response, and may thereby inhibit antisocial behaviour (Sharpe, 2008). Indeed, impairments in ToM processing have been found to be related to the development of antisocial behaviour, social difficulties, and conduct problems (Fahie & Symons, 2003; Hughes & Ensor, 2006; Sharp, Croudace, & Goodyer, 2007). It is possible that these children tend to display deficits in considering another’s thought pattern and thus, may display antisocial behaviours without recognizing the negative impact they bestow upon others. However, children with conduct problems do not always present impairments in ToM processing (Happé & Frith, 1996), suggesting that more research is needed in this area. It is possible that inconsistent findings may be due to the variable presentation of CD and conduct problems in children.

1.6.3.3. IQ and conduct problems.

Some research exists supporting the notion that general intelligence may be lower in children with conduct problems than in typically developing children. Schonfeld and colleagues found that adolescents with Conduct Disorder were more likely to demonstrate deficiencies in cognitive functioning (Schonfeld, Shaffer, O’Conner, & Portnoy, 1988), while Olvera and colleagues found that verbal intelligence scores were lower for children with conduct problems when compared to typically-developing children (Olvera, Semrud-Clikeman, Pliszka, & O’Donnell, 2005). Additional studies found that intelligence levels may predict treatment outcomes and the effectiveness of specific approaches (Kazdin & Crowley, 1997). While many
studies control for sample differences in intelligence scores between children with and without conduct problems, these studies do not conclusively confirm that intelligence scores differ between the samples. Therefore, there is some research supporting the idea that children with conduct problems have a lower IQ, but additional research is needed to describe this difference with certainty.

Deficits involving executive functioning, ToM, and intelligence may be indicative of metacognitive deficits that could negatively impact social functioning. Such findings are interesting when considering how essential these cognitive processes are in deceiving others. As such, questions are raised about if and how these cognitive skills may predict deceit in this population.

1.6.3.4 Parenting, deceit, and conduct problems.

While some research documents the lie-telling behaviours of children with conduct problems, these studies tend to report increased deception based upon parental reports concerning the frequency of their children’s lies. While these studies report increased lie-telling in this population (Gervais et al., 2000; Stouthamer-Loeber & Loeber, 1986), research has yet to analyze lying in a population of children with conduct problems through experimental means. Thus, the accuracy of parental ratings compared to children’s actual behaviour has yet to be confirmed.

Finally, research suggests that parenting styles are related to child development and behaviour (Baumrind, 1966, 1967, 1971), but the degree to which parenting variables may directly influence deception in children with conduct problems has yet to be explored systematically. Lytton’s (1990) research suggests that parenting style alone does not account for CD, as genetic contributions appear to supersede the impact of parenting. However, parenting
styles may contribute to the presentation of CD through a ‘vulnerability-stress’ model of psychopathology and may exasperate atypical behavioural tendencies within this population. While some evidence exists suggesting that parenting may indeed be related to deception (see Section 1.4.4.), this hypothesis has yet to be explored empirically in children with behavioural problems.

1.6.4. Implications for Deception in Children with Conduct Problems

Given the literature describing increases in deception for children with conduct problems, the possible outcomes of an empirical investigation must be considered. Children with conduct problems tend to transgress more often, meaning that they are caught in their lies more frequently. Repeatedly detected deception could be related to several factors. It is possible that a different developmental trajectory of deception is due to the utilization of different cognitive mechanisms than a typical population. By not enacting the same deceptive strategies, these children may take a different path when socializing and deceiving. Alternatively, it is possible that these children display significant deficits in many cognitive areas and thus are unable to enact and employ the same cognitive strategies and skills during deception. Furthermore, it must be considered that perhaps the practice effects of frequent deceit may trump the need for well-developed cognitive skills and therefore children with conduct problems may be able to overcome significant deficits to tell sophisticated lies. Indeed, practice effects associated with deception have been found within children with FASD (Rasmussen et al., 2008) and children who are physically punished (Talwar & Lee, 2011). Finally, it is possible that social influences, such as parenting styles, may increase or decrease children’s lying behaviours, with harsh parenting styles failing to encourage the development of prosocial behaviours.
1.7. Current Study

The current study addressed a significant gap in current literature by considering deception in children with and without severe CP in order to examine how antisocial and prosocial lie-telling behaviours and abilities differ. Further, cognitive functions, such as EF, ToM, and intelligence will be factored into the research design to determine what role they may play in lie-telling across different populations. Finally, parental ratings of the frequency of their children’s lies as well as ratings of parenting styles will be examined to determine if there is a relationship between these factors and deception.

1.8. Hypotheses

Given the number of measures investigated in the current study, it is important to carefully consider our hypotheses, which are driven by current knowledge from the literature.

1.8.1. Hypotheses Related to Deceptive Behaviours

As the clinically–referred sample displays conduct problems, it is expected that they will exhibit more antisocial behavioural tendencies during the deception paradigms. It is hypothesized that, when compared to their typically developing counterparts:

Hypothesis 1a: Children with conduct problems will tell more antisocial lies.

Hypothesis 1b: Children with conduct problems will tell fewer prosocial lies.

Previous research has mapped the typical trajectory for lie-telling, and has established that throughout childhood, children will lie more frequently and their ability to deceive improves (e.g., Talwar & Lee, 2008). However, it has also been found that by adolescence, children tend to tell fewer antisocial lies and more prosocial lies (e.g., Evans & Lee, 2011; Popliger et al., 2011). Given that children with conduct problems are generally exhibiting more antisocial behaviours at
any age, it seems unlikely that the trend of increased prosocial skills with age would hold true for this population. Therefore, it is hypothesized that:

Hypothesis 2a: Children with conduct problems will be equally likely to engage in antisocial lying at any age, whereas typically developing children will tell fewer antisocial lies with age.

Hypothesis 2b: Children with conduct problems will be equally likely to engage in prosocial lying at any age, whereas typically developing children will tell more prosocial lies with age.

Well-executed lies are not detectable and therefore, by virtue of children with conduct problems being rated as lying frequently (e.g., Gervais et al., 2000), it follows that these children may be telling unsophisticated and easily detectable lies. It is hypothesized that when compared to the typical sample, children with conduct problems will:

Hypothesis 3a: tell less sophisticated antisocial lies and disclose incriminating information.

Hypothesis 3b: tell less sophisticated or convincing prosocial lies.

1.8.2. Hypotheses Related to Cognitive Functioning and Deception

Extensive literature has demonstrated that many cognitive skills are related to deception for typically developing populations (e.g., Evans & Lee, 2011; Talwar & Lee, 2008). However, deception appears to develop atypically for children with conduct problems, and may indicate clinically significant behavioural problems (APA, 2000). Thus, it follows that the cognitive skills related to deception are utilized differently for these population. It is expected that:

Hypothesis 4a: different cognitive skills will predict deception for children with conduct problems versus the typical sample, with the typical sample demonstrating patterns similar to those noted in the literature.
Hypothesis 4b: different cognitive skills will predict the sophistication of antisocial and prosocial lies for children with conduct problems and the typical sample.

1.8.3. Hypotheses related to Parent Ratings and Deception

Current research considering the deceptive behaviours in children with conduct problems relies exclusively on parent and teacher reports of lying behaviours (Gervais et al., 2000; Stouthamer-Loeber & Loeber, 1986). Given the emphasis placed on these ratings in previous literature, it is expected that for both samples:

Hypothesis 5a: parent ratings of children’s lie-telling frequency will significantly predict antisocial lying rates.

Hypothesis 5b: parent ratings of children’s lie-telling frequency will significantly predict prosocial lying rates.

Finally, in terms of parenting styles, there is limited research on the relationship between parenting styles and deceptive tendencies in children. While prosocial lying has previously been found to be predicted by ratings of more authoritative parenting styles (Popliger et al., 2011), it is unclear if this pattern will remain for children with conduct problems. Further, different parenting styles have been found to explain variations in children’s behaviours (Rinaldhi & Howe, 2012). Therefore, it is expected that for both samples:

Hypothesis 6a: more authoritative parenting will predict prosocial behaviour (fewer antisocial and more prosocial lies).

Hypothesis 6b: authoritarian and permissive parenting will predict an increase antisocial behaviour (increased antisocial lying and less prosocial lying).
CHAPTER 2: METHOD

2.1 Participants

A total of 66 children between the ages of 6-11 (M = 8 years, 9 months (104.97 months), SD = 22.09 months) participated in the current study. In total, 46 males and 20 females participated in the current study. Recruitment was completed in Toronto, Ontario, and the composition of the sample closely replicated the demographics of the city of Toronto in terms ethnicity (see Table 2.1.1). Parent ratings indicated that most participants self-identified as Caucasian (43.9%), with the remaining identifying as African Canadian (12.1%), Asian (3%), Latino (1.5%) or Other (19.7%). A total of 13 participants (19.7%) did not indicate their ethnicity.

Half of the sample was recruited from the Child Development Institute during the intake phase of the Stop Now and Plan (SNAP®) program and SNAP® therapeutic summer camp. Children are referred to this program by parents, teachers, or mental health professionals due to severe conduct problems (CP) that they may be displaying, such as aggression, oppositionality, or disruptive behaviours. This sample will be referred to as the ‘CP sample’ or ‘children with CP’. Upon an initial intake meeting with case workers at the Child Development Institute, parents were asked if they would be interested in participating in the present study. If they responded positively, they were contacted and informed of the details of the study.

Of the 33 children in the CP sample (M age = 8 years, 9 months (104.79 months), SD = 22.11 months), 13 were tested at the Child Development Institute for parental convenience. The remainder of the children in the CP sample were tested at the Child Development Research Lab at the University of Toronto. No differences were found in regards to performance due to testing location. A control sample was recruited through a database at the University of Toronto as well as through interest garnered via mailing flyers to the community. The 33 children in the control
sample \((M \text{ age } = 105.15 \text{ months, } SD = 22.41 \text{ months})\) were matched for age and gender, and therefore, there were no significant differences between these variables. To the best of our knowledge, none of the children in the control sample have ever had any behavioural interventions due to conduct problems, are considered to be typically-developing (TD), and will be referred to as the ‘TD sample’.

Efforts were made to control for social economic status (SES) by considering parental education levels, as this variable has been found to be highly predictive of SES (e.g., Cirino et al., 2002). For the current study, we loosely adopted Hollingshead’s (1975) method for calculating SES by analyzing the average years of education per household (years of education for both parents, divided by 2; For coding method, see Table 2.1.1). Despite these efforts, the SES of the TD sample \((M = 14.99, SD = 1.27)\) was significantly higher than the SES of the CP sample \((M = 12.85, SD = 2.87)\), \(F (1, 65) = 15.99, p < .001\). Therefore, SES will be controlled for in subsequent analyses when comparing groups.

Table 2.1.1.

<table>
<thead>
<tr>
<th>Coding Scheme for Parent Education Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education Level</td>
</tr>
<tr>
<td>----------------------------------------</td>
</tr>
<tr>
<td>Completed Elementary School</td>
</tr>
<tr>
<td>Some High School</td>
</tr>
<tr>
<td>Completed High School</td>
</tr>
<tr>
<td>Some College</td>
</tr>
<tr>
<td>Completed College</td>
</tr>
<tr>
<td>Some University</td>
</tr>
<tr>
<td>Completed University</td>
</tr>
</tbody>
</table>

2.1.1 Establishing Clinically Significant Behaviour Problems.

Researchers studying a sample of children with conduct problems must face the challenge of accurately classifying and describing the heterogeneity of this group. Fergusson et al., (2005)
comment on the benefits and shortcomings of classifying children with conduct problems according to either a categorical model or a dimensional model. A categorical model considers diagnostic classifications and children are divided into a clinical group with a diagnosis (e.g., CD) or non-clinical group. However, this model may be incompatible with research on children with behavioural problems as children may display severe conduct problems but may not meet diagnostic criteria for CD. In order to intervene early and accurately, research must clarify the potential precursors to developing CD and thus, a closer examination of children with CP is necessary. A dimensional model takes into account the variability of behavioural problems, with behaviours potentially ranging from ‘none’ to ‘severe’. Further, the dimensional model is more sensitive to variability of symptomology within a sample. For the purpose of the present study, we will consider a dimensional model and hope to capture children that are experiencing behavioural problems but may not yet have a diagnosis. This approach allows us to consider a range of behavioural difficulties without necessarily selecting a single subscale or measure that only narrowly defines this group.

To establish our clinical sample of children with conduct problems, all children were referred to and screened for the Stop Now and Plan® intervention program through the Child Development Institute. In order to receive services, children are not required to have a diagnosis of a Disruptive Behaviour Disorder, such as ODD or CD, but must display significant behavioural problems as determined by various measures. At the time of intake, parents completed a variety of measures to establish if the child was experiencing significant behavioural issues. All participants met criteria for services through the Child Development Institute, indicating that the clinical sample displayed concerning behavioural problems.

For the current study, all parents completed a series of questionnaires, including the Child
Behavior Checklist (CBCL; Achenbach & Rescorla, 2001) and the Antisocial Process Screening Device (APSD; Frick & Hare, 2001). For the majority of participants (94%) mothers completed the questionnaires. In comparing the scores of children with and without conduct problems on the CBCL DSM subscales as well as on the APSD Composite scores, the CP sample displayed significantly higher scores than their typically developing counterparts on nearly all of the scales (see Table 2.1.2 and Table 2.1.3). The only scale not found to be significantly different was the ‘Somatic Complaints’ DSM subscale (e.g., headaches, stomach-aches, etc.; often associated with internalizing disorders) on the CBCL. Thus, our samples were reliably different, with the CP sample displaying marked behavioural impairments.

Table 2.1.2.
Means and Standard Deviations of T-Scores for the DSM Scales of the Child Behavior Checklist.

<table>
<thead>
<tr>
<th>DSM Scales</th>
<th>CP</th>
<th>TD</th>
<th>ANOVA results</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>Affective Problems</td>
<td>61.23</td>
<td>8.16</td>
<td>53.79</td>
</tr>
<tr>
<td>Anxiety Problems</td>
<td>59.74</td>
<td>8.44</td>
<td>55.48</td>
</tr>
<tr>
<td>Somatic Problems</td>
<td>57.16</td>
<td>6.30</td>
<td>54.85</td>
</tr>
<tr>
<td>ADHD Problems</td>
<td>64.84</td>
<td>9.30</td>
<td>55.03</td>
</tr>
<tr>
<td>Oppositional Defiant Problems</td>
<td>65.16</td>
<td>9.35</td>
<td>56.12</td>
</tr>
<tr>
<td>Conduct Problems</td>
<td>66.26</td>
<td>8.77</td>
<td>54.09</td>
</tr>
</tbody>
</table>
Table 2.1.3.

*Means and Standard Deviations for the Antisocial Process Screening Device.*

<table>
<thead>
<tr>
<th>APSD Scales</th>
<th>CP</th>
<th></th>
<th>TD</th>
<th></th>
<th>ANOVA results</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td></td>
</tr>
<tr>
<td>Callous/Unemotional</td>
<td>61.36</td>
<td>10.15</td>
<td>51.03</td>
<td>10.42</td>
<td>$F (1, 65) = 16.66, p &lt; .001, \eta^2 = .80$</td>
</tr>
<tr>
<td>Narcissism</td>
<td>59.42</td>
<td>12.24</td>
<td>46.94</td>
<td>8.82</td>
<td>$F (1, 65) = 22.59, p &lt; .001, \eta^2 = .80$</td>
</tr>
<tr>
<td>Impulsivity</td>
<td>56.73</td>
<td>10.88</td>
<td>44.21</td>
<td>7.39</td>
<td>$F (1, 635) = 29.87, p &lt; .001, \eta^2 = .70$</td>
</tr>
</tbody>
</table>

### 2.2 Setting

Both research settings were outfitted with hidden cameras and wired for sound. At the lab at the University of Toronto, four hidden cameras were used to capture the children’s behaviour. One camera focused on the child’s face, one captured their side profile, one captured the top of the table and one captured their feet and gross body movements (See Figure 2.1.). The cameras were fed through a closed-circuit network to a control room across the hall where the video was recorded. At the Child Development Institute, the set up differed slightly with only two hidden cameras in the room, capturing the front and back of each child.

*Figure 2.1. Room design at the Child Development Research Lab*
In addition to the cameras already wired into the rooms, an additional camera was placed on the table and activated by the experimenter during key portions of the testing in order to ensure that the child’s face was clearly captured.

2.3 Design and Procedure

Prior to beginning data collection and contacting families, the proposed study was submitted to the Ethics Review Committee at the University of Toronto as well as at the Research Ethics Board at the Child Development Institute. Approvals were received at both institutes, though approval was only provided in writing at the University of Toronto (see Appendix A). The study was in compliance with the ethical guidelines of these institutions and procedures were carried out in accordance with the ethics proposal.

Parents were contacted by phone and the study was explained to them in full detail including the procedures, the purpose of the study, and also about the use of hidden cameras. Formal written consent was obtained from all parents (Appendix B) and oral assent (Appendix C) was obtained from all children prior to commencement of the study. At the end of the study, all children were fully debriefed about the experimental procedures, including the use of hidden cameras, and were given an opportunity to ask questions about the design and purpose of the study (for details of the debriefing procedure, see Appendix D).

Upon arrival at the lab, children played with a research assistant (RA) while the main experimenter asked the parents to sign the consent forms in a separate room. This procedure was followed to prevent the main experimenter from forming a friendly or collegial bond with the child prior to testing, which could potentially affect the child’s truth and lie-telling behaviour. Parents were shown the hidden cameras and again explained the procedures and purpose of the study. Parents were given several questionnaires to be completed while their child was
participating in the study. For questionnaire completion, parents were given a $10 gift card to one of four locations (Tim Horton’s, Shopper’s Drug Mart, Walmart, and No Frills) and were compensated for their transportation costs (i.e., parking or public transportation fares).

Once consent was obtained, the main experimenter proceeded to the waiting room where an RA was playing with the child. The experimenter asked the RA to show the child the testing room and the possible prizes they could win. The RA revealed three possible prizes, all valued at approximately $10 each, and an undesirable fourth prize: a package of plain soap. The child was asked to rank the prizes in order from the prize they liked the best to the prize they liked the least. The main experimenter listened to the child’s selection through the hidden cameras to be certain of the child’s ranking. Overall, 73% of the children indicated that they liked the soap the least, while 25% ranked the soap as their second to least favourite. One child from the CP sample stated that she liked the soap second best. The RA then concealed the prizes and asked the child to be seated at the testing table. This was the main experimenter’s cue to enter the room and begin the testing phase.

The study involved a series of cognitive tasks and two experimental scenarios (one antisocial lie-telling and one prosocial lie-telling scenario). The order remained constant for all participants so as to ensure that a comparable amount of time had passed before either of the lie-telling scenarios. This fixed order procedure is common in existing correlational studies to ensure statistical integrity (Carlson & Moses, 2001; Sabbagh et al., 2006).

2.3.1 Deception Scenarios

2.3.1.1 Antisocial Lie-telling Scenario.

A modified temptation resistance paradigm was used in the present study. Previous studies using the traditional temptation resistance paradigm (e.g., Talwar & Lee, 2008) have
children left alone in a room with instructions not to peek at a tempting toy while their behaviours were recorded via hidden cameras. This approach, however, was not feasible in the current study for several reasons. Primarily, the present study enlisted children between the ages of 6 and 11. The traditional paradigm is rarely used with children up to the age of 11 (e.g., Li et al., 2011), as the toy may not be adequately tempting and therefore, the situation may not be motivating enough for children to commit the transgression. Secondly, half of the population in the current study demonstrated significant behavioural problems, raising concerns about leaving them unsupervised in the testing room. Modifications were made so that the children would be more interested in peeking at the object and so the experimenter would not have to leave the child unattended.

Approximately half-way through the testing session, children were told that they would receive a bonus prize for their hard work. The experimenter explained, “Before I give you your bonus prize, I want to wrap it up for you. I’m going to wrap it on the table. I want you to sit up straight, put your hands on the table, and close your eyes. I do not want you to peek at the prize while I am wrapping it. Ready?” The experimenter waited for the child to get in the proper position and repeated any instructions as necessary.

Once the child was ready, the experimenter activated the additional hidden camera which focused upon the child’s face in order to capture potential peeking behaviour. The experimenter then retrieved a piece of plain brown wrapping paper and set it on the table. A mug was then set on the table in the middle of the paper, with the handle pointing to the side so that it was clearly identifiable to the child. The mug was chosen as the bonus prize as it is a common household item that is recognizable to the participants. At this point, the experimenter then pretended to look for tape to wrap up the gift, stating, “Where is my tape?” to themselves, but in a voice
audible enough for the child to hear. The experimenter then said, “It must be over there” and walked to a bin located behind the child that contained several office supplies (See Figure 2.1). The experimenter created noise with the items in the bin in order to reinforce the perception that they were positioned behind the child. This manipulation took place so that the child would have an opportunity to peek while the experimenter could not see their face and thus would be less likely to catch the child in the act of peeking. The experimenter stayed behind the child for approximately 20 seconds ($M = 18.08$ seconds, $SD = 5.41$). After this time, they stated, “Here’s my tape!” and walked back to the table to finish wrapping the item.

A large box with the front flap cut out was then placed over the mug. This was done to facilitate wrapping and if the child peeked, they could still see the prize. Further, this made the wrapped prize appear to be rectangular and further hid the identity of the prize.

Once the prize was wrapped, the experimenter put away the tape and additional camera. They then asked the child to open their eyes and asked the child the critical lie-telling question: “While I was wrapping the prize, did you peek?” Regardless of the child’s response, the experimenter asked a series of follow-up questions in order to measure the child’s ability to suppress information that they should not know. They were asked “What do you think it is?” and “What colour do you think it is?” Finally, children were asked, “Why do you think it’s a (colour) (object)?” At this point, the child was permitted to open the prize. The mug was set aside and the testing session continued. At the end of the testing period, participants were debriefed regarding the purpose of the session and given an opportunity to exchange the mug for $1.

### 2.3.1.2 Prosocial Lie-telling Scenario.

Similar to other prosocial deception studies, an undesirable gift paradigm was utilized and was the final task in the study. After finishing all cognitive tasks, children were told that for
successfully completing the study, they would receive a prize. The experimenter stated, “I know that you selected a prize with (Research Assistant), but I picked out a prize for you before you got here.” At this point, the experimenter handed the child a closed paper bag that contained a single bar of white soap. All children received the same prize, except for the child who rated the soap as their second favourite prize and was given the item they had endorsed liking the least. Children were told, “I’m going to start cleaning up the room but you can go ahead and open your prize.” The experimenter stands and cleans up the room without facing the child for 30 seconds. This is done to closely replicate previous studies where children were given undesirable gifts and briefly left alone in the room to allow the child to react to the prize (Talwar, Murphy, et al., 2007). However, for safety reasons, the experimenter did not leave the child alone in the room.

Following the 30-second delay, the experimenter returned to her seat directly across from the child and asked, “Do you like your prize?” Children were given an opportunity to respond, with the question being repeated for children who were reluctant to give a response. This question was also repeated for children who gave a non-committal response (e.g., ‘I don’t know’). If the child failed to give a response after being asked twice, the question was not asked a third time. If they responded that they liked the soap, they were asked two follow-up questions: “What do you like about it?” and “What will you do with it?” These questions were selected in order to determine if children were able to maintain their initial prosocial lie, with response coding enabling the quantification of the level of sophistication for prosocial lies.

Following their responses, children were informed that they could switch their awarded prize for one that they had previously selected. All children switched their prize, confirming that the original prize was something that they indeed disliked.
2.3.2 Cognitive Tasks

In addition to the two deceptive scenarios, all participants completed a series of cognitive tasks measuring Executive Functioning (EF) skills, Theory of Mind (ToM) understanding, and Intelligence (IQ). Tasks were chosen relative to their established association with deception in research involving typically developing children. Also, the selected tasks were brief in administration time in order to maximize the efforts and interest of the participants. The tasks are as follows:

2.3.2.1 Executive Functioning tasks.

Previous research has established that greater proficiency in specific executive functioning (EF) skills is related to increased rates of lying behaviour and greater abilities to maintain lies. For this reason, EF skills were investigated using a series of cognitive tasks, which are described below in turn.

2.3.2.1.1 Inhibition tasks.

Given previous findings relating inhibition and deception (Evans & Lee, 2011; Talwar & Lee, 2008), two tasks measuring inhibition were administered. When telling a lie, one must suppress or inhibit the information that he or she knows, while making a verbal statement consistent with the lie. One commonly used measure pertinent to this concept is the Stroop task. This task requires that an individual look at a word or picture, and state something incongruous to the item. Such tasks have had relatively consistent correlations with aspects of lie telling, particularly when needing to be strategic in maintaining a lie (e.g., Evans et al., 2011). Measures of this nature are ideal when considered with deceptive tasks as they require one to inhibit information while providing a verbal response to an item.
Two measures of inhibition using two different Stroop tasks were utilized in the current study. Initially, the classic Stroop Colour and Word Test (Golden, 1978) was administered, which has been commonly utilized in previous research studying lying and inhibition. This task requires children to read or recognize colours as quickly as possible, with all trials involving a sheet of paper with words listed in 5 columns containing 20 items in each column. In the first trial (Word Trial), children are given 45 seconds to read the words ‘RED’, ‘BLUE’ and ‘GREEN’ which are presented in random order in the columns and written in black ink. Children practice the first three items to ensure they can read the list. The second trial is the ‘Colour Trial’ where the child receives a piece of paper with a series of X’s in red, green or blue ink. The child is instructed to state the colour of the ink as quickly as possible as they read down the columns. The third trial is the ‘Word-Colour’ trial, where children are presented with the words ‘RED’, ‘GREEN’ and ‘BLUE’ written in ink that contrasts with the word that is written (e.g., the word ‘RED’ written in blue ink). Children are instructed to state the colour of the ink and not the word that is written, thus requiring them to inhibit their natural response to read the words.

In order to obtain a clear estimate of the child’s ability, an interference score was calculated by subtracting the child’s score on the Word-Colour list from their score on the Colour trial. Low interference scores suggest higher inhibitory abilities as the child demonstrated the ability to read the Word-Colour list with fewer problems. However, the child’s reading skills must be considered, as children with limited reading abilities do not demonstrate difficulty through their interference scores. To control for this, a second measure of inhibition was obtained by using the Day-Night Stroop, which did not rely upon reading but instead, required the children to recognize symbols.
A Day-Night Stroop task has been employed by several studies when the inhibitory control skills of children are measured (Carlson & Moses, 2001; Talwar & Lee, 2008). This task typically involves the child viewing 16 cards that depict either a sun or moon and asking the child to say ‘day’ when they see the moon, and ‘night’ when they see the sun. This process thus inhibits the typical response to viewing the image. This paradigm however, has not been used with older children, as they would be more likely to respond correctly to all 16 cards, leading to limited variability between participants. In the current study, this paradigm was modified to more closely replicate the Word-Colour Stroop.

Children performed two trials for the Day-Night Stroop task, with the first acting as a control trial. The children were handed a sheet of paper that had 5 columns with 20 symbols of suns and moons per column, presented in random order. Children were asked to say ‘day’ whenever they saw a sun, and ‘night’ when they saw a moon, and given 45 seconds to name as many items as possible. On the second trial, the children were advised that the rules had changed, and now when they saw a sun, they were to say ‘night’, and when they saw a moon, they were to say, ‘day’. Children were then timed for 45 seconds. An interference score was calculated by subtracting their score from Trial 1 from their Trial 2 score.

2.3.2.1.2. Working Memory task.

In order to estimate participants’ working memory proficiency, the Digit Span task from the Wechsler Intelligence Scale for Children, 4th Edition (WISC-IV; Wechsler, 2003) was used. This measure of working memory has been commonly used in deception literature (e.g., Evans & Lee, 2011). For this task, participants were first requested to repeat a string of digits after the experimenter (Digit Span Forward) and then were asked to repeat a string of digits backwards
(Digit Span Backward). The numbers could not be repeated by the administrator and children were only awarded a point if they did not make any errors.

2.3.2.2. Theory of Mind tasks.

In order to determine theory of mind (ToM) understanding, children were read three stories presented on a computer screen. The stories were animated as to optimize children’s interest. Following each story, participants were asked several questions that assessed their ability to comprehend another’s perspective.

2.3.2.2.1. First Order Theory of Mind task.

Children were read the ‘Sally-Anne’ story and then were asked several questions to determine their ToM understanding. This story was adapted from previous studies by Wimmer and Perner (1983) and Rasmussen, Talwar and Wyper (2009), and is as follows:

“This is Sally, and this is Anne. Sally puts her ball into the basket. Then Sally leaves the room. Anne moves the ball from the basket into her box. Anne leaves the room.”

1) When Sally returns to get her ball, where will she look first?
2) Where does Sally think the ball is?
3) Where is the ball now?
4) Where did Sally put the ball in the beginning?

Correct responses to all questions were totalled in order to determine children’s overall ability to understand and correctly answer the questions relating to 1<sup>st</sup> Order ToM.

2.3.2.2.2. Second Order Theory of Mind tasks.

Children were read two stories related to 2<sup>nd</sup> Order ToM to evaluate their ability to reason about another’s mental state. The stories were adaptations from previous studies (Hogrefe et al. (1986), Sullivan et al. (1994), Talwar, Gordon, et al., 2007). The stories are as follows:

<sup>Story 1:</sup>

John and Mary are in the park. Mary wanted to buy ice cream from the ice cream van but she hasn’t got any money. The ice cream man tells her that he will be there all afternoon. Mary goes home to get money for ice cream. After a while, the ice cream man changes his mind and tells John that he is going to go to the school yard and sell ice
cream there. The ice cream man sees Mary on the road on his way to the school. He tells her that he is going to the school yard and will be selling ice cream there. John goes to Mary’s house but Mary is not there. Her mom tells him that she has gone to buy ice cream.

1) Where is the ice cream man now?
2) Does John know that Mary talked to the ice cream man?
3) John is looking for Mary. Where does John think that Mary has gone for ice cream?
4) Why does he think that?
5) Where has Mary gone for her ice cream?

**Story 2:**

Danny and Amy are brother and sister. They are playing in the living room. Their mother returns home from shopping. She bought some chocolate and she gives some to Danny. Amy doesn’t get any chocolate because she has been naughty. Danny eats some of the chocolate and puts the rest in the drawer. He doesn’t give any chocolate to Amy. That makes Amy angry.

Amy is alone in the living room. Because she is angry with Danny, Amy hides the chocolate. She takes the chocolate out of the drawer and puts it in the toy chest. Danny is busy cleaning the kitchen, but goes outside to throw the fruit leftovers in the bin near the garden. Through the window, he sees the living room. He sees Amy take the chocolate out of the drawer and put it in the toy chest. Amy does not see Danny.

1) Where is the chocolate now?
2) Does Danny know that Amy hid the chocolate in the toy chest?
3) Does Amy know that Danny saw her hide the chocolate?

Danny has finished cleaning the kitchen and he is hungry. He wants to eat some of his chocolate. Danny enters the living room and says, “I would like some chocolate.”

4) Where does Amy think that Danny will look for the chocolate?
5) Why does she think that?

A total score from both stories was calculated to determine participants’ overall ability to understand and correctly answer the questions relating to 2nd Order ToM.

**2.3.2.3. Intelligence tasks**

As limited support exists to demonstrate strong correlations between general intelligence and lying, a brief measure of intelligence was obtained for several reasons. Primarily, some evidence suggests that children with significant conduct problems may demonstrate lower intelligence scores than children without behavioural difficulties (e.g., Schonfeld et al., 1998). These significant differences in intelligence scores may predict differential performance on
measures of lie-telling and therefore warrant consideration. Furthermore, existing studies that include a measure of intelligence tend to be brief and often only involve a measure of receptive vocabulary as the source for an estimate of general intelligence. However, considering the reliance upon verbal and non-verbal skills in order to successfully deceive, receptive vocabulary may not be the most appropriate measure to be correlated to lie-telling.

The current study employed the Kaufman Brief Intelligence Test, Second Edition (KBIT-2; Kaufman & Kaufman, 2004). This measure was selected as it provides an estimate of intelligence that is known to have high internal consistency (.90 overall) and high test-retest stability (.90) (Kaufman & Kaufman, 2004). Additionally, the KBIT-2 has been found to have high validity with other measures of intelligence, including the WISC-IV (overall Composite correlation: .77) and the Wechsler Abbreviated Scale of Intelligence (WASI; overall Composite correlations: .89). In addition to providing a reliable estimate of intelligence, the KBIT-2 also has a relatively brief administration time (approximately 20 minutes), which was essential for the current sample. Further, this measure provides an estimate for three different subscales: Receptive Vocabulary, Expressive Vocabulary, and Non-verbal Reasoning. Receptive Vocabulary, or the child’s ability to understand language, is measured by having the child identify a picture that matches a verbal label. Expressive Vocabulary, or the children’s ability to express themselves, is measured by having the child answer questions using single words. Finally, Non-verbal Reasoning, or the ability to solve problems without the use of language, was measured by having the child complete patterns. An estimate of overall intelligence was obtained by combining participant’s scores on these three subscales.
2.3.3 Parent Questionnaires

Given the challenging composition of our sample, parents completed several questionnaires in order to obtain comprehensive estimates of the child’s behaviour at home as well as to gain a perspective regarding parenting styles.

2.3.3.1 Parent Ratings of Children’s Behaviour.

2.3.3.1.1 Child Behavior Checklist.

The Child Behavior Checklist (Achenbach & Rescorla, 2001) is commonly used in clinical research due to its strong psychometric properties. High reliability is reported, with internal consistency for the DSM-oriented scales ranging from .67-.94, and short term test-retest reliability ranging from .88-.90 (Achenbach, & Rescorla, 2001). Extensive evidence also suggests strong validity (Achenbach & Rescorla, 2001) and high correlations with similar instruments, such as the Behavior Assessment Scale for Children (Reynolds & Kamphaus, 1992) and the Conners' Rating Scales-Revised (Conners, 1997). The CBCL is commonly used in research to identify children with and without behavioural challenges (e.g., Hudziak, Copeland, Stanger, & Wadsworth, 2004). Diagnostic-oriented scales (DSM) provide clinical symptom indicators for areas such as ADHD, Oppositional Defiant Problems and Conduct Problems. While this measure is commonly used as part of comprehensive clinical assessments, the CBCL was used in the current study in order to confirm that our clinical sample was experiencing significant behavioural challenges (see Table 2.1.2.).

2.3.3.1.2 Antisocial Process Screening Device (APSD).

This measure of antisocial behaviour was created to provide a measure of psychopathy in children by classifying antisocial behaviours according to specific subtypes, which may assist in the identification and understanding of problematic behaviours in childhood (Frick & Hare,
The APSD obtains a measure of parental endorsement relating to Callous/Unemotional traits, Narcissism, and Impulsivity by using a brief 20-item questionnaire. This measure has been found to demonstrate strong internal validity (Vitacco, Rogers, & Neumann, 2003), and research has revealed significant correlations between these three composites, and a diagnoses of Conduct Disorder or Oppositional Defiant Disorder (Frick, Bodin, & Barry, 2000). Strong correlations with the CBCL have also been found, with Callous-Unemotional traits being related to aggression, delinquency and destruction of property (Christian, Frick, Hill, Tyler, & Fraser, 1997). The APSD was used in the current study to confirm that our CP sample was experiencing significant behavioural challenges that differed from the TD sample (see Table 2.1.3.).

2.3.3.1.3 Lie-telling Questionnaire.

Given the lack of understanding regarding how parental perceptions of lying may compare to actual lying behaviour in children with conduct problems, a lie-telling questionnaire was given to parents to gain a broad estimate of parental perceptions of lies. Parents responded on a 5-point Likert scale ranging from never to always in response to questions pertaining to their children’s lie-telling. This scale was previously used by Engles and colleagues (2006) to gain estimates of lying behaviour in an adolescent population. Engles et al. (2006) reported a high reliability coefficient (Cronbach’s alpha of .90), with corrected item-total correlations ranging from .40 to .77. As this scale is not yet normed or standardized, the measure was administered in the current study and a factor analysis was completed.

2.3.3.2. Rating of Parenting Styles.

Little is known about the relationship between parenting styles and deceptive behaviours in children. It is possible that parental responses to children’s lying may alter the likelihood that a child may respond deceptively. Indeed, different parenting styles have been found to explain a
significant portion of the variance in children’s behaviours (Rinaldhi & Howe, 2012). As such, the *Parenting Styles and Dimensions Questionnaire* (PSDQ) was administered to gain parental ratings of their own and their partners’ (or co-parents’) parenting styles (Robinson, Mandleco, Olsen, & Hart, 1995; 2001). This 32-item questionnaire was completed by parents who rated both their own and their co-parents’ parenting tendencies, which measure attributes of three parenting styles (Authoritarian, Authoritative, and Passive) based upon Baumrind’s findings (1966). This questionnaire has been adapted from a 62-item version, and has been found to have cross-cultural validity, as well as high reliability and validity (Kern & Jonyniene, 2012; Robinson, et al., 1995, 2001). Of the 32 questions, 15 were considered under the Authoritative Parenting scale, 12 under the Authoritarian Parenting scale and 5 under the Permissive Parenting scale. Individuals rated themselves and their co-parents on a 5-point Likert scale ranging from 1 (Never) to 5 (Always). Responses to the questions within each of the three parenting scales were averaged and thus, scores for parent self-reports and co-parent reports on each scale range from 1 to 5, with higher scores indicating a higher tendency to display the given parenting style.
CHAPTER 3: RESULTS

3.1. Deception Rates by Age and Sample

Preliminary results did not reveal significant gender differences in terms of deceptive behaviour, which is consistent with the extensive deception literature. For subsequent analyses, the results for both genders have been collapsed. Further, given the sample size, ethnicity was not included in the analyses as results would not have sufficient statistical power.

3.1.1. Coding

The behaviours and responses of all children in all tasks, except for the standardized measures, were coded by two independent raters. Inter-rater reliability was found to be moderate with kappa at .56 for children’s peeking and lie-telling behaviours. Reliability rates are thought to be impacted by the conservative reliability coding process; while raters indicated if a child peeked or not, it was challenging to determine the true peeking behaviour of some participants. If coders rated the peeking behaviour as ‘unclear’, then this was not calculated to be a rating agreement. However, all discrepancies were clarified by a third coder who made a final decision by viewing the video recordings and rating the videos without knowing the previous ratings.

For children’s prosocial lie-telling behaviours, inter-rater reliability achieved a kappa of .81 in classifying children’s responses as blunt truths or prosocial lies. In addition, the sophistication of children’s prosocial lies was coded according to a 6-point Likert scale (see Table 3.1.1.). Inter-rater reliability in classifying the sophistication of prosocial lies had a kappa equal to .58, with no discrepancies being greater than 1 point on the Likert scale. For children’s prosocial lying and for the sophistication coding, discrepancies were resolved by a third coder.
Table 3.1.1.

Coding for the Sophistication of Prosocial Lying.

<table>
<thead>
<tr>
<th>Rating</th>
<th>Classification</th>
<th>Description</th>
<th>Example: (Q1) What do you like about it? (Q2) What will you do with it?</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Blunt Truth</td>
<td>Stated they did not like the prize</td>
<td>Q1: No</td>
</tr>
</tbody>
</table>
| 1      | Simplistic     | Endorsed liking prize with no elaboration | Q1: I don’t know  
|        |                |             | Q2: I don’t know |
| 2      | Basic          | 1 simple elaboration | Q1: I don’t know  
|        |                |             | Q2: Wash my hands |
| 3      | Moderate       | Simple elaborations to both questions | Q1: It smells good  
|        |                |             | Q2: Use it in the shower |
| 4      | Sophisticated  | 1 sophisticated and 1 simple elaboration | Q1: There is a lot of sickness going around my school so I will use it to wash my hands.  
|        |                |             | Q2: Wash my hands. |
| 5      | Highly Sophisticated | 2 sophisticated elaborations | Q1: I will use it to wash my hands and prevent germs.  
|        |                |             | Q2: I will save it for a when company comes over so that they can use a fresh bar of soap. |

3.1.2. Considerations in Analyses

Given the small sample size, a bootstrap analysis was conducted for all regressions. A bootstrap analysis reduces the impact of anomalies and outliers in a data set by re-sampling with replacement from the original dataset. This process ensures reliability of results by creating many alternative versions of the dataset for a more accurate picture of what is likely to exist in the population. For the purposes of the current study, any reference to a bootstrap analysis indicates that the analysis was set to run 1000 times with a Confidence Interval (CI) of 95%.

As described in the methods section (Section 2.1), SES differed significantly between the
two samples (CP and TD) as indexed by the average of the parents’ education level. As a result, this variable was entered on the first step of the following regression analyses to control for any potential differences in SES.

3.1.3 Antisocial Lie-telling Behaviour

3.1.3.1. Transgressing and antisocial lie-telling.

Overall, 78.8% of participants (52 out of 66) peeked at the prize while it was being wrapped, which is comparable to previous studies that have implemented a temptation resistance paradigm (e.g., Evans & Lee, 2011; Talwar & Lee, 2008). When considering the two sample types (CP vs. TD), 87.9% (or 29 of 33 participants) of the children with CP peeked, while only 69.7% of the TD sample peeked (23 of 33 participants).

A hierarchical binary logistic regression was performed for peeking behaviour (1 = peeked, 0 = did not peek), with a control for Social Economic Status (SES) entered on the first step. Age in months (continuous variable) and Sample type (CP=0, TD=1) were entered on the second step. The interaction between Age and Sample type could not be considered as the samples were age matched and therefore interaction results would always remain non-significant as age was not a random factor.

The first step with SES was not significant, $\chi^2(1, 66) = 0.00$, Nagelkerke $R^2 = 0.00$, $p > .05$, though the second step of the regression with Age and Sample was, $\chi^2(2, 66) = 8.40$, Nagelkerke $R^2 = .19$, $p = .02$. Results indicated that, above and beyond the contribution of all variables, the Age variable was significant, $B = -.03$, Wald = 3.83, $p = .05$, Odds Ratio ($OR$) $= .97$, 95% CI $= [.94, 1.00]$. Given that the odds ratio was less than 1, the inverse was considered (i.e., $1 /$ odds ratio) and multiplied by 12 to consider the impact of each year increase. Results demonstrated that for every additional year, participants were 12.37 times less likely to peek.
Sample type was found to be marginally significant, $B = 1.53$, Wald = 3.48, $p = .06$, $OR = 4.61$, 95% CI = [.04, 1.08], with the odds ratio revealing that children with CP were 4.61 times more likely to peek than children from the TD sample. The bootstrap analysis confirmed the results for SES ($B = .12$, 95% CI = [-.28, .56], $p > .05$) and Age ($B = -.03$, 95% CI = [-.08, -.005], $p = .03$). Further, bootstrap analyses indicated that Sample was a significant predictor, $B = 1.53$, 95% CI = [.29, 4.19], $p = .02$, thus confirming that the marginal trend with Sample type is a reliable finding.

All children who peeked at the prize lied about their transgression. Therefore, no comments can be made in relation to children who may choose to confess. All children who peeked and lied will henceforth be referred to as ‘Antisocial Liars’ and children who did not peek (and therefore did not tell a lie) will be referred to as ‘Non-Transgressors’.

3.1.3.2. Sophistication of children’s antisocial lies (Verbal Leakage).

Following their initial deception question, children were asked three follow-up questions to determine if they were able to inhibit information that they should not know. Children were asked what they thought the prize was, what colour it was, and why they thought it was the item they had described. If children stated that they did not peek, they should not know the identity or colour of the prize. Failing to hide this information that they should not know would be less sophisticated, as it would be inconsistent with their initial lie. This disclosure of information will be referred to as ‘Verbal Leakage’ (Talwar & Lee, 2002a) as this information has been ‘leaked’ and unfolded into incriminating evidence.

Overall, 38.5% of the antisocial liars (20 of 52) displayed Verbal Leakage by stating either the identity of the prize, the colour, or both. When considering differences in Verbal Leakage between the samples, results indicated that while 48.3% of children with CP displayed Verbal Leakage and incriminated themselves (14 out of 29 cheaters), only 26.1% of the TD
sample displayed verbal leakage (6 out of 23 cheaters). A hierarchical binary logistic regression was performed on the Antisocial Liar group, with SES entered on the first step, Age in months (continuous variable) and Sample (CP vs. TD) on the second step, and Verbal Leakage (1 = Verbal Leakage, 0 = Verbal Leakage control) as the predicted variable.

The first step with SES was not significant, \( \chi^2(1, 52) = 0.01 \), Nagelkerke \( R^2 = 0.00 \), \( p > .05 \). The second step with Age and Sample was also not significant, \( \chi^2(2, 52) = 3.14 \), Nagelkerke \( R^2 = 0.08 \), \( p > .05 \). Thus, these variables were not significant predictors of Verbal Leakage. The bootstrap analysis yielded similar results, indicating that SES, Age and Sample were not significant predictors of Verbal Leakage.

### 3.1.4. Prosocial Lie-telling Behaviour

#### 3.1.4.1. Initial prosocial lie-telling.

Overall, 74.2% of participants (49 out of 66) told a prosocial lie when asked if they liked the prize. In relation to Sample type, 63.6% (or 21 of 33 participants) of children with CP were found to have told a Prosocial lie, while 84.8% (or 28 of 33 participants) of children in the TD sample were found to do so.

A binary logistic regression was conducted with SES entered on the first step, Age in months (continuous variable) and Sample type (CP vs. TD) on the second step, and prosocial lie telling as the predicted variable (0 = blunt truth, 1= prosocial lie). The first step with SES was not significant, \( \chi^2(1, 66) = .49 \), Nagelkerke \( R^2 = .01 \), \( p > .05 \), though the second step with Age and Sample was significant, \( \chi^2(2, 66) = 6.00 \), Nagelkerke \( R^2 = .14 \), \( p = .05 \). While age was not found to be a significant predictor, \( B = .02 \), Wald = 2.31, \( p > .05 \), \( OR = 1.02 \), 95% CI = [.99, 1.05], Sample was a marginally significant predictor of prosocial lie-telling over and above the contribution of all other variables, \( B = -1.17 \), Wald = 3.03, \( p = .08 \), \( OR = .31 \), 95% CI = [.08,
1.16. Given that the odds ratio is less than 1, the inverse was calculated for ease of understanding, with results indicating that children with CP are 3.45 times less likely to tell a prosocial lie than TD children. The bootstrap analysis confirmed findings with non-significant results yielded for SES and Age, with marginally significant results for Sample, $B = -1.17$, 95% CI = [-2.79, .37], $p = .08$.

3.1.4.2. Sophistication of children’s prosocial lies.

Children answered two follow-up questions after being asked if they liked their prize in order to measure their prosocial lie maintenance abilities. After their initial prosocial lie, children were asked what they liked about the prize and what they would do with it. Responses were coded by two independent raters as was previously described (Section 3.1.1). If participants stated they did not like the prize, they were deemed to be ‘blunt truth tellers’ and were given a score of ‘0’. Children who told blunt truths were not included in subsequent analyses considering sophistication of prosocial lies. Overall, the mean score of the sophistication of the prosocial lies was 2.79 ($SD = .76$), with children with CP displaying lower sophistication scores than their TD counterparts, ($M = 2.67$, $SD = .80$ and $M = 2.89$, $SD = .74$, respectively).

A linear regression analysis was conducted with lying sophistication as the predicted variable, with SES entered on the first step and Age in months (continuous variable) and Sample type (CP vs TD) on the second step. Neither the first ($\Delta F (1, 47) = 2.15, p > .05$, $RD^2 = .04$) nor the second models ($\Delta F (2, 45) = .60, p > .05$, $RD^2 = .03$) were significant. The bootstrap analysis yielded similar results suggesting that these factors do not predict the sophistication of prosocial lies.

3.1.5. Anti- and Prosocial Lie-telling Group Performance

As most previous studies have examined children’s prosocial and antisocial lie-telling
separately, the present study was able to consider their behaviour concurrently to determine if there were commonalities between children’s performances. As such, three deception groups were created considering the antisocial and prosocial lie-telling behaviours of all participants (i.e., both CP and TD populations): 1) Non-Transgressor/Prosocial Lie Teller, 2) Antisocial Liar/Prosocial Lie Teller, 3) Antisocial Liar/Blunt Truth Teller (see Figure 3.1). The fourth possible category, Non-Transgressor/Blunt Truth Teller category was not included in the analysis as only one child displayed this behaviour pattern and this child is subsequently not included in the following analyses.

Figure 3.1. Deceptive behaviours across lie-telling scenarios

A Multinomial Logistic Regression was conducted using Group Type as the predicted variable with Group Type 1 (Non-Transgressor/Prosocial Liar) as the reference group, as these children displayed optimally social behaviours in both lie-telling scenarios. SES, Age in months (continuous variable) and Sample type (CP vs. TD) were predictor variables. The SES variable was not significant and was subsequently removed from the analysis. Results demonstrated that the model was significant, $\chi^2(1, 65) = 12.40$, Nagelkerke $R^2 = .20$, $p = .02$. Age was found to be a significant predictor, with Group 2 (Antisocial Liar/Prosocial Liar) differing marginally
significantly from the reference group (Group 1) with regards to Age, $B = -.03$, $Wald = 3.61$, $p = .06$, $OR = .97$, 95% CI = [.94, 1.00]. As the odds ratio was less than 1, the inverse was calculated and multiplied by 12 to determine the impact of age with each yearly increase. The odds ratio indicated that for each year increase in age, children were 12.37 times more likely to belong to Group 1 as opposed to Group 2. Age also predicted group membership between Group 3 (Cheater/Blunt Truth Teller) and Group 1 (reference group), $B = -.05$, $Wald = 5.18$, $p = .02$, $OR = .96$, 95% CI = [.92, .99]. The inverse of the odds ratio multiplied by 12 was considered and demonstrated that for every additional year of age, children were 12.5 times less likely to belong to Group 3 than Group 1.

Furthermore, Sample type (CP or TD) was significantly related to classification in Group 3 vs. Group 1, $B = 2.05$, $Wald = 5.45$, $p = .02$, $OR = 7.77$, 95% CI = [1.39, 43.45]. Participants with CP were 7.77 times more likely to be in Group 3 (Antisocial Liar/Blunt Truth Tellers) and demonstrate more antisocial behaviour overall than children from the TD sample. Bootstrap analyses demonstrated the same results in terms of Age (Group 2: $B = -.03$, 95% CI = [-.08, -.002], $p = .05$; Group 3: $B = -.05$, 95% CI = [-.10, -.01], $p < .01$) and Sample (Group 2: $B = .79$, 95% CI = [-.70, 3.21], $p > .05$; Group 3: $B = 2.05$, 95% CI = [.37, 19.66], $p = .02$).

3.1.6. Summary

When considering how Age and Sample predict antisocial and prosocial deception in the current study, several significant findings were uncovered. Results suggest that children with CP were more likely to display antisocial behaviour. When compared to the TD sample, children with CP were more likely to commit a transgression and lie about it. This partially confirms Hypothesis 1a as children with CP transgressed more but all children were equally as likely to lie. Children with CP were also found to be less likely to tell a prosocial lie, which confirms
Hypothesis 1b. While the samples were not significantly different in terms of sophistication of antisocial or prosocial lies (Hypotheses 3a and 3b), trends were noted in the predicted direction though further analyses are required to confirm these results.

As age increased, children were significantly less likely to commit a transgression and subsequently lie. This trend however was not found to predict Prosocial Lying, and Age was not found to be a significant predictor of lie-telling sophistication for either Antisocial or Prosocial Lying.

These trends were further exemplified by analyzing group differences, as older children from the TD sample were significantly more likely to be in Group 1 (Non-Transgressors/Prosocial Liars), as opposed to children with CP, who were more likely to be in Group 3 (Antisocial Liars/Blunt truth tellers). Bootstrap analyses confirmed all results, suggesting that these are reliable trends.
3.2. Cognitive Measures by Age and Sample

As many cognitive measures were utilized in the current study, they were each investigated in turn by implementing linear regression analyses, with each Composite area (Executive Functioning skills, Theory of Mind understanding, and intelligence levels) investigated separately and entered as the predicted variable. In addition to each Composite area, the individual measures were investigated separately in order to determine if any single measure was significantly related to the independent variables (SES, Age, and Sample).

3.2.1. Considerations in Analyses

Preliminary results did not reveal significant gender differences in terms of deceptive behaviour. For subsequent analyses, the results for both genders have been collapsed.

The potential variability in SES between samples was controlled in the following regression analyses by entering SES on the first step, with Age and Sample (CP vs TD) entered on the second step as the predictor variables. As previously mentioned (Section 3.1.3.1), the interaction between Age and Sample was not considered. Bootstrap analysis was conducted for each regression analysis to confirm that the observed trends were reliable.

The cognitive tasks selected were based upon the methodologies incorporated within previous relevant studies and were chosen for ease of comparability between present and past results (for review, see Section 1.4 and Section 2.3.2). Many of the measures selected had age norms and standardized scores (Word-Colour Stroop, Digit Span, all KBIT tasks). However, some of the measures utilized (Day-Night Stroop, Theory of Mind tasks) were created for the present study and thus, do not have pre-existing standardized scores. To increase the comparability between the cognitive tasks, a z-score was created for each measure using the current sample as the selected population.
3.2.2. Executive Functioning Skills

3.2.2.1. Executive Functioning Composite.

Children’s total Executive Functioning score (EF Composite) was calculated by analyzing their performance on the 3 EF tasks: Word-Colour Stroop, Day-Night Stroop, and Digit Span. As previously described, z-scores for these measures were calculated and an overall Composite z-score was created.

A hierarchical linear regression was conducted with the EF Composite entered as the predicted variable, with SES entered on the first step, and Age in months (continuous variable) and Sample type (CP vs TD) on the second step. The first step with SES was significant, $\Delta F(1, 61) = 7.57, p < .01, R^2 = .11$. The model demonstrated a positive correlation between SES and EF Composite scores, $b = .07, t = 2.75, p < .01$, part correlation = .33, 95% CI = [.02, .12]. The second model with Age and Sample was not found to be significant, $\Delta F(2, 59) = .61, p > .05$, $R^2 = .02$. Bootstrap analyses confirmed all results, including the significant results for SES ($b = .07, 95\% \text{ CI} = [-.004, .12], p = .03$).

3.2.2.2. Individual Executive Functioning measures.

The relationship between Age and Sample and each measure was considered, as the Composite scores may not capture the individual contribution of each measure. Thus, each EF measure will be discussed in turn, with means and standard deviations of all EF tasks provided in Table 3.2.1.
Table 3.2.1.

*Means and Standard Deviations of Executive Functioning Z-Scores*

<table>
<thead>
<tr>
<th></th>
<th>CP</th>
<th></th>
<th>TD</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Word-Colour Stroop</td>
<td>.12</td>
<td>1.15</td>
<td>-.08</td>
<td>.85</td>
</tr>
<tr>
<td>Day-Night Stroop</td>
<td>-.13</td>
<td>1.05</td>
<td>.12</td>
<td>.96</td>
</tr>
<tr>
<td>Digit Span</td>
<td>-.45</td>
<td>.79</td>
<td>.41</td>
<td>1.01</td>
</tr>
<tr>
<td>EF Composite</td>
<td>-.13</td>
<td>.55</td>
<td>.15</td>
<td>.44</td>
</tr>
</tbody>
</table>

3.2.2.1. Word-Colour Stroop.

In total, 63 children completed the Word-Colour Stroop. Three subjects from the CP sample could not read the first three words and thus, the Word-Colour Stroop task was discontinued. For all other participants, an interference score was calculated by subtracting children’s scores on the Word-Colour Trial from their score on the Colour Trial.

A hierarchical linear regression was conducted with Word-Colour Stroop interference z-scores entered as the predicted variable, with SES entered on the first step, and Age in months (continuous variable) and Sample type (CP vs TD) on the second step. The first step with SES was not significant, $\Delta F (1, 61) = .08, p > .05$, $R^2 = .001$, though the second step with Age and Sample type was, $\Delta F (2, 59) = 5.71, p < .01$, $R^2 = .16$. Age was a significant unique predictor of Word-Colour Stroop scores, $B = -.018, t = -3.28, p = .002$, part correlation = -.39, 95% CI = [-.03, -.01]. Lower Word-Colour Stroop scores indicate stronger inhibition skills and results demonstrated that older children displayed more sophisticated inhibitory abilities. Sample type was not a significant predictor, $B = -.21, t = -.76, p > .05$, part correlation = -.09, 95% CI = [-.75, .34]. Bootstrap analysis confirmed all findings, including the significant results for Age, ($B = -.02, 95\% \text{ CI} = [-.03, -.01], p < .01$).
3.2.2.2.2. Day-Night Stroop.

Of the 66 participants, 63 completed the Day-Night Stroop task. The 3 CP participants who did not complete the task refused to finish it and thus, this measure was discontinued. An interference score was calculated by subtracting the participant’s score on the Day-Night Reverse trial from the Day-Night Control trial.

A hierarchical linear regression was conducted with Day-Night Stroop interference z-scores entered as the predicted variable, with SES entered on the first step, and Age in months (continuous variable) and Sample type (CP vs TD) on the second step. Neither step demonstrated significance (Step 1: $\Delta F (1, 61) = .2.65, p < .05, RD^2 = .04$; Step 2: $\Delta F (2, 59) = .06, p < .05, RD^2 = .002$), and thus, these variables did not predict performance on the Day-Night Stroop measure. The bootstrap analysis then confirmed these results.

3.2.2.2.3. Digit Span.

In total, 65 children completed the Digit Span task, with one child with CP refusing to complete the measure. A total Digit Span score was calculated by considering children’s total raw score on the forward and backward tasks, which emulated how a Digit Span score is calculated on the WISC-IV (Wechsler, 2003).

A hierarchical linear regression was conducted with Digit Span z-scores entered as the predicted variable, with SES entered on the first step, and Age in months (continuous variable) and Sample type (CP vs TD) on the second step. The first step with SES was significant, $\Delta F (1, 63) = 6.06, p = .02, RD^2 = .09$. Therefore, as SES increased, Digit Span scores also increased, $B = .12, t = 2.46, p = .02$, part correlation = .30, 95% CI = [.02, .22].

The second step was also found to be significant, $\Delta F (2, 61) = 17.71, p < .001, RD^2 = .34$. Over and above the contribution of all variables, Age was a significant predictor of Digit Span,
\[ B = .02, t = 4.82, p < .001, \text{ part correlation} = .47, 95\% \text{ CI} = [.01, .03]. \] Therefore, as age increased, Digit Span scores also increased. Additionally, Sample type was a significant predictor of Digit Span above and beyond the contribution of all other variables, \( B = .68, t = 3.15, p < .01, \text{ part correlation} = .31, 95\% \text{ CI} = [.25, 1.15]. \) Thus, children from the TD sample had significantly higher Digit Span scores than children with CP. Bootstrap analyses confirmed all results, including the findings for SES (\( B = .12, 95\% \text{ CI} = [.04, .24], p = .02 \)), Age (\( B = .02, 95\% \text{ CI} = [.01, .03], p < .01 \)), and Sample (\( B = .68, 95\% \text{ CI} = [.24, 1.09], p < .01 \)).

### 3.2.3. Theory of Mind Understanding

#### 3.2.3.1. Theory of Mind Composite.

Children’s total Theory of Mind score (ToM Composite) was calculated by considering their performance on the three ToM stories: one 1\textsuperscript{st} Order ToM story and two 2\textsuperscript{nd} Order ToM stories. Children’s performance on the questions for each story type was totalled and z-scores were calculated from the sample for children’s 1\textsuperscript{st} and 2\textsuperscript{nd} Order ToM task performance.

A hierarchical linear regression was conducted with the ToM Composite entered as the predicted variable, with SES entered on the first step, and Age in months (continuous variable) and Sample type (CP vs TD) on the second step. The first step with SES demonstrated significance, \( \Delta F(1, 64) = 7.19, p < .01, RD^2 = .10. \) The model indicated that as SES increased, ToM scores also increased, \( B = .13, t = 2.68, p = .01, \text{ part correlation} = .31, 95\% \text{ CI} = [.03, .23]. \)

The second model with Age and Sample was also significant, \( \Delta F(2, 62) = 3.49, p = .04, RD^2 = .09. \) Results suggest that above and beyond the contribution of all other variables, Age was a significant predictor of ToM scores. As age increased, ToM Composite scores also increased, \( B = .01, t = 2.50, p < .01, \text{ part correlation} = .30, 95\% \text{ CI} = [.02, .25]. \) Sample was not found to be a significant predictor, \( B = .17, t = .68, p > .05, \text{ part correlation} = .08, 95\% \text{ CI} = [-] \)
Bootstrap analyses confirmed all results, including the significant findings for SES ($B = .13$, 95% CI = [.04, .30], $p = .04$), and Age ($B = .01$, 95% CI = [.004, .02], $p < .01$).

### 3.2.3.2. Individual Theory of Mind measures.

In addition to the ToM Composite, 1st and 2nd Order ToM were investigated separately in order to evaluate their unique contributions. Means and Standard Deviations of raw scores are provided in Table 3.2.2.

Table 3.2.2.

<table>
<thead>
<tr>
<th></th>
<th>CP</th>
<th>SD</th>
<th>TD</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Order ToM</td>
<td>-.25</td>
<td>1.09</td>
<td>.23</td>
<td>.87</td>
</tr>
<tr>
<td>2nd Order ToM</td>
<td>-.20</td>
<td>1.04</td>
<td>.19</td>
<td>.95</td>
</tr>
<tr>
<td>Total ToM</td>
<td>-.23</td>
<td>1.07</td>
<td>.23</td>
<td>.90</td>
</tr>
</tbody>
</table>

#### 3.2.3.2.1. 1st Order Theory of Mind task.

All participants completed the 1st Order ToM task, which involved listening to a brief story and answering questions related to 1st Order ToM comprehension (See Section 2.3.2.2.1. for story and questions).

A hierarchical linear regression was conducted with 1st Order ToM z-scores entered as the predicted variable, with SES entered on the first step, and Age in months (continuous variable) and Sample type (CP vs TD) on the second step. The first step with SES was significant, $\Delta F (1, 64) = 4.49$, $p = .04$, $R^2 = .07$. This result indicates that as SES increased, 1st Order ToM also increased, $B = .11$, $t = 2.12$, $p = .04$, part correlation = .26, 95% CI = [.01, .21].

The second step with Age and Sample was marginally significant, $\Delta F (2, 62) = 2.54$, $p = .087$, $R^2 = .07$. Greater than the contribution of all other variables, Age was a marginally significant predictor of 1st Order ToM scores, $B = .01$, $t = 1.91$, $p = .06$, part correlation = .23, 95%
CI = [-.01, .02]. Therefore, as age increased, 1\textsuperscript{st} Order ToM also increased. Sample was not a significant predictor of 1\textsuperscript{st} Order ToM, \( B = .28, t = 1.05, p > .05, \) part correlation = .12, 95\% CI = [-.25, .81]. The trend for Age predicting 1\textsuperscript{st} Order ToM was confirmed by the bootstrap analysis, \( B = .01, \) 95\% CI = [.001, .021], \( p = .04. \) However, the bootstrap analysis did not confirm the marginally significant result for SES, \( (B = .01, 95\% CI = [.02, .28], p > .05), \) suggesting that SES is not a reliable predictor of 1\textsuperscript{st} Order ToM.

3.2.3.2.2. 2\textsuperscript{nd} Order Theory of Mind tasks.

All participants completed the 2\textsuperscript{nd} Order ToM task, which involved listening to two brief stories and answering questions related to 2\textsuperscript{nd} Order ToM comprehension (See Section 2.3.2.2.2. for stories and questions).

A hierarchical linear regression was conducted with 2\textsuperscript{nd} Order ToM z-scores entered as the predicted variable, with SES entered on the first step, and Age in months (continuous variable) and Sample type (CP vs TD) on the second step. The first step with SES was significant, \( \Delta F (1, 64) = 6.58, p = .01, \) \( RD^2 = .09. \) Thus, as SES increased, 2\textsuperscript{nd} Order ToM also increased, \( B = .13, t = 2.57, p = .01, \) part correlation = .31, 95\% CI = [.03, .23].

The second step with Age and Sample was marginally significant, \( \Delta F (2, 62) = 3.02, p = .056, \) \( RD^2 = .08. \) Over and above the contribution of all other variables, Age was a significant predictor of 2\textsuperscript{nd} Order ToM scores, \( B = .01, t = 2.39, p = .02, \) part correlation = .28, 95\% CI = [.002, .02]. This finding suggests that as age increased, 2\textsuperscript{nd} Order ToM also increased. Sample was not a significant predictor of 2\textsuperscript{nd} Order ToM, \( B = .01, t = .38, p > .05, \) part correlation = .04, 95\% CI = [-.42, .62]. The bootstrap analysis confirmed the significant findings for SES \( (B = .13, 95\% CI = [.04, .28], p = .04) \) and Age \( (B = .01, 95\% CI = [.004, .02], p < .01). \)
3.2.4. Intelligence

3.2.4.1. IQ Composite.

Of the 66 participants, only one child was unable to complete the three intelligence subtests. Raw scores for all three of the subtests were combined and converted into a z-score to measure performance on the IQ Composite.

A hierarchical linear regression was conducted with IQ Composite z-scores entered as the predicted variable. SES was entered on the first step, and Age in months (continuous variable) and Sample type (CP vs TD) on the second step. The first step with SES was marginally significant, $\Delta F (1, 63) = 3.59, p = .06, RD^2 = .05$, with results demonstrating that as SES increased, the IQ Composite also increased, $B = .10, t = 1.90, p = .063, \text{part correlation} = .23, 95\% \text{ CI} = [-.01, .20]$. The second step was also significant, $\Delta F (2, 61) = 33.75, p < .01, RD^2 = .50$.

Above and beyond the contributions of all variables, Age was a significant predictor of the IQ Composite score, $B = .03, t = 7.91, p < .001, \text{part correlation} = .68, 95\% \text{ CI} = [.02, .04]$. Results indicated that as age increased, children were found to have higher IQ scores. Sample type was not significant, $B = .32, t = 1.67, p > .05, \text{part correlation} = .14, 95\% \text{ CI} = [-.06, .70]$. A bootstrap analysis confirmed all results, including the significant findings for SES ($B = .01, 95\% \text{ CI} = [.01, .22], p = .07$), and Age ($B = .03, 95\% \text{ CI} = [.02, .04], p < .01$).

3.2.4.2. Individual IQ Measures.

In order to better understand the unique contribution of each subtest, children’s performance on the Receptive Vocabulary, Expressive Vocabulary and Non-Verbal subtests will be considered individually. Means and standard deviations of the Standard Scores for each measure are provided in Table 3.2.3.
Table 3.2.3.

Means and Standard Deviations of IQ Z-Scores

<table>
<thead>
<tr>
<th></th>
<th>CP</th>
<th></th>
<th></th>
<th>TD</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td></td>
</tr>
<tr>
<td>Receptive Vocabulary</td>
<td>-.31</td>
<td>.82</td>
<td>.31</td>
<td>1.08</td>
<td></td>
</tr>
<tr>
<td>Expressive Vocabulary</td>
<td>-.28</td>
<td>.91</td>
<td>.27</td>
<td>1.02</td>
<td></td>
</tr>
<tr>
<td>Non-Verbal Reasoning</td>
<td>-.17</td>
<td>.89</td>
<td>.17</td>
<td>1.08</td>
<td></td>
</tr>
<tr>
<td>IQ Composite</td>
<td>-.28</td>
<td>.85</td>
<td>.27</td>
<td>1.07</td>
<td></td>
</tr>
</tbody>
</table>

3.2.4.2.1. Receptive Vocabulary.

A hierarchical linear regression was conducted allowing for Receptive Vocabulary z-scores to be entered as the predicted variable, with SES entered on the first step, and Age in months (continuous variable) and Sample type (CP vs TD) on the second step. The first step with SES was not significant, $\Delta F (1, 64) = 2.61, p > .05, RD^2 = .04$, though the second step with Age and Sample was, $\Delta F (2, 62) = 38.08, p < .01, RD^2 = .53$. Above and beyond the contributions of all variables, Age was found to be a significant predictor of Receptive Vocabulary scores, $B = .03, t = 8.20, p < .001$, part correlation = .68, 95% CI = [.02, .04]. As age increased, Receptive Vocabulary scores also increased. Sample was also a significant predictor of Receptive Vocabulary, $B = .44, t = 2.37, p = .02$, part correlation = .20, 95% CI = [.07, .81]. Results indicated that the TD sample children had significantly higher Receptive Vocabulary scores. A bootstrap analysis confirmed all results, including the significant findings regarding Age ($B = .03, 95\% \text{ CI} = [.02, .04], p < .01$) and Sample ($B = .44, 95\% \text{ CI} = [.06, .82], p = .02$).

3.2.4.2.2. Expressive Vocabulary.

A hierarchical linear regression was conducted with Expressive Vocabulary z-scores entered as the predicted variable, with SES entered on the first step, and Age in months (continuous variable) and Sample type (CP vs TD) on the second step. The first step with SES was significant, $\Delta F (1, 63) = 6.07, p = .02, RD^2 = .09$, demonstrating that as SES increased,
Expressive Vocabulary scores also significantly increased, \( B = .12, t = 2.46, p = .02 \), part correlation = .30, 95% CI = [.02, .22]. The second step with Age and Sample was also significant, \( \Delta F (2, 61) = 19.23, p < .01, RD^2 = .35 \). Above and beyond the contributions of all variables, Age was also found to be a significant predictor of Expressive Vocabulary, \( B = .03, t = 5.97, p < .001 \), part correlation = .57, 95% CI = [.02, .04]. As age increased, children were found to have higher Expressive Vocabulary scores. Sample type was not found to be significant, \( B = .27, t = 1.27, p > .05 \), part correlation = .12, 95% CI = [-.16, .70]. A bootstrap analysis confirmed all results, including the significant result regarding SES (\( B = .12, 95\% \) CI = [.04, .23], \( p < .01 \)), and Age (\( B = .03, 95\% \) CI = [.02, .04], \( p = .001 \)).

### 3.2.4.2.3. Non-Verbal Reasoning.

A hierarchical linear regression was conducted with Non-Verbal Reasoning z-scores entered as the predicted variable, with SES entered on the first step, and Age in months (continuous variable) and Sample type (CP vs TD) on the second step. The first step with SES was not significant, \( \Delta F (1, 63) = 1.19, p > .05, RD^2 = .02 \), although the second step with Age and Sample was, \( \Delta F (2, 61) = 18.04, p < .01, RD^2 = .37 \). Above and beyond the contributions of all variables, Age was a significant predictor of Non-Verbal Reasoning, \( B = .03, t = 5.88, p < .001 \), part correlation = .59, 95% CI = [.02, .04]. Therefore, as age increased, Non-Verbal Reasoning scores also increased. Sample was not a significant predictor, \( B = .18, t = .80, p > .05 \), part correlation = .08, 95% CI = [-.27, .63]. Bootstrap analyses confirmed all results, including the significant findings in regards to Age (\( B = .03, 95\% \) CI = [.02, .04], \( p = .001 \)).

### 3.2.5 Correlations between Cognitive Measures

A well-established consensus in empirical research exists stating that measures of cognitive functions are highly correlated and often develop concurrently (Carlson & Moses,
As a result, correlations between the measures used in the current study were investigated through bivariate correlations (Table 3.2.2 and 3.2.3). Many of the assessment tools employed within this study proved to be highly correlated with other comparable cognitive measures. With the exception of the Word-Colour and Day-Night Stroop tasks, all other tasks were correlated with each other. These correlations are unsurprising and are consistent with previous research studying multiple cognitive factors simultaneously (e.g., Talwar & Lee, 2008).

Table 3.2.4.

Correlation Matrix among Individual Cognitive Measures for the CP Sample

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Word-Colour Stroop Interference</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2. Day-Night Stroop Interference</td>
<td>-.02</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3. Digit Span Total</td>
<td>-.17</td>
<td>.06</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4. First Order Theory of Mind</td>
<td>-.17</td>
<td>.15</td>
<td>.45**</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5. Second Order Theory of Mind</td>
<td>-.25</td>
<td>-.04</td>
<td>.54**</td>
<td>.65**</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>6. Receptive Vocabulary</td>
<td>-.15</td>
<td>-.17</td>
<td>.63**</td>
<td>.52**</td>
<td>.44**</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>7. Expressive Vocabulary</td>
<td>-.11</td>
<td>-.04</td>
<td>.76**</td>
<td>.52**</td>
<td>.59**</td>
<td>.69**</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>8. Non-Verbal Reasoning</td>
<td>-.24</td>
<td>-.03</td>
<td>.67**</td>
<td>.51**</td>
<td>.58**</td>
<td>.61**</td>
<td>.76**</td>
<td>-</td>
</tr>
</tbody>
</table>

*p<.05  **p < .01
Table 3.2.5.

**Correlation Matrix among Individual Cognitive Measures for the TD Sample**

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Word-Colour Stroop Interference</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2. Day-Night Stroop Interference</td>
<td>-.05</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3. Digit Span Total</td>
<td>-.12</td>
<td>-.33</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4. First Order Theory of Mind</td>
<td>-.20</td>
<td>-.15</td>
<td>.41*</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5. Second Order Theory of Mind</td>
<td>.11</td>
<td>-.41*</td>
<td>.60**</td>
<td>.51**</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>6. Receptive Vocabulary</td>
<td>-.18</td>
<td>-.19</td>
<td>.60**</td>
<td>.40*</td>
<td>.53**</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>7. Expressive Vocabulary</td>
<td>-.17</td>
<td>-.23</td>
<td>.66**</td>
<td>.45**</td>
<td>.65**</td>
<td>.85**</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>8. Non-Verbal Reasoning</td>
<td>-.25</td>
<td>-.33</td>
<td>.61**</td>
<td>.39*</td>
<td>.44*</td>
<td>.69**</td>
<td>.70**</td>
<td>-</td>
</tr>
</tbody>
</table>

*p<.05  **p < .01

3.2.5.1. **Correlation differences between sample types**

Correlations between the cognitive measures were considered separately for the two samples in order to determine if any of the cognitive measures are differentially correlated. To determine if these differences were significant, a separate Fisher transformation was completed for each of the Pearson correlation scores for all of the measures for the CP and TD samples (Tables 3.2.6. and 3.2.7.). These scores were subtracted across the samples to determine if the differences were more than the critical value (+/- 1.96). No scores met this threshold (see Table 3.2.8.), which indicated that the correlations were not significantly different between the samples.
Table 3.2.6.

Fisher Scores for the Correlations of the Individual Cognitive Measures for the CP Sample

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Word-Colour Stroop Interference</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2. Day-Night Stroop Interference</td>
<td>-0.02</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3. Digit Span Total</td>
<td>-0.17</td>
<td>0.06</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4. First Order Theory of Mind</td>
<td>-0.17</td>
<td>0.15</td>
<td>0.48</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5. Second Order Theory of Mind</td>
<td>-0.26</td>
<td>-0.04</td>
<td>0.61</td>
<td>0.78</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>6. Receptive Vocabulary</td>
<td>-0.15</td>
<td>-0.18</td>
<td>0.74</td>
<td>0.58</td>
<td>0.48</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>7. Expressive Vocabulary</td>
<td>-0.11</td>
<td>-0.04</td>
<td>0.99</td>
<td>0.57</td>
<td>0.68</td>
<td>0.85</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>8. Non-Verbal Reasoning</td>
<td>-0.25</td>
<td>-0.03</td>
<td>0.82</td>
<td>0.56</td>
<td>0.66</td>
<td>0.71</td>
<td>0.98</td>
<td>-</td>
</tr>
</tbody>
</table>

*p<.05  **p < .01
Table 3.2.7.

Fisher Scores for the Correlations of the Individual Cognitive Measures for the TD Sample

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Word-Colour Stroop Interference</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2. Day-Night Stroop Interference</td>
<td>-0.05</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3. Digit Span Total</td>
<td>-0.12</td>
<td>-0.34</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4. First Order Theory of Mind</td>
<td>-0.20</td>
<td>-0.15</td>
<td>0.44</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5. Second Order Theory of Mind</td>
<td>0.11</td>
<td>-0.44</td>
<td>0.69</td>
<td>0.57</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>6. Receptive Vocabulary</td>
<td>-0.18</td>
<td>-0.19</td>
<td>0.69</td>
<td>0.42</td>
<td>0.59</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>7. Expressive Vocabulary</td>
<td>-0.17</td>
<td>-0.24</td>
<td>0.80</td>
<td>0.48</td>
<td>0.77</td>
<td>1.26</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>8. Non-Verbal Reasoning</td>
<td>-0.26</td>
<td>-0.34</td>
<td>0.71</td>
<td>0.41</td>
<td>0.47</td>
<td>0.85</td>
<td>0.87</td>
<td>-</td>
</tr>
</tbody>
</table>

*p < .05  **p < .01
Table 3.2.8.

*Fisher Score differences between the CP and TD samples*

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Word-Colour Stroop Interference</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2. Day-Night Stroop Interference</td>
<td>0.02</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3. Digit Span Total</td>
<td>-0.05</td>
<td>0.40</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4. First Order Theory of Mind</td>
<td>0.03</td>
<td>0.30</td>
<td>0.04</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5. Second Order Theory of Mind</td>
<td>-0.37</td>
<td>0.40</td>
<td>-0.09</td>
<td>0.21</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>6. Receptive Vocabulary</td>
<td>0.03</td>
<td>0.01</td>
<td>0.05</td>
<td>0.16</td>
<td>-0.11</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>7. Expressive Vocabulary</td>
<td>0.06</td>
<td>0.19</td>
<td>0.20</td>
<td>0.09</td>
<td>-0.09</td>
<td>-0.41</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>8. Non-Verbal Reasoning</td>
<td>0.01</td>
<td>0.31</td>
<td>0.11</td>
<td>0.14</td>
<td>0.19</td>
<td>-0.14</td>
<td>0.12</td>
<td>-</td>
</tr>
</tbody>
</table>

*Critical threshold is +/- 1.96*

### 3.2.6. Summary

In regards to the Age and Sample differences in the cognitive measures that were utilized in the current study, there were several findings of note. First, it is important to distinguish that for all cognitive measures except for the Day-Night Stroop task, Age was found to be a significant predictor of performance greater than the contribution of all variables, with performance increases that parallel age. This finding was expected as scores were not age normed, though this finding highlights the importance of controlling for age in subsequent analyses when evaluating these cognitive factors.
Differences in terms of SES were noted, with significant differences in several cognitive areas predicted by SES (including the EF Composite, Digit Span, ToM Composite, 1st and 2nd Order ToM, IQ Composite and Expressive Vocabulary). These results indicated that as SES increased, performance on these cognitive measures also increased. Such findings are consistent with past literature that suggests correlations exist between SES and cognitive measures (e.g., Molfese, Modglin, & Molfese, 2003; Turkheimer, Haley, Waldron, D’Onofrio, & Gottesman, 2003). In the current study, the TD sample demonstrated a stronger performance on all cognitive measures when compared to the CP sample, though when controlling for SES, there were only differences between the samples for two cognitive variables (Digit Span and Receptive Vocabulary). Thus, minimal differences in cognitive measures were noted between the samples once SES was controlled for.

Correlations between the different cognitive measures were not significantly different between the TD sample and the CP sample. The lack of variation in the correlations between the samples suggests that cognitive measures are similarly related for both samples. Bootstrap analyses confirmed all results, suggesting that the findings are reliable.
3.3. Cognitive Measures Predicting Lie-Telling Behaviour

As discussed previously, extensive research suggests that cognitive measures are related to deception (e.g., Talwar & Lee, 2008; Evans & Lee, 2011). This study investigated how cognitive skills may predict deception in children with and without severe conduct problems through a series of hierarchical binary and logistic regressions.

3.3.1 Considerations in Analyses

In order to determine if cognitive measures may differentially predict deception in the CP and TD samples, the two samples were considered separately. In regards to the measures that will be analyzed, the z-scores of the cognitive measures will be used as predictors, with Composite scores being investigated initially, then followed by analyses of the individual measures. Bootstrapping analyses were conducted for each regression to confirm the reliability of the obtained results.

As age effects are commonly associated with cognitive measures, Age in months (continuous variable) was entered onto the first step of each analysis and thus, was controlled for. Results for each cognitive measure can thus be considered to be reliable above and beyond the contribution of age. Preliminary results did not reveal significant gender differences in terms of deceptive behaviour. For subsequent analyses, the results for both genders have been collapsed.

3.3.2 Antisocial Deception and Cognitive Measures

In evaluating the prediction of antisocial lie-telling through the cognitive measures, Age in months (continuous variable) was entered on the first step. For each analysis for Antisocial Lying, the first step with Age was not significant for the CP sample, $\chi^2(1, 30) = 0.03$, Nagelkerke $R^2 = 0.002$, $p > .05$, but it was significant for the TD sample, $\chi^2(1, 33) = 6.28$, Nagelkerke $R^2 = 0.25$, $p = .01$. The model indicated that as age increased, children from the TD sample were
significantly less likely to commit a transgression, $B = -.05$, $Wald = 5.23$, $p = .02$, $OR = .95$, 95% CI = [.92, .99]. Given that the odds ratio was less than 1, the inverse was considered and multiplied by 12, with results indicating that with each year increase in age, the TD sample was 12.59 times less likely to commit a transgression and lie. Bootstrap analyses confirmed these results, with increased age predicting less likelihood of antisocial lying behaviours for the TD sample, $B = -.05$, 95% CI = [-.13, -.01], $p < .01$, but not in children with CP, $B = .002$, 95% CI = [-.06, 1.61], $p > .05$. These results pertaining to age are consistent for subsequent analyses regarding Antisocial Lying.

3.3.2.1. Antisocial Lying and Executive Functioning.

3.3.2.1.1. Executive Functioning Composite

A hierarchical binary logistic regression was conducted with Antisocial Lying behaviour entered as the predicted variable. Age in months (continuous variable) was entered on the first step, with the EF Composite score on the second step. The second step with the EF Composite score was marginally significant for the CP sample, $\chi^2(1, 30) = 3.46$, Nagelkerke $R^2 = 0.20$, $p = .06$. Specifically, higher EF Composite scores were marginally significantly predictive of lower rates of antisocial lying within the CP sample, $B = -1.99$, $Wald = 2.91$, $p = .088$, $OR = .14$, 95% CI = [.01, 1.34]. Given that the odds ratio is less than 1, the inverse was calculated and for each point increase in the EF Composite z-score, children with CP were 7.3 times less likely to commit a transgression and tell an antisocial lie. The second step for the TD sample was not significant, $\chi^2(1, 33) = .19$, Nagelkerke $R^2 = 0.25$, $p > .05$. The bootstrap analysis confirmed all results, including the marginal trend for children with CP suggesting that increases in EF Composite scores predict a decrease in Antisocial Lying behaviour, $B = -1.99$, 95% CI = [-159.89, 1.05], $p = .065$. 
3.3.2.1.2. Individual Executive Functioning measures.

A hierarchical binary logistic regression was conducted with the peeking and antisocial lying (or cheating) behaviour entered as the predicted variable. Age in months (continuous variable) is entered on the first step, with the three EF measures (Word-Colour Stroop Interference z-score, Day-Night Stroop Interference z-score and Digit Span z-score) entered on the second step.

The second step with the EF measures was not significant for either the CP sample, $\chi^2(1, 33) = 6.11$, Nagelkerke $R^2 = 0.34$, $p > .05$ or the TD sample, $\chi^2(1, 33) = 1.96$, Nagelkerke $R^2 = 0.31$, $p > .05$. However, the bootstrap analyses demonstrated significant findings for the CP sample in regards to the Day-Night Stroop, $B = -0.92$, 95% CI = [-383.42, -0.04], $p = .03$ and the Digit Span, $B = -2.40$, 95% CI = [-567.62, 2.03], $p = .01$. Results suggest that low scores on the Day-Night Stroop (higher inhibition skills) and higher Digit Span scores (working memory) for the CP sample significantly predict a lesser likelihood of Antisocial Lying. The findings of this bootstrap analysis are considered to be reliable, as this analysis controls for any individual participants within the sample that may significantly influence the overall regression results.

3.3.2.2. Antisocial Lying and Theory of Mind.

3.3.2.2.1 Theory of Mind Composite.

A hierarchical binary logistic regression was conducted with Age in months (continuous variable) entered on the first step, and the Composite score for ToM tasks on the second step, with antisocial lying entered as the predicted variable. The second step with the ToM Composite scores was not significant for the CP sample, $\chi^2(1, 33) = .03$, Nagelkerke $R^2 = 0.003$, $p > .05$, but it was marginally significant for the TD sample, $\chi^2(1, 33) = 3.46$, Nagelkerke $R^2 = .36$, $p = .06$. While the overall model was significant, the actual ToM Composite score was not, $B = -1.57$,
Wald = 1.49, \( p > .05 \), \( OR = .21 \), 95% CI = [.02, 2.58], suggesting that it is the combination of Age and the ToM Composite that predict Antisocial Lying.

The bootstrap analysis confirmed the results for the CP sample and also revealed a significant finding for the TD sample in regards to the Composite ToM score in predicting Antisocial Lying, \( B = -.04 \), 95% CI = [-34.99, -.37], \( p = .05 \). This analysis suggests that individual participants within the TD sample may be attributing undue influence on the overall results, and when controlling for these participants with the bootstrap analysis, the ToM Composite predicts Antisocial Lying in the TD population.

**3.3.2.2. Individual Theory of Mind measures.**

A hierarchical binary logistic regression was conducted with antisocial lying behaviour entered as the predicted variable, and Age in months (continuous variable), entered on the first step and ToM scores (First Order and Second Order) on second step as the predictor variables.

The second step with the ToM measures was not significant for either the CP sample, \( \chi^2(1, 33) = 1.69 \), Nagelkerke \( R^2 = 0.01 \), \( p > .05 \) or the TD sample, \( \chi^2(1, 33) = 3.73 \), Nagelkerke \( R^2 = 0.37 \), \( p > .05 \). However, the bootstrap analysis was significant for 1st Order ToM within the CP sample, \( B = -.93 \), 95% CI = [-52.27, -.31], \( p = .05 \), and was marginally significant for the TD sample, \( B = -12.01 \), 95% CI = [-13.35, .56], \( p = .08 \). For both samples, increases in 1st Order ToM understanding predicted a lesser likelihood of peeking. Results indicate that individual participants within each sample may have undue influence on the results thereby suggesting that the bootstrap analysis provides a more reliable result.
3.3.2.3. Antisocial Lying and Intelligence

3.3.2.3.1 IQ Composite.

A hierarchical binary logistic regression was conducted with antisocial lying entered as the predicted variable, Age in months (continuous variable) entered on the first step, with the IQ Composite score on the second step. The second step with the IQ Composite score was not significant for the CP sample, $\chi^2(1, 32) = .28$, Nagelkerke $R^2 = 0.02$, $p > .05$, but was significant for the TD sample, $\chi^2(1, 33) = 5.07$, Nagelkerke $R^2 = .41$, $p = .02$. For the TD sample specifically, higher IQ Composite scores were marginally significantly predictive of lower rates of antisocial lying, $B = -1.84$, $Wald = 3.27$, $p = .07$, $OR = .16$, 95% CI = [.02, 1.17]. Given that the odds ratio was less than 1, the inverse was evaluated and for each point increase on the IQ Composite z-score, TD children were 6.29 times less likely to commit a transgression and tell an antisocial lie.

The bootstrap analysis confirmed the results for the CP sample, $B = -.40$, 95% CI = [-3.01, 1.04], $p > .05$, and the TD sample, $B = -1.84$, 95% CI = [-24.58, -.36], $p = .02$. This analysis suggests that a higher IQ Composite may be predictive of decreased transgressing and antisocial lying in typically developing children.

3.3.2.3.2. Individual IQ measures.

A hierarchical binary logistic regression was conducted with antisocial lying behaviour entered as the predicted variable. Age in months (continuous variable) was entered on the first step, with the three IQ measures (Receptive Vocabulary, Expressive Vocabulary and Non-Verbal Reasoning) on the second step.

The second step with the IQ measures was not significant for the CP sample, $\chi^2(1, 32) = 1.09$, Nagelkerke $R^2 = 0.06$, $p > .05$, though results were significant for the TD sample, $\chi^2(1, 33)$
= 8.66, Nagelkerke $R^2 = 0.52, p = .03$. Specifically, children with higher Receptive Vocabulary scores were less likely to commit a transgression and lie in the TD population, though this finding was marginally significant, $B = -1.85$, Wald $= 3.55$, $p = .06$, OR $= .16$, 95% CI $= [.02, 1.08]$. The odds ratio indicated that for every point increase in the z-score for Receptive Vocabulary, TD children were 6.41 times less likely to commit a transgression and tell an antisocial lie. Bootstrap analyses confirmed all results, with Receptive Vocabulary significantly predicting fewer Antisocial Lying behaviours in children, $B = -1.85$, 95% CI $= [-426.65, .20], p = .02$.

3.3.3. Sophistication of Antisocial Deception (Verbal Leakage) and Cognitive Measures

In considering the variables that might predict antisocial Verbal Leakage (or lie-telling sophistication), only children who committed the transgression and lied about were included in the following analyses (Antisocial Liars). Children who disclosed incriminating information (the colour or identity of the prize) were designated as having Verbal Leakage (coded as 1) and were compared to those who did not incriminate themselves (coded as 0). Age in months (continuous variable) was entered on the first step to control for the possibility of age predicting Verbal Leakage and to control for any effect of age upon each of the cognitive measures. For each analysis of Verbal Leakage, the first step with Age was not found to be significant for the CP sample, $\chi^2(1, 29) = 0.26$, Nagelkerke $R^2 = 0.01, p > .05$, nor for the TD sample, $\chi^2(1, 23) = .01$, Nagelkerke $R^2 = 0.001, p > .05$. Bootstrap analyses confirmed that age was not a significant predictor for Verbal Leakage within either sample. These age-associated results represent the first step in the subsequent analyses of Verbal Leakage.
3.3.3.1. Verbal Leakage and Executive Functioning.

3.3.3.1.1. Executive Functioning Composite.

A hierarchical binary logistic regression was conducted with Verbal Leakage entered as the predicted variable. Age in months (continuous variable) was entered on the first step, with the EF Composite score on the second step. The second step with EF Composite scores was not significant for the CP sample, $\chi^2(1, 26) = .73$, Nagelkerke $R^2 = 0.04$, $p > .05$, nor for the TD sample, $\chi^2(1, 23) = 2.88$, Nagelkerke $R^2 = 0.17$, $p > .05$. The bootstrap analysis confirmed these results.

3.3.3.1.2. Individual Executive Functioning measures.

A hierarchical binary logistic regression was conducted with Verbal Leakage entered as the predicted variable. Age in months (continuous variable) was entered on the first step, with the three EF measures (Word-Colour Stroop Interference $z$-score, Day-Night Stroop Interference $z$-score and Digit Span $z$-score) on the second step.

The second step with the EF measures was not found to be significant for either the CP sample, $\chi^2(3, 26) = .89$, Nagelkerke $R^2 = 0.05$, $p > .05$, or the TD sample, $\chi^2(3, 23) = 5.15$, Nagelkerke $R^2 = 0.29$, $p > .05$. However, the bootstrap analysis for the TD sample demonstrated that the Word-Colour Stroop was a significant predictor of Verbal Leakage, $B = -1.96$, 95% CI = [-748.94, .75], $p = .02$, with results indicating that children with stronger inhibitory skills (depicted by lower scores) displayed less Verbal Leakage. Given the possibility that individual participants may exert undue influence on the regression results, the bootstrap results are considered to be reliable.
3.3.3.2. Verbal Leakage and Theory of Mind.

3.3.3.2.1 Theory of Mind Composite.

A hierarchical binary logistic regression was conducted with Verbal Leakage entered as the predicted variable. Age in month (continuous variable) was entered on the first step, with the ToM Composite score on the second step. The second step was not significant for the CP sample, \( \chi^2(1, 29) = .84, \) Nagelkerke \( R^2 = 0.05, p > .05, \) nor for the TD sample, \( \chi^2(1, 23) = 2.40, \) Nagelkerke \( R^2 = .15, p > .05. \) The bootstrap analysis confirmed these results.

3.3.3.2.2. Individual Theory of Mind measures.

A hierarchical binary logistic regression was conducted with Verbal Leakage entered as the predicted variable. Age in months (continuous variable) is entered on the first step, with the two ToM scores (First Order and Second Order) on the second step.

The second step with the ToM measures was not significant for the CP sample, \( \chi^2(2, 29) = 4.43, \) Nagelkerke \( R^2 = 0.20, p > .05, \) but was marginally significant for the TD sample, \( \chi^2(2, 23) = 4.82, \) Nagelkerke \( R^2 = 0.28, p = .09. \) Particularly, TD children with higher 2nd Order ToM scores were found to be less likely to demonstrate Verbal Leakage, \( B = -1.16, \) Wald \( = 3.99, p = .05, OR = .31, 95\% CI = [.10, .29]. \) As the odds ratio was less than 1, the inverse was considered and indicated that for every point increase in the z-score for 2nd Order ToM, TD children were 3.19 times less likely to have incriminated themselves. Bootstrap analyses confirmed all results, with higher 2nd Order ToM significantly predicting less Verbal Leakage for TD children, \( B = -.83, 95\% CI = [-36.93, 4.01], p = .02. \)
3.3.3.3. Verbal Leakage and Intelligence.

3.3.3.3.1. IQ Composite.

A hierarchical binary logistic regression was conducted with Verbal Leakage entered as the predicted variable. Age in months (continuous variable) was entered on the first step, with the IQ Composite score on the second step. The second step with IQ Composite scores was not significant for the CP sample, $\chi^2(1, 28) = .79$, Nagelkerke $R^2 = 0.05$, $p > .05$, nor was it significant for the TD sample, $\chi^2(1, 23) = .66$, Nagelkerke $R^2 = 0.04$, $p > .05$. The bootstrap analysis confirmed these results. Therefore, the overall IQ Composite score did not predict whether or not children from either sample would incriminate themselves.

3.3.3.3.2. Individual IQ Measures.

A hierarchical binary logistic regression was conducted with Verbal Leakage entered as the predicted variable. Age in months (continuous variable) was entered on the first step, with the three IQ measures (Receptive Vocabulary, Expressive Vocabulary and Non-Verbal Reasoning) on the second step.

The second step with IQ Composite scores was not significant for the CP sample, $\chi^2(3, 28) = .99$, Nagelkerke $R^2 = 0.06$, $p > .05$, and was also not significant for the TD sample, $\chi^2(3, 23) = 1.47$, Nagelkerke $R^2 = 0.09$, $p > .05$. Bootstrap analyses confirmed these results and thus, IQ measures did not predict Verbal leakage in either sample.

3.3.4. Prosocial Lie-Telling and Cognitive Measures

For the following analysis, children’s prosocial lies were coded by two independent raters and were evaluated by children’s response to the question ‘Do you like your prize?’ and were thus coded as either prosocial lies (coded as ‘1’) or blunt truths (coded as ‘0’). Age in months (continuous variable) was entered on the first step to control for any effect of age in predicting
Prosocial Lying, or upon obtained scores from the cognitive measures. For each analysis of Prosocial Lying, the first step with Age was not significant within the CP sample, $\chi^2(1, 33) = 1.07$, Nagelkerke $R^2 = 0.04$, $p > .05$, nor for the TD sample, $\chi^2(1, 33) = 1.63$, Nagelkerke $R^2 = 0.08$, $p > .05$. Bootstrap analyses confirmed that age was not a significant predictor for Prosocial Lying within the CP sample, though the results for the TD sample indicated that age was a marginally significant predictor of Prosocial Lying, $B = -.03$, 95% CI = [.002, .09], $p = .056$.

These results for age represent the first step in subsequent analyses regarding Prosocial Lying.

3.3.4.1. Prosocial Lying and Executive Functioning.

3.3.4.1.1. Executive Functioning Composite.

A hierarchical binary logistic regression was conducted with Prosocial Lying entered as the predicted variable. Age in months (continuous variable) was entered on the first step, and the EF Composite score on the second step. The second step was not significant for the CP sample, $\chi^2(1, 30) = .08$, Nagelkerke $R^2 = 0.08$, $p > .05$, though it was for the TD sample, $\chi^2(1, 33) = 4.86$, Nagelkerke $R^2 = 0.31$, $p = .03$. Results indicated that as EF Composite scores increased, TD participants were more likely to tell a prosocial lie, though this finding was marginal, $B = 3.51$, $Wald = 3.21$, $p = .07$, $OR = 33.35$, 95% CI = [.72, 1551.23]. The bootstrap analysis confirmed all results, including the finding regarding higher EF Composite scores predicting higher rates of Prosocial Lie-telling within the TD sample, $B = 3.06$, 95% CI = [.55, 26.44], $p = .02$.

3.3.4.1.2. Individual Executive Functioning measures.

A hierarchical binary logistic regression was conducted with Verbal Leakage entered as the predicted variable. Age in months (continuous variable) was entered on the first step, with the three EF measures (Word-Colour Stroop Interference z-score, Day-Night Stroop Interference z-score and Digit Span z-score) on the second step.
The second step with the EF measures was not significant for either the CP sample, $\chi^2(3, 30) = .251$, Nagelkerke $R^2 = 0.18, p > .05$, nor for the TD sample, $\chi^2(3, 33) = 5.07$, Nagelkerke $R^2 = 0.32, p > .05$. However, the bootstrap analysis demonstrated significant results for the TD sample, with higher Day-Night Stroop scores, $B = 1.08$, 95% CI = [-4.32, 362.93], $p = .05$, and higher Digit Span scores, $B = 1.39$, 95% CI = [-24.34, 601.54], $p = .056$ (marginal), predicting a greater likelihood of Prosocial Lying. Given that individual participants may attribute undue influence on the regression results, the bootstrap analyses are thought to be a reliable result.

3.3.4.2. Prosocial Lying and Theory of Mind.

3.3.4.2.1 Theory of Mind Composite.

A hierarchical binary logistic regression was conducted with Prosocial Lying entered as the predicted variable. Age in month (continuous variable) was entered on the first step, with the ToM Composite score on the second step. The second step with ToM Composite scores was not significant for the CP sample, $\chi^2(1, 33) = .32$, Nagelkerke $R^2 = 0.06, p > .05$, nor was it significant for the TD sample, $\chi^2(1, 33) = 2.01$, Nagelkerke $R^2 = .18, p > .05$. The bootstrap analysis confirmed these results.

3.3.4.2.2. Individual Theory of Mind measures.

A hierarchical binary logistic regression was conducted with Prosocial Lying entered as the predicted variable. Age in months (continuous variable) was entered on the first step, with the two ToM scores (First Order and Second Order) on the second step.

The second step with the ToM measures was not significant for either the CP sample, $\chi^2(2, 33) = .32$, Nagelkerke $R^2 = 0.06, p > .05$, nor the TD sample, $\chi^2(2, 33) = 2.15$, Nagelkerke $R^2 = 0.19, p > .05$. Bootstrap analyses confirmed these results, and thus, individual 1st and 2nd Order ToM measures do not seem to be predictive of Prosocial Lying.
3.3.4.3. Prosocial Lying and Intelligence.

3.3.4.3.1. IQ Composite.

A hierarchical binary logistic regression was conducted with Prosocial Lying entered as the predicted variable. Age in months (continuous variable) was entered on the first step and with the IQ Composite score on the second step. The second step with the IQ Composite score was not significant for the CP sample, $\chi^2(1, 32) = .25$, Nagelkerke $R^2 = 0.21$, $p > .05$, nor for the TD sample, $\chi^2(1, 33) = 2.54$, Nagelkerke $R^2 = .21$, $p > .05$. However, the bootstrap analysis demonstrated that the overall IQ Composite for the TD sample marginally significantly predicted Prosocial Lying, $B = 1.17$, 95% CI = [-1.27, 111.69], $p = .07$. Given that the bootstrap analysis controls for individual participants who may allocate undue influence upon the regression results, this finding is considered to be reliable.

3.3.4.3.2. Individual IQ measures.

A hierarchical binary logistic regression was conducted with Prosocial Lying entered as the predicted variable. Age in months (continuous variable) was entered on the first step, with the three IQ measures (Receptive Vocabulary, Expressive Vocabulary and Non-Verbal Reasoning) on the second step.

The second step with the IQ measures was not significant for the TD sample, $\chi^2(3, 33) = 3.22$, Nagelkerke $R^2 = 0.24$, $p > .05$, but was significant for the CP sample, $\chi^2(3, 32) = 8.46$, Nagelkerke $R^2 = .35$, $p = .04$. For the CP sample, children with higher Expressive Language Scores were found to be more likely to tell a prosocial lie, $B = 3.22$, $Wald = 5.33$, $p = .02$, $OR = 25.13$, 95% CI = [1.63, 387.87]. The odds ratio indicates that for every point increase in the z-score for Expressive Language, children with CP were 25.13 times more likely to tell a prosocial lie. Further, CP children who had higher Non-Verbal Reasoning scores were significantly less
likely to tell a prosocial lie, \( B = -2.30, \text{Wald} = 4.35, p = .04, OR = .10, 95\% \text{ CI} = [.01, .87] \). The inverse of the odds ratio demonstrated that for every point increase in children’s Non-Verbal Reasoning z-scores, children with CP were 9.9 times less likely to tell a prosocial lie. Bootstrap analyses confirmed all results, with higher Expressive Language and lower Non-Verbal Reasoning significantly predicting Prosocial Lies for children with CP, \( B = 3.22, 95\% \text{ CI} = [.95, 432.25], p = .02 \) and \( B = -2.30, 95\% \text{ CI} = [-339.46, -.60], p < .01 \), respectively.

### 3.3.5. Prosocial Lying Sophistication and Cognitive Measures

For the following analysis, the sophistication of children’s prosocial lies was coded by two independent raters on a 5-point Likert scale as described in Table 3.1.1. Only children who were coded as having told a prosocial lie were included in the following analysis. Age in months (continuous variable) was entered on the first step to control for any effect of age upon predicting either Prosocial Lying Sophistication, or upon obtained scores from the cognitive measures employed within this study. For the analysis of Prosocial Lying Sophistication, the first step with Age was not significant for the CP sample, \( \Delta F (1, 19) = .24, p > .05, RD^2 = .01 \), nor was it significant for the TD sample, \( \Delta F (1, 26) = .28, p > .05, RD^2 = .01 \). Bootstrap analyses confirmed that age was not a significant predictor for the sophistication of Prosocial Lying Sophistication within either sample. These results represent the first step for subsequent analyses regarding Prosocial Lying Sophistication.

#### 3.3.5.1. Prosocial Lying Sophistication and Executive Functioning.

#### 3.3.5.1.1. Executive Functioning Composite.

A hierarchical linear logistic regression was conducted with Prosocial Lying Sophistication entered as the predicted variable. Age in month (continuous variable) was entered on the first step, with the EF Composite score on the second step. The second step with EF
Composite scores was not significant for the CP sample, $\Delta F (1, 16) = 2.96, p > .05, RD^2 = .15$, nor for the TD sample, $\Delta F (1, 25) = 2.46, p > .05, RD^2 = .09$. Bootstrap analyses confirmed all results.

3.3.5.1.2. **Individual Executive Functioning measures.**

A hierarchical linear logistic regression was conducted with Prosocial Lie Sophistication entered as the predicted variable. Age in months (continuous variable) is entered on the first step, with the three EF measures (Word-Colour Stroop Interference z-score, Day-Night Stroop Interference z-score and Digit Span z-score) on the second step.

The second step with the EF measures was not significant for the TD sample, $\Delta F (3, 23) = 1.13, p > .05, RD^2 = .13$, though results were marginally significant for the CP sample, $\Delta F (3, 14) = 2.90, p = .07, RD^2 = .37$. Specifically, results indicated that children with CP who have lower Word-Colour Stroop scores (and therefore, stronger inhibitory skills) tend to tell more sophisticated prosocial lies, $B = -.49, t = -2.81, p = .01$, part correlation = -.58, 95% CI = [-.86, -.12]. No other findings were found to be significant. The bootstrap analysis confirmed all results, including the finding regarding lower Word-Colour Stroop scores predicting higher Prosocial Lie-telling Sophistication within the CP sample, $B = -.49, 95\% \text{ CI} = [-.87, -.05], p = .04$.

3.3.5.2. **Prosocial Lying Sophistication and Theory of Mind**

3.3.5.2.1 **Theory of Mind Composite.**

A hierarchical linear logistic regression was conducted with Prosocial Lying Sophistication entered as the predicted variable. Age in month (continuous variable) was entered on the first step, with the ToM Composite score on the second step. The second step with ToM Composite scores was not significant for the CP sample, $\Delta F (1, 18) = .16, p > .05, RD^2 = .01$, nor for the TD sample, $\Delta F (1, 25) = 2.93, p > .05, RD^2 = .10$. However, the bootstrap analysis
yielded a marginally significant result for the TD sample, $B = .27$, 95% CI = [-.20, .85], $p = .05$, suggesting that higher ToM Composite scores significantly predict Prosocial Lying Sophistication. As bootstrap analyses can control for individual effects from participants, it is thought that this finding is reliable.

### 3.3.5.2.2. Individual Theory of Mind measures.

A hierarchical linear logistic regression was conducted with Prosocial Lying Sophistication entered as the predicted variable. Age in months (continuous variable) was entered on the first step, with the two ToM scores ($1^{st}$ Order and $2^{nd}$ Order) on the second step.

The second step with the ToM measures was not found to be significant for either the CP sample, $\Delta F (2, 17) = .18, p > .05, RD^2 = .02$, or the TD sample, $\Delta F (2, 24) = 1.81, p > .05, RD^2 = .13$. The bootstrap analysis demonstrated that for the TD sample, lower $2^{nd}$ Order ToM scores were a marginally significant predictor of higher Prosocial Lying Sophistication, $B = -.31$, 95% CI = [-.22, .76], $p = .06$.

### 3.3.5.3. Prosocial Lying Sophistication and Intelligence.

#### 3.3.5.3.1. IQ Composite.

A hierarchical linear logistic regression was conducted with Prosocial Lying Sophistication entered as the predicted variable. Age in months (continuous variable) was entered on the first step, with the IQ Composite score on the second step. The second step with the IQ Composite scores was not found to be significant for the CP sample, $\Delta F (1, 18) = .50, p > .05, RD^2 = .03$, but it was marginally significant for the TD sample, $\Delta F (1, 25) = 3.95, p = .06, RD^2 = .14$. Results indicated that TD children who have higher IQ scores tend to tell more sophisticated prosocial lies, $B = .42, t = 1.99, p = .058$, part correlation = .37, 95% CI = [-.02, .85].
The bootstrap analysis confirmed the results for the IQ Composite scores predicting Prosocial Lying Sophistication, $B = .42$, 95% CI = [.06, .91], $p = .01$.

**3.3.5.3.2. Individual IQ measures.**

A hierarchical linear logistic regression was conducted with Prosocial Lying Sophistication entered as the predicted variable. Age in months (continuous variable) was entered on the first step, with the three IQ measures (Receptive Vocabulary, Expressive Vocabulary and Non-Verbal Reasoning) on the second step.

The second step with the IQ measures was not significant for the CP sample, $\Delta F (3, 16) = .77, p > .05$, $RD^2 = .13$, nor the TD sample, $\Delta F (1, 23) = 1.64, p > .05$, $RD^2 = .17$. Bootstrap analyses confirmed all results. Therefore, the individual IQ measures were not found to predict Prosocial Lying Sophistication.

**3.3.6. Summary**

In consideration of how EF skills, ToM understanding and intelligence levels might influence antisocial and prosocial deception, results of the current study suggest that there are many differences between the samples. In regards to Antisocial Lying, the EF Composite was found to be marginally significant within the CP sample. Bootstrap analyses also confirmed that the Day-Night Stroop, Digit Span, and 1st Order ToM task were significant predictors of transgressions and antisocial lying within the CP sample, with higher scores in each area predicting a decreased likelihood of transgressing and subsequent lying. For the Typical Sample, Antisocial Lying was significantly predicted by the ToM Composite, the IQ Composite, and the Receptive Language measure, with bootstrap analyses demonstrating marginally significant results for 1st Order ToM. Higher scores in these areas predicted a lesser likelihood of Antisocial Lying. When determining the sophistication of children’s antisocial lies, no cognitive variables...
were found to be predictive of Verbal Leakage within the CP sample, although 2nd Order ToM was a marginally significant predictor for the TD sample. This finding is consistent with previous literature (Talwar, Gordon, et al., 2007). Additionally, the bootstrap analysis demonstrated that the Word-Colour Stroop was a significant predictor of Verbal Leakage for the TD sample, which is also congruous with previous research (Evans & Lee, 2011).

Regression results pertaining to Prosocial Lying demonstrated that for the CP sample, higher Expressive Vocabulary and lower Non-Verbal Reasoning scores predicted increases in Prosocial Lying. For the TD sample, higher EF Composite scores significantly predicted Prosocial Lying, with the bootstrap analysis determining that higher Day-Night Stroop, Digit Span and IQ Composite scores significantly predicting Prosocial Lying. Finally, for Prosocial Lying Sophistication, results demonstrated that for the CP sample, higher inhibitory skills, as indicated by the Word-Colour Stroop, significantly predicted higher degrees of sophistication for prosocial lies. For the TD sample, higher scores on the IQ composite and lower 2nd Order ToM scores were marginally predictive of more sophisticated prosocial lies. The bootstrap analysis also demonstrated that the ToM Composite was predictive of prosocial Lying Sophistication within the TD sample.

The sum of the findings from this study suggests that there was little overlap regarding how cognitive measures may predict deceptive behaviours in children with and without CP. While many findings for the TD sample are consistent with previous research, fewer cognitive measures predict antisocial and prosocial deception for children with CP, confirming Hypotheses 4a and 4b. Such findings suggest that there may be different cognitive processes involved in deception in children with CP compared to typically-developing population.
3.4. Parent Ratings of Lying and Children’s Actual Behaviours

While many parents report lie-telling and deception in their children, there are no standardized lie-telling measures that are generally accepted within the literature. The lie-telling questionnaire created by Engels, Finkenauer, and van Kooten (2006) determined three factors or categories of parental ratings of child deception, which are a) lies about activities or actions to parents, b) tells white lies, and c) makes stories more interesting by adding incorrect information. For the purpose of the present discussion, these three factors will be referred to as a) Lies about Actions b) White Lies, and c) Exaggerations. These categories have not been considered concurrently with empirical investigations of children’s deceptive behaviours and thus, there is no evidence to support that parental report of lying behaviours can actually predict children’s behaviours.

3.4.1. Factor Analysis with Lie-telling Questionnaire

A factor analysis using the principal component method of extraction with varimax rotation was performed on parental ratings of children’s lie-telling behaviour on the Lie-Telling Questionnaire. In examination of the 12 questions that varied on a 5-point scale, from Never to Very Often, the analysis yielded three factors that accounted for 71.4% of the variance (see Table 3.4.1.). The first factor, labelled ‘Lying about Actions’, contained evaluations of 8 questions (factor loadings above 0.5) which included items 1-8 on the questionnaire (eigenvalue = 6.09, 51% of the variance accounted for). The second factor, labelled ‘White Lies’, contained evaluations of three questions including items 9-11 on the questionnaire (eigenvalue = 1.36, 11% of the variance accounted for). The third factor, labelled ‘Exaggerations’, contained evaluations of 2 questions including items 1 and 12 on the questionnaire (eigenvalue = 1.11, 9% of the variance accounted for). For subsequent analyses, scores representing the 3 factors were derived.
It should be noted that these factors map directly onto the factors outlined by Engels et al. (2006), thereby increasing the reliability and validity of our results.

Table 3.4.1.

*Results from the Factor Analysis for the Lie-Telling Questionnaire*

<table>
<thead>
<tr>
<th></th>
<th>Lies about Activities</th>
<th>White Lies</th>
<th>Exaggerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Lies to you about the things he/she is involved in?</td>
<td>.668</td>
<td>.219</td>
<td>.565</td>
</tr>
<tr>
<td>2. Is not being completely honest with you?</td>
<td>.854</td>
<td>.150</td>
<td>.059</td>
</tr>
<tr>
<td>3. Conceals things from you that are going on at school</td>
<td>.824</td>
<td>.102</td>
<td>.042</td>
</tr>
<tr>
<td>4. Lies about the reasons why he/she did not fulfill a commitment?</td>
<td>.772</td>
<td>.229</td>
<td>-.034</td>
</tr>
<tr>
<td>5. Consciously does not tell you the truth when you have a conversation?</td>
<td>.778</td>
<td>.305</td>
<td>.267</td>
</tr>
<tr>
<td>6. Does not tell you important things when you ask him/her something?</td>
<td>.728</td>
<td>.201</td>
<td>.032</td>
</tr>
<tr>
<td>7. Lies about what he/she does with his/her friends?</td>
<td>.677</td>
<td>.208</td>
<td>.450</td>
</tr>
<tr>
<td>8. Only tells you part of the story when you ask him/her something?</td>
<td>.770</td>
<td>.159</td>
<td>.301</td>
</tr>
<tr>
<td>9. Tells lies to protect other people or to prevent other people's feelings from being hurt?</td>
<td>.048</td>
<td>.872</td>
<td>.049</td>
</tr>
<tr>
<td>10. Pictures things better than they actually are?</td>
<td>.328</td>
<td>.591</td>
<td>.153</td>
</tr>
<tr>
<td>11. Sometimes does not tell the truth so he/she does not have to hurt somebody else's feelings?</td>
<td>.273</td>
<td>.827</td>
<td>.095</td>
</tr>
<tr>
<td>12. Exaggerates the things he/she experiences?</td>
<td>.039</td>
<td>.099</td>
<td>.938</td>
</tr>
</tbody>
</table>

**3.4.2. Age and Sample Differences**

Three separate univariate ANOVAs were performed for each of the three factor scores, with Age in months as a continuous variable and Sample type as a categorical variable.

For the Lies about Activities factor, there was a significant effect of Sample type, $F(1, 60) = 15.46, p < .01, \eta^2 = .21$. Results demonstrated that the scores for children with CP were significantly higher than the TD sample, and thus, parents of children from the CP sample reported higher frequencies of Lies about Actions by these children (see Table 3.5.1. for means
and standard deviations). Age was not found to be a significant factor, $F(1, 60) = .03, p > .05, \eta^2 = .00$.

For the White Lies factor, neither Age ($F(1, 60) = 1.97, p > .05, \eta^2 = .03$), nor Sample, ($F(1, 60) = 1.80, p > .05, \eta^2 = .03$), were significant. Thus, there are no significant differences in regards to Age or Sample in parental ratings of children’s White Lie telling behaviours.

For the Exaggerations factor, neither Age ($F(1, 60) = .00, p > .05, \eta^2 = .00$), nor Sample, ($F(1, 60) = 2.85, p > .05, \eta^2 = .05$), were found to be significant. Results indicated that there were no significant differences in regards to Age or Sample in parental ratings of children’s Exaggerations.

Table 3.4.2.

**Means and Standard Deviations of the Lie-Telling Questionnaire**

<table>
<thead>
<tr>
<th></th>
<th>CP M</th>
<th>CP SD</th>
<th>TD M</th>
<th>TD SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lies about Action</td>
<td>.46</td>
<td>.97</td>
<td>-.46</td>
<td>.81</td>
</tr>
<tr>
<td>White Lies</td>
<td>.17</td>
<td>1.00</td>
<td>-.17</td>
<td>.99</td>
</tr>
<tr>
<td>Exaggerations</td>
<td>.22</td>
<td>1.12</td>
<td>-.22</td>
<td>.83</td>
</tr>
</tbody>
</table>

3.4.3. Parent Ratings of Lies as Predictors of Children’s Actual Behaviours

Given the extensive weight allocated to parental ratings of children’s lies in research as well as in clinical practice, the degree to which parental ratings of lies predict children’s actual behaviours must be considered. This is a particularly important question when studying children with CP as deceit represents a diagnostic criterion for Conduct Disorder.

A series of binary and linear hierarchical regressions were performed, with Age entered on the first step, and the 3 factors from the Lie-Telling Questionnaire (Lies about Actions, White Lies, and Exaggerations) entered on the second step. Significant findings regarding the impact of Age when entered on the first step are discussed in Sections 3.3.2., 3.3.3., 3.3.4., and 3.3.5.,
with results revealing that as age increases, children in the TD sample tell fewer antisocial lies and marginally significantly more prosocial lies. The two samples (CP and TD) were considered separately in order to determine if parental ratings differentially predict deceptive behaviours.

### 3.4.3.1. Antisocial Lie-telling and parent ratings on the Lie-telling Questionnaire.

In the hierarchical binary logistic regression analysis for Antisocial Lying, results for both the CP sample ($\chi^2(3, 29) = 1.45$, Nagelkerke $R^2 = 0.09$, $p > .05$) and the TD sample ($\chi^2(1, 30) = 1.66$, Nagelkerke $R^2 = 0.34$, $p > .05$) were not significant. The bootstrap analysis confirmed these results, demonstrating that parental ratings of lying did not predict actual Antisocial Lying behaviours.

### 3.4.3.2. Antisocial Verbal Leakage and parent ratings on Lie-telling Questionnaire.

In the hierarchical binary logistic regression analysis for Verbal Leakage, results for the CP sample were not significant ($\chi^2(3, 26) = 3.66$, Nagelkerke $R^2 = 0.18$, $p > .05$), although the model for the TD sample was, ($\chi^2(3, 22) = 12.18$, Nagelkerke $R^2 = .65$, $p < .01$). Results indicated that above and beyond the contributions of all other variables, the White Lies factor was a significant predictor of Verbal Leakage, $B = -3.80$, $Wald = 4.24$, $p = .04$, $OR = .02$, 95% CI = [.001, 8.32], with higher scores indicating a lesser likelihood of Verbal Leakage. The bootstrap analysis confirmed this result, $B = -3.80$, 95% CI = [-1993.28, -2.23], $p < .01$. Additional marginally significant findings for the TD sample were found, with the bootstrap analysis demonstrating that higher scores in the Lies about Actions factor were related to more frequent Verbal Leakage, $B = .87$, 95% CI = [-352.20, 529.16], $p = .06$. The bootstrap analysis also demonstrated marginally significant results for the CP sample in regards to Exaggerations, $B = .76$, 95% CI = [-.29, 5.88], $p = .07$, with higher rates of Exaggerations being predictive of Verbal Leakage.
3.4.3.3. Prosocial Lie-telling and parent ratings on the Lie-telling Questionnaire.

In the hierarchical binary logistic regression for Prosocial Lying, results were not significant for the CP sample ($\chi^2(3, 30) = .73$, Nagelkerke $R^2 = 0.06$, $p > .05$), nor were they significant for the TD sample ($\chi^2(3, 30) = 2.52$, Nagelkerke $R^2 = 0.18$, $p > .05$). The bootstrap analysis confirmed these results. Parental ratings were therefore not predictive of prosocial lying in either sample.

3.4.3.4. Prosocial Lying Sophistication and parent ratings on the Lie-telling Questionnaire.

The hierarchical linear logistic regression for Prosocial Lying Sophistication did not reveal significant results within the CP sample, $\Delta F (3, 15) = .42$, $p > .05$, $RD^2 = .08$ or the TD sample, $\Delta F (3, 20) = 1.14$, $p > .05$, $RD^2 = .14$. Bootstrap analyses confirmed these results.

3.4.3.5. Parent Ratings of lie-telling predicting deception group membership.

A hierarchical linear logistic regression was conducted with Group Type (Group 1: Non-Transgressors/Prosocial Liar, Group 2: Antisocial Liar/Prosocial Liar, Group 3: Antisocial Liar/Blunt Truth Teller) entered as the predicted variable. SES and Age in months were entered on the first step, with the 3 Lie-telling Questionnaire factors entered on the second step. The model was not significant, $\Delta F (3, 53) = .46$, $p > .05$, $RD^2 = .02$, indicating that parental ratings of children’s lie-telling tendencies did not predict their actual deceptive behaviours.

3.4.4. Summary

Results from parental ratings demonstrated that the lie-telling questionnaire revealed significant rating differences between the samples for the ‘Lies About Activities’ factor, where children with CP were rated significantly higher than their TD counterparts. Age was not found to be a significant predictor for any of the factors.
Parental ratings of deceptive behaviours had little success in significantly predicting actual lying behaviours in children, and thus, Hypotheses 5a and 5b were not confirmed. However, ratings significantly predicted Verbal Leakage. Results demonstrated that for the TD sample, higher White Lie ratings significantly predicted less Verbal Leakage. The bootstrap analysis also found that higher scores on the ‘Lies about Actions’ factor was significantly predictive of Verbal Leakage for the TD sample, with higher ‘Exaggeration’ scores predicting Verbal Leakage within the CP sample.
3.5. Parent Styles and Deception

Little is currently known about how parenting styles may be differentially related to the development of deception in children. Though most research supports the goal of practicing Authoritative parenting, which tends to be flexible yet balances discipline and warmth, research considering any impact upon deceptive behaviours is limited. Additionally, how deception may manifest in children exposed to more Authoritarian (strict and controlling) or Permissive (passive with few appropriate limits) parenting styles is also unknown.

In order to investigate the relationship between parenting styles and deception, the Parenting Styles and Dimensions Questionnaire (PSDQ) was used. As described in Section 2.3.3.3., questions are categorized as Authoritarian, Authoritative or Permissive, and parental responses to the questions in each category were averaged resulting in scores ranging from 1-5 for each of the three parenting style categories. Parents also rated co-parents on these questions, allowing us to obtain both a self-report score and a co-parent score.

3.5.1. Age and Sample Differences for Parenting Style ratings

For the following analyses, the three parenting styles (Authoritative, Authoritarian and Permissive) were analyzed separately using Univariate ANOVAs. Age in months was considered as a continuous variable, with Sample type as a categorical variable.

In considering the Authoritative Parenting Style, no significant effects were found in regards to Age, $F(1, 66) = 0.65, p > .05, \eta^2 = .01$ or Sample, $F(1, 66) = 0.32, p > .05, \eta^2 = .005$ for parental self-reports. For the co-parent ratings, Age was not found to be a significant factor, $F(1, 66) = 1.11, p > .05, \eta^2 = .02$, though Sample type was significant, $F(1, 66) = 15.76, p < .01, \eta^2 = .20$ (see Table 3.5.1. for means and standard deviations). Results indicated that the scores for children with CP were significantly lower than those observed within the TD sample. Therefore,
co-parents of children from the TD sample reportedly display a more Authoritative parenting style compared to the co-parents of the CP sample.

In relation to the Authoritarian Parenting Style, self-reports indicated that no significant effects were found in regards to Age, $F (1, 66) = .08, p > .05, \eta^2 = .001$, but a significant effect involving Sample type was found, $F (1, 66) = 12.58, p = .001, \eta^2 = .17$. Results indicated that the scores for children with CP were significantly higher than the TD sample. For the co-parent ratings, Sample type was again found to be significant, $F (1, 66) = 8.52, p < .01, \eta^2 = .12$, though co-parents of children from the TD sample were rated as being more Authoritarian than co-parents from the CP sample. Age was not found to be a significant factor, $F (1, 66) = .36, p > .05, \eta^2 = .01$. Thus, parents of the CP children rated themselves as being more authoritarian and their co-parents as less authoritarian, whereas parents of the TD sample displayed the opposite effect.

In consideration of the Permissive Parenting Style, self-reports indicated that no significant effects were found in regards to Age, $F (1, 66) = .10, p > .05, \eta^2 = .02$, or Sample type, $F (1, 66) = 2.04, p > .05, \eta^2 = .03$. However, for the co-parent ratings, Sample type was found to be significant, $F (1, 66) = 9.46, p < .01, \eta^2 = .13$, with co-parents of children from the TD sample being rated as more Permissive than co-parents from the CP sample. Age was not found to be a significant factor, $F (1, 66) = .54, p > .05, \eta^2 = .01$.

Table 3.5.1. Means and Standard Deviations of the Lie-Telling Questionnaire

<table>
<thead>
<tr>
<th></th>
<th>CP</th>
<th></th>
<th>TD</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Self-Ratings</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Authoritative</td>
<td>4.22</td>
<td>.39</td>
<td>4.15</td>
<td>.51</td>
</tr>
<tr>
<td>Authoritarian</td>
<td>2.03</td>
<td>.48</td>
<td>1.65</td>
<td>.38</td>
</tr>
<tr>
<td>Permissive</td>
<td>2.31</td>
<td>.93</td>
<td>2.03</td>
<td>.64</td>
</tr>
<tr>
<td>Co-parent</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ratings</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Authoritative</td>
<td>1.59</td>
<td>2.03</td>
<td>3.35</td>
<td>1.57</td>
</tr>
<tr>
<td>Authoritarian</td>
<td>.74</td>
<td>.96</td>
<td>1.33</td>
<td>.65</td>
</tr>
<tr>
<td>Permissive</td>
<td>.96</td>
<td>1.26</td>
<td>1.79</td>
<td>.89</td>
</tr>
</tbody>
</table>
3.5.2. Parent Style ratings as predictors of children’s deception

A series of binary and linear hierarchical regressions, with Age entered on the first step, and the three parenting styles (Authoritative, Authoritarian and Permissive) on the second step, were executed. Significant findings regarding controlling Age variability on the first step are discussed in Sections 3.3.2., 3.3.3., 3.3.4., and 3.3.5., with results indicating that as age increases, children in the TD sample tell fewer Antisocial Lies and marginally significantly more Prosocial Lies. The two samples (CP and TD) will be considered separately in order to determine if parental ratings differentially predict deceptive behaviours.

3.5.2.1. Antisocial Lie-telling and Parenting Styles

In the hierarchical binary logistic regression for Antisocial Lying, results for both the CP sample ($\chi^2(3, 33) = .47$, Nagelkerke $R^2 = 0.03$, $p > .05$) and the TD sample ($\chi^2(3, 33) = 1.18$, Nagelkerke $R^2 = 0.31$, $p > .05$) were not found to be significant in regards to parental self-reports. Similarly, ratings for co-parents were also not found to be significant predictors of antisocial lying within the CP sample, ($\chi^2(3, 33) = 4.81$, Nagelkerke $R^2 = 0.26$, $p > .05$) or the TD sample ($\chi^2(3, 33) = 1.10$, Nagelkerke $R^2 = 0.28$, $p > .05$). The bootstrap analysis confirmed these results. Thus, parenting styles did not predict children’s antisocial lie-telling behaviours.

3.5.2.2. Verbal Leakage and Parenting Styles

In the hierarchical binary logistic regression for Verbal Leakage, only data from children who peeked and lied were included in the analysis. Results for the CP sample ($\chi^2(1, 29) = 1.77$, Nagelkerke $R^2 = 0.09$, $p > .05$) and the TD sample ($\chi^2(1, 23) = 1.12$, Nagelkerke $R^2 = 0.07$, $p > .05$) were not significant. Ratings for co-parents were also not significant within either sample (CP: $\chi^2(3, 29) = .44$, Nagelkerke $R^2 = 0.03$, $p > .05$; TD: $\chi^2(3, 23) = 3.49$, Nagelkerke $R^2$
95

= 0.21, \( p > .05 \)). The bootstrap analysis confirmed these results. Parental ratings of children’s lie-telling were therefore not predictive of their actual antisocial lie-telling behaviours.

### 3.5.2.3. Prosocial Lying and Parenting Styles

In the hierarchical binary logistic regression for Prosocial lying, results were not significant for the CP sample, \( \chi^2(3, 33) = .86, \) Nagelkerke \( R^2 = 0.08, p > .05 \), or for the TD sample \( \chi^2(3, 33) = 1.75, \) Nagelkerke \( R^2 = 0.17, p > .05 \). However, for the co-parent ratings, the model was not significant for the TD sample, \( \chi^2(3, 33) = 1.03, \) Nagelkerke \( R^2 = 0.14, p > .05 \), but it was for the CP sample \( \chi^2(3, 33) = 10.65, \) Nagelkerke \( R^2 = 0.41, p = .01 \). No single variable could be identified as significantly predicting prosocial lying for the CP sample and therefore it appears that the combination of co-parent ratings predicted prosocial deception. The bootstrap analysis confirmed all results, and indicated that ratings for more authoritarian co-parents predicted a lesser likelihood of telling a prosocial lie for the CP sample, \( B = -4.65, p = .04, 95\% \text{ CI} = [-1955.39, 1.83] \). As the bootstrap analysis controls for any potential individual scores that may attribute undue influence upon the analysis, this result is thought to be reliable.

Thus, parenting style self-reports were not predictive of prosocial lie-telling behaviours, although ratings of co-parents and specifically higher co-parent authoritarian scores, did significantly predict less prosocial lying within the CP sample.

### 3.5.2.4. Prosocial Lying Sophistication and Parenting Styles

In the hierarchical linear logistic regression for Prosocial Lying Sophistication, only children who told prosocial lies were included in the analysis. Results for both the CP sample \( \Delta F (3, 16) = 1.04, p > .05, \) \( R^2 = .16 \) and the TD sample \( \Delta F (3, 23) = 1.68, p > .05, \) \( R^2 = .18 \) were not significant regarding parental self-reports. Ratings for co-parents also did not yield significant results within either sample (CP: \( \Delta F (3, 16) = .46, p > .05, \) \( R^2 = .08 \); TD: \( \Delta F (3, 23) \)
The bootstrap analysis confirmed these results and also demonstrated a marginally significant effect for the CP sample in that higher authoritarian ratings for a co-parent predicted more sophisticated prosocial lies, $B = 3.60$, 95% CI = [-2.08, 15.42], $p = .065$.

### 3.5.2.5 Parenting Styles predicting deception group membership

A hierarchical linear regression was conducted with Group Type (Group 1: Non-Transgressors/Prosocial Liar, Group 2: Antisocial Liar/Prosocial Liar, Group 3: Antisocial Liar/Blunt Truth Teller) entered as the predicted variable. SES and Age in months were entered on the first step, with the three Parenting Styles (Authoritative, Authoritarian and Permissive) entered on the second step. The model was not found to be significant regarding self-ratings, $\Delta F (3, 59) = .88$, $p > .05$, $RD^2 = .04$, nor for co-parent ratings, $\Delta F (3, 59) = 1.16$, $p > .05$, $RD^2 = .05$. Bootstrap analyses confirmed these results, indicating that parental ratings of their own parenting style and their co-parents’ style does not predict children’s deceptive behaviours.

### 3.5.3. Summary

Results indicated that parents of children from the samples rated their own parenting style and their co-parent’s style significantly differently. Parents from the TD sample rated their co-parent significantly higher on all three parenting styles than parents from the CP sample. Furthermore, parents from the CP sample rated themselves as more authoritarian than parents from the TD sample. Parenting styles were not found to be predictive of antisocial lying or Verbal Leakage, but for the CP sample, more authoritarian co-parenting was found to predict fewer prosocial lies, which provides some support for Hypothesis 6b. However, of children in the CP sample who told a prosocial lie, those with more authoritarian co-parents told marginally more sophisticated prosocial lies.
CHAPTER 4: DISCUSSION

4.1. General Overview

The current study investigated the antisocial and prosocial lie-telling behaviours of children with and without severe conduct problems. In addition, cognitive measures that may be related to deception were investigated to determine if there are different trajectories for deception in these populations. Finally, parental ratings of children’s lie-telling behaviours as well as parenting styles were analyzed. Results will be summarized and considered concurrently with previous research, with hypotheses being described in Table 4.1. Limitations of the current study, future directions and implications will be discussed.

4.2. Summary of Results

4.2.1. Deception

Overall, rates of antisocial transgressions in the present study were similar to results described in previous studies (Evans & Lee, 2011; Talwar & Lee, 2002a; 2008), with nearly 80% of children peeking at the prize. The analyses revealed that children with CP were significantly more likely to commit the transgression and peek at the prize. However, Hypothesis 1a specifically predicted that children with CP would be more likely to lie, though all children who committed the transgression subsequently lied. Thus, while children with CP were more likely to behave antisocially and peek at the prize, we cannot conclude that they were more likely to lie as all transgressors denied any wrong-doing.

Results indicated that overall, children were less likely to commit the transgression and subsequently lie as age increased. When evaluating the samples separately and controlling for age (Section 3.3.2.), the age variable was only found to be significant for the TD sample and children with CP were equally as likely to transgress at any age. However, Hypothesis 2a was
not confirmed as the age prediction was related to lying behaviour though all children who transgressed were equally likely to lie.

Following an antisocial lie, 38.5% of children incriminated themselves by disclosing information they should not know. The majority of children who had Verbal Leakage were from the CP group (14 of 20, or 70% of children with Verbal Leakage). However, this finding was not significant and thus, Hypothesis 3a was not confirmed. However, this trend suggests that children with CP were more likely to incriminate themselves by disclosing either the identity or the colour of the prize and therefore, tended to tell less sophisticated antisocial lies. As only 20 children in the current study incriminated themselves and displayed Verbal Leakage, a larger sample size may be required in order to demonstrate significant differences.

In regards to Prosocial Lying, 74.2% of participants told a prosocial lie, which is consistent with rates documented within similar studies (Popliger et al., 2011; Talwar, Murphy, et al., 2007). Children with CP were marginally significantly less likely to tell a prosocial lie, which confirms Hypothesis 1b.

When considering the samples together, age was not found to be a significant predictor of prosocial lying. However, when considering the samples separately (Section 3.3.4.), a marginally significant effect of age was noted for the TD sample and as age increased, TD children were more likely to tell a prosocial lie. This confirms Hypothesis 2b as age is related to prosocial lying behaviours of the TD sample but not the CP sample.

The sophistication of children’s prosocial lies was not predicted by either age or sample type, which is inconsistent with Hypothesis 3b. Trends do, however, suggest that with a larger sample size, sophistication levels may significantly differ between the groups. Thus, additional studies may assist in further clarifying the prosocial lying behaviours of children with CP.
Table 4.1.

Summary of Hypotheses and Findings

<table>
<thead>
<tr>
<th>Description of Hypotheses</th>
<th>Confirmation of Hypotheses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypothesis 1</td>
<td></td>
</tr>
<tr>
<td>a) Children with CP will tell more antisocial lies.</td>
<td>Not confirmed: CP sample more likely to transgress, but both samples were equally likely to lie.</td>
</tr>
<tr>
<td>b) Children with CP will tell fewer prosocial lies.</td>
<td>Confirmed (marginal)</td>
</tr>
<tr>
<td>Hypothesis 2</td>
<td></td>
</tr>
<tr>
<td>a) Age will not predict antisocial lying rates for the CP sample, but it will for the TD sample.</td>
<td>Not Confirmed: CP sample more likely to transgress, but both samples were equally likely to lie.</td>
</tr>
<tr>
<td>b) Age will not predict prosocial lying rates for the CP sample, but it will for the TD sample.</td>
<td>Confirmed (marginal)</td>
</tr>
<tr>
<td>Hypothesis 3</td>
<td></td>
</tr>
<tr>
<td>a) CP sample will tell less sophisticated antisocial lies and be more likely to incriminate themselves.</td>
<td>Not confirmed, though trend supports hypothesis.</td>
</tr>
<tr>
<td>b) Children with CP will tell less sophisticated prosocial lies.</td>
<td>Not confirmed, though trend supports hypothesis.</td>
</tr>
<tr>
<td>Hypothesis 4</td>
<td></td>
</tr>
<tr>
<td>a) Cognitive skills will predict deception differently for children with CP vs TD.</td>
<td>Confirmed</td>
</tr>
<tr>
<td>b) Cognitive skills will predict deception sophistication differently for children with CP vs TD.</td>
<td>Confirmed</td>
</tr>
<tr>
<td>Hypothesis 5</td>
<td></td>
</tr>
<tr>
<td>a) Parent ratings will significantly predict antisocial lying rates.</td>
<td>Not Confirmed</td>
</tr>
<tr>
<td>b) Parent ratings will significantly predict prosocial lying rates.</td>
<td>Not Confirmed</td>
</tr>
<tr>
<td>Hypothesis 6</td>
<td></td>
</tr>
<tr>
<td>a) More authoritative parenting will predict prosocial behaviour.</td>
<td>Not Confirmed</td>
</tr>
<tr>
<td>b) Authoritarian and permissive parenting will predict an increase antisocial behaviour.</td>
<td>Partially Confirmed: High co-parent authoritarian ratings predicted less prosocial lying.</td>
</tr>
</tbody>
</table>
When antisocial and prosocial lie-telling was examined concurrently by grouping children according to their behaviours (Group 1: Non-Transgressor/Prosocial Lie Teller, Group 2: Antisocial Liar/Prosocial Lie Teller, Group 3: Antisocial Liar/Blunt Truth Teller), results demonstrated that with age, children were more likely to belong to the socially desirable Group 1 rather than the other two groups. Furthermore, children from the TD sample were significantly more likely to be in Group 1 than in the highly antisocial Group 3. This provides further evidence suggesting that children with CP tend to behave more antisocially; these children are more likely to commit a minor transgression and lie, and are also less likely to tell a prosocial lie. While results suggest that lies within the CP sample may not be as sophisticated as those observed within the TD sample, these differences were not found to be significant.

4.2.2. Cognitive Skills and Deception

Unsurprisingly, performance on nearly all of the cognitive measures improved with age. As we used z-scores of the children’s raw scores from the cognitive measures, this finding was expected and was found for all measures except for the Day-Night Stroop task. Children with CP were found to have lower scores on two cognitive measures when SES was controlled for (Digit Span and Receptive Vocabulary). Such findings suggest that while children with CP may struggle cognitively relative to their TD counterparts in terms of working memory and language comprehension, the samples did not vary significantly in most areas of cognitive functioning. Séguin (2009) would suggest that this may be due to the sample itself; in the current study, we did not control for the types of conduct problems; instead, we considered children with variable presentations of concerning behaviours concurrently. Therefore, the deficits that are commonly observed in children with CP may not be represented within the current study as consideration of the group as a whole may attenuate possible cognitive deficits in children with CP. However,
limitations with the size of the sample made it challenging to consider different behavioural categories within the CP group. Thus, a larger sample size would be required in order to evaluate how varying behavioural presentations (e.g., overt vs. covert) may be associated with differing results captured by cognitive measures.

4.2.2.1. Antisocial lying.

When considering how cognitive skills may relate to deception, results differed between the CP and TD samples among the various lying situations (See Table 4.2). When considering Antisocial Lying for the TD sample, lower performance on the ToM Composite and the IQ Composite measures both predicted more frequent transgressing and lying, with lower Receptive Vocabulary scores also predicting more deceptive behaviour. Within the CP sample, the EF Composite was a marginally significant predictor, with this finding possibly being driven by the Day-Night Stroop and Digit Span tasks, which were also found to be significant. Therefore, results demonstrated that children with CP who demonstrated better inhibitory and working memory skills were less likely to peek at the prize. For both samples, lower 1\textsuperscript{st} Order ToM abilities predicted more frequent transgressing, which has not yet been documented in the literature. While previous studies have found higher 1\textsuperscript{st} Order ToM abilities to be predictive of initial lies (or denials of a transgression), our results found that increases in this area allowed children to resist the temptation to peek for both samples.

Interestingly, all other variables besides 1\textsuperscript{st} Order ToM differed somewhat between the samples, with the executive functioning skills of children with CP and intellectual skills of TD children predicting transgressing and Antisocial Lying. Though the reasoning behind this trend is purely speculative at this point, it appears that children with CP needed to actively engage in resisting the temptation to peek by relying on EF skills. However, children from the TD sample
may have been better able to recognize that they would receive the gift and thus, the need to peek was lessened. This also speaks to the idea that the paradigm may not have been motivating for children with higher intelligence. However, results demonstrated that antisocial transgressing and lying in children with CP involves different cognitive processes than for the TD sample.

In terms of the sophistication of children’s antisocial lies within the TD sample, lower inhibitory skills on the Word-Colour Stroop task and lower 2\textsuperscript{nd} Order ToM predicted more Verbal Leakage, a finding that is consistent with results described in previous studies (Evans & Lee, 2011; Talwar, Gordon et al., 2007). The consistency of the results within the TD sample indicates that the measures and paradigms of the current study are congruous with previous research. No cognitive measures, however, were found to significantly predict Verbal Leakage within the CP sample. The differences between the CP and TD samples suggests that children with and without CP rely upon different cognitive skills when attempting to maintain a lie. These cognitive skills in children with CP may not be related to their ability to maintain a lie, although it is important to recall that a trend was found that demonstrated more Verbal Leakage in this population. Therefore, it could potentially be the lack of reliance on such skills that lead to the production of less sophisticated lies, though further research is required.

Table 4.2.

<table>
<thead>
<tr>
<th>Summary of significant predictors of Antisocial Lying by sample</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CP Sample</strong></td>
</tr>
<tr>
<td>Antisocial Transgressing and Lying predicted by:</td>
</tr>
<tr>
<td>Lower EF Composite</td>
</tr>
<tr>
<td>Lower Working Memory</td>
</tr>
<tr>
<td>Lower Inhibition (DN Stroop)</td>
</tr>
<tr>
<td>Lower 1\textsuperscript{st} Order ToM</td>
</tr>
<tr>
<td>Verbal Leakage predicted by:</td>
</tr>
<tr>
<td>Higher parent ratings of ‘Exaggerations’</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
4.2.2.2. Prosocial Lying.

When evaluating Prosocial Lying, it was found that the EF Composite was a significant predictor for the TD sample, with this finding being driven by greater inhibition (Day-Night Stroop) and working memory skills (Digit Span). This is the first time that executive functioning skills have been found to be significantly predictive of Prosocial Lying abilities; while some studies have found a relation for socializing factors (Popliger et al., 2011), how cognitive skills may increase Prosocial Lying has yet to be explored. Further, these findings suggest that, similar to Antisocial Lying, the TD sample may rely upon inhibitory skills to resist the disclosure of their true feelings about the prize, and working memory skills may be applied in order to state an alternative response to the truth. Additional research in the area of cognitive functioning and Prosocial Lying would be beneficial in order to build on the present findings.

Both samples appeared to rely on factors of intelligence in order to produce a lie for another’s benefit. Higher total IQ Composite scores predicted Prosocial Lying within the TD sample, while higher Expressive Vocabulary and lower Non-Verbal Reasoning scores predicted Prosocial Lying in children with CP. Results suggest that overall increases in intellectual skills, particularly verbal skills, may increase the likelihood that one may tell a prosocial lie. Interestingly, for the CP sample, lower Non-Verbal Reasoning skills predicted more Prosocial Lying. The explanation for this relationship is unclear, although limitations with Non-Verbal Reasoning may have decreased the child’s ability to understand the non-verbal cues of the situation and, thus, these children did not fully comprehend that their prize was actually the bar of soap. Further exploration of this result with a larger sample size may assist in the development of an understanding of this finding.
Prosocial Lying Sophistication was again differentially predicted for the samples (see Table 4.3). For the TD sample, the IQ Composite was found to be predictive of higher degrees of sophistication, demonstrating that overall intelligence levels may predict both initial prosocial lies and the sophistication of responses within the TD sample. However, conflicting results in regards to ToM comprehension were uncovered for the TD sample: whereas a higher ToM Composite overall predicted higher degrees of sophistication, lower 2\textsuperscript{nd} Order ToM scores predicted more sophisticated prosocial lies. Both of these results regarding ToM were found to be marginally significant through the bootstrap analyses. Although this analysis controls for participants and variables that may exert undue influence on the results, these findings lack internal consistency. In the limited studies that exist that concurrently consider ToM comprehension and prosocial lying, no significant results have yet been found with regards to the sophistication of the prosocial lies (e.g., Li et al., 2011). Therefore, additional studies are needed before confirming how 2\textsuperscript{nd} Order ToM comprehension may be related to prosocial lying sophistication. When considering the CP sample, better inhibitory skills predicted greater sophistication of prosocial lies, confirming that for children with CP, stronger inhibitory skills may increase prosocial behaviours.

Results demonstrated that while many of the cognitive measures typically found to be associated with deception were confirmed within the TD sample, the CP sample displayed markedly different patterns of cognitive functioning related to deception, which confirms Hypotheses 4a and 4b. It is important to reiterate that most cognitive measures were not significantly different between the samples, but how they predicted deceit varied greatly. Therefore, how these cognitive skills are applied in deceptive scenarios may impact the developmental trajectory of deception in children with CP.
Table 4.3.

*Summary of significant predictors of Prosocial Lying by Sample*

<table>
<thead>
<tr>
<th>Predictors</th>
<th>CP Sample</th>
<th>TD Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prosocial Lying</td>
<td>Higher Expressive Vocabulary</td>
<td>Higher EF Composite</td>
</tr>
<tr>
<td>predicted by</td>
<td>Lower Non-Verbal Reasoning</td>
<td>Higher Inhibition (DN Stroop)</td>
</tr>
<tr>
<td></td>
<td>Lower Authoritarian</td>
<td>Higher Working Memory</td>
</tr>
<tr>
<td></td>
<td>co-parenting rates</td>
<td>Higher IQ Composite</td>
</tr>
<tr>
<td></td>
<td>Higher Working Memory</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Higher IQ Composite</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prosocial Lying Sophistication predicted by</td>
<td>Higher Inhibition (WC Stroop)</td>
<td>Higher ToM Composite</td>
</tr>
<tr>
<td></td>
<td>Higher Authoritarian</td>
<td>Lower 2nd Order ToM</td>
</tr>
<tr>
<td></td>
<td>co-parenting rates</td>
<td>Higher IQ Composite</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**4.2.3. Parent Ratings**

Given the weight of parental ratings in clinical and research settings with regards to children’s deceptive behaviours, the ability for these ratings to predict children’s actual lie-telling behaviours was explored. When comparing ratings across the samples, parent ratings only differed on the ‘Lies about Actions’ factor, with children in the CP sample receiving higher ratings than children within the TD sample. Such a finding suggests that children with CP are more likely to be caught in their lies as parents report a high frequency of deception. Therefore, attempts to deceive may not be well-executed and possibly less sophisticated.

Overall, the lie-telling questionnaire had limited success in predicting children’s actual deceptive behaviours, and thus Hypotheses 5a and 5b were not confirmed. However, ratings were found to be predictive of the sophistication of antisocial lies (Verbal Leakage); children from the TD sample with higher scores on the ‘Lies about Actions’ factor and lower scores on the ‘White Lies’ factor were more likely to have Verbal Leakage and incriminate themselves. Such results suggest that parents who frequently catch their children lying about their actions or telling blunt truths seem to be correctly predicting that their children have difficulty maintaining
or telling sophisticated lies. Similarly, for the CP sample, children who were found to have higher scores on the ‘Exaggerations’ factor were found to be more likely to have Verbal Leakage. Thus, parents of children with CP may recognize children’s exaggerations as untruthful, or children with CP may exaggerate in unconvincing ways and thus, tell less sophisticated lies. Therefore, in the current study, parental ratings of lie-telling behaviours predicted the degree of antisocial lie-telling sophistication (Verbal Leakage).

In terms of parenting styles, differences were noted in how parents of children with and without CP rated themselves and their co-parents. Parents of the TD sample rated their co-parent consistently higher than the CP co-parents on all three parenting styles, though no differences were found for self-reports and authoritative parenting. Furthermore, parents of CP children rated themselves as being more authoritarian than the TD parents did. Contrary to Hypotheses 6a and 6b, parenting styles were not found to predict Antisocial Lying or Verbal Leakage, although for the CP sample, ratings suggesting more authoritarian co-parents was associated with fewer, yet more sophisticated, prosocial lies. This suggests that while most children with CP who have authoritarian co-parents may be less likely to tell a prosocial lie, those who do choose to lie may be motivated to tell a more convincing lie in order to escape harsh parenting practices. Though previous studies that have found authoritative parenting to be predictive of increased likelihoods of prosocial lying (Popliger et al., 2011), our results could not confirm this finding, although it was found that more authoritarian parenting styles decreased the likelihood of prosocial responding. With a larger sample size, additional results related to parenting practices and deception may be revealed.
4.2.4. Children with Conduct Problems and Deception

This study attempted to compare the deceptive behaviours of children with and without conduct problems, with findings supporting the general hypothesis that children with conduct problems would behave more antisocially overall. Indeed, these children transgressed more and told fewer prosocial lies. However, why these trends and patterns were found must be explored.

At the outset of the study, it was considered that children with CP may perform differently with regards to deceptive behaviours due to deficits in cognitive functioning. However, when observing the cognitive factors that were investigated, children with conduct problems were only significantly lower than their typically-developing counterparts on two subtests. Cognitive functioning is therefore not significantly lower in the measured areas of EF skills, ToM comprehension or even intelligence levels. However, it is interesting to consider that in relation to deception, the TD sample generally performed in a manner consistent with previous literature, with the performance of the CP sample differing markedly. Findings seem to imply that children with CP may not be deficient in specific skills but instead may utilize these skills in a different manner when socially interacting. These children seem to apply different cognitive strategies or mechanism when deciding to deceive and thus, the trajectory of deception appears to differ.

The finding that children with CP reportedly tell more lies and how these ratings may predict their lying abilities must also be addressed. The current study found that when parents rated children’s lies, the CP sample received higher rating in the ‘Lies about Actions’ category, which incorporates antisocial lies. Further, previous studies with clinical populations (FASD) found that there may be practice effects that may increase deceptive abilities (Rasmussen et al., 2008). However, this did not seem to be the case in the current study. While these children
transgressed more, they were also more likely to incriminate themselves by divulging information that should not have known. Thus, no practice effects were observed.

Further, the observed patterns cannot be accounted for by parenting styles. While some differences existed in the samples, parenting styles had limited predictive abilities for deception, though authoritarian parenting seemed to discourage prosocial responding. It is therefore possible that with an increased emphasis on warmth in the parent-child relationship, children may behave more prosocially. However, the limited findings demonstrate that deception may be more influenced by cognitive skills than by environment.

4.3. Limitations and Future Studies

This study is the first to compare the lie-telling behaviours of children with and without CP. While significant differences were found, a considerable limitation of the study was the small sample size. In order to address the possible confounds due to sample size, bootstrap analyses were run for all results, which increases the confidence in the findings as 1000 permutations of the data were run and results controlled for any participants who may have exerted undue influence on the findings. An increase in sample size may also assist in clarifying the various marginal results that were discovered.

Though recruitment efforts were extensive, recruiting children with CP is extremely difficult for a variety of reasons. First, the difficult behaviours exhibited by the children may cause stress to the families, making them less likely to engage in research. Further, families who were recruited were already engaging in an intervention through the Child Development Institute. Thus, our sample may represent a bias in that families were already seeking intervention. Of the families approached at the Child Development Institute, only a minority agreed to participate, which again suggests that the children who ultimately participated may represent a biased sample
of children with CP whose parents were both willing to seek treatment and were agreeable to participate in research. In future studies, this could be addressed by incorporating the research methodologies into behavioural classes at schools (where parents may not be actively seeking intervention) and also during the intake procedure at intervention agencies. Further, children who have committed criminal acts at a young age could also be considered as this may assist in diversifying the sample. These children would have obvious conduct problems and treatment is likely court-mandated as opposed to voluntary.

With a larger sample of children with CP, it may be possible to delineate children displaying covert vs. overt symptoms, which may help to clarify our understanding of how these behaviours develop and how deceptive behaviours may differ between the varying presentations of CP or CD. The cognitive skills that were related to deception in the current study were found to differ from the TD population, though the ways in which this related to specific behaviours within the CP sample remains unclear. It is possible that the cognitive profiles of children with overt vs. covert behavioural presentations will be differentially related to deception. Séguin (2009) would also argue that children with more overt symptoms may demonstrate specific deficits in cognitive measures. Therefore, a larger sample of children with CP where overt and covert CP symptoms may be separated would assist in clarifying the findings, and may lead to a better understanding of how deception develops in this complex population. Currently, these details are not able to be differentiated with any reliability as the sample size does not allow such conclusions to be drawn.

In addition to increasing the sample size, efforts must be made to recruit a control sample that more closely replicates the demographic variables of the clinical sample, as variables such as SES or ethnicity may impact results. Though findings are mixed regarding whether or not
children from lower SES backgrounds tell more lies (Achenbach & Edelbrock, 1981; Stouthamer-Loeber & Loeber, 1986), controlling for this variable with a more similar control sample would increase confidence in results. While SES was controlled for throughout the study when directly comparing the samples, broadening recruitment of the control sample into all SES brackets would be ideal. Further, while ethnicity could not be included in the present analyses due to the sample size, future studies employing a larger sample size could consider and control for the possible influences of ethnicity.

Future studies may also consider the merits in extending the current study to different ages. The age range in the present study was selected for several reasons. While access to a population of children from ages 6 to 11 was available through the Child Development Institute, this age range was ideal as developmental shifts in terms of cognitive skills and deceptive abilities occur during these middle-childhood years. However, children may display concerning behaviours from a younger age and differences in how the development of early cognitive skills may predict deception for young children with CP would be beneficial. Furthermore, a greater understanding of how adolescents with enduring behavioural difficulties tell lies may assist in clarifying the maladaptive deception trajectory even further. Extending the age bracket to include younger and older children displaying concerning behaviours may therefore assist in advancing our knowledge of this population and of one of the most common symptoms of CD. By extension, a longitudinal study may also be beneficial; as limited longitudinal deception studies have been conducted, the degree to which children continue to act antisocially or increase in their prosocial functioning could be captured by working with the same children across a time span.

Methodological limitations must also be considered in the present study and possibly rectified in future research. First, this study replicated the rate of antisocial transgressions found
in many other studies (Evans & Lee, 2011; Talwar & Lee, 2002a; 2008), though no children chose to confess about their transgression. This high rate of lie-telling may possibly be due to the scenario itself; the situation involved peeking at a prize children were already going to receive and therefore the children had little to gain by telling the truth and may not have been motivated to confess their wrong-doing. It is possible that if there were repercussions for transgressing, or positive reinforcement for telling the truth, children may have been more likely to confess their actual behaviour. It is possible that by changing the methodology to include components that may promote truth-telling, such as having children promise to tell the truth, more children may have chosen to confess their transgression, which has been found in previous studies (e.g., Evans & Lee, 2010). However, the current scenario provides an interesting baseline from which future studies may consider ways to encourage confessing to promoting truth-telling.

Given the challenges in assessing children with conduct problems, the methodology had to be created around realistic expectations for a CP population. Therefore, the testing session was intended to be short (less than 1 hour), with many frequent breaks and changes in tasks. Thus, fewer cognitive measures could be administered than if working solely with a TD population. If future studies could work with participants over two sessions, it may be possible to obtain additional measures of cognitive functioning. For instance, studies have found that measures addressing planning skills (Tower of London; Evans & Lee, 2011) may be related to deception. Furthermore, it may be of interest to consider additional EF skills that have been found to be associated with conduct problems, such as mental flexibility (e.g., Wisconsin Card Sorting Task; for review, see Séguin & Zelazo, 2005). However, as the present study faced time restrictions and attempted to provide foundational work in the field, these additional measures of executive functioning could not be incorporated.
Further, children’s understanding of lies and truths was not assessed in the current study. It is possible that children with and without CP may view deception very differently and their ideas of lie-telling may shape their behaviour. Findings are mixed regarding whether or not children’s ratings of truths and lies actually predict deception; while the classification of lies does not seem to be related to actual behaviour (Talwar & Lee, 2008; Xu et al., 2010), there is some evidence to suggest that children’s moral evaluations of lies predicts their lie-telling behaviour (Talwar & Lee, 2008). How children with CP may evaluate truths and lies is currently unknown, yet this knowledge may assist in the development of appropriate interventions.

4.4. Implications

The current study provides a first step towards gaining a better understanding of the deceptive behaviours of children with CP. Results show that these children are more apt to behave antisocially; they are more likely to commit a transgression and subsequently lie, and they are also less likely to tell a prosocial lie. Further, the cognitive mechanisms associated with their lies differ from those observed within the TD sample, suggesting that these cognitive factors may be responsible for the different trajectory of lie-telling within the CP sample. These results may imply that the topic of deception must be approached differently with children with CP, with research suggesting that these children may be at risk for persistent lying behaviours (Gervais et al., 2000).

Deception is a complex issue. Lying is a marker of normative development and extensive research, including the current study, supports the idea that higher EF skills, well-developed ToM comprehension, and even intelligence levels can lead to more sophisticated lies. However, improved antisocial lying is not necessarily a skill that one desires for children with CP. The goal of interventions targeting lie-telling would not be to increase the frequency of sophisticated lies,
but instead to increase abilities related to deception, such as EF skills and ToM comprehension, in the hopes of increasing the child’s awareness of the true impact of their deceit. Furthermore, research demonstrates that with age and increased development, children commit fewer transgressions and are more likely to confess to their wrong-doings. Thus, facilitating the development of the skills associated with deceit in children with CP may have similarly positive effects on the lie-telling practice of this population.

Though it may seem counter-intuitive, it is undeniable that improved deceptive ability implies an increase in some cognitive areas and that successful deceit is, in many ways, normative. By virtue of deception being rated to occur frequently in this population, these children may be less-skilled in the art of deception and thus, get caught more often. Children who are frequently caught in lies would likely face difficulties at home and at school, with rejection by peers also being a likely outcome. The cycle of antisocial behaviour may continue as the child may perpetually be facing punishment and isolation for their deceptive practices, which may lead to other rule-breaking behaviours. Therefore, if children with CP began to tell better lies, research suggests that this may imply advances in cognitive development, and could have the potential benefit of improving social outcomes, such as improved peer relations (Feldman, Tomasian, & Coats, 1999). An increase in these skills could co-occur with less problematic behaviour and therefore, a lower reliance upon lying as a behavioural strategy may be evident.

Given limitations regarding the application of cognitive skills in deception, results suggest that children with CP may require direct instruction on improving their skills related to EF and ToM comprehension. Such ideas lend support to interventions such as the SNAP® program, which emphasizes inhibitory skills and understanding another’s perspective. Findings may also have more broad implications and speak to the need to enhance honesty and minimize
antisocial coping skills. Educational strategies that impact the moral tone of an educational setting, such as strategies related to positive psychology, could assist in promoting and encouraging more positive behaviours and emotions. The conceptual framework of positive psychology relates to the idea that one’s strengths should be recognized and encouraged, as opposed to focusing on weakness (Seligman & Csikszentmihalyi, 2000). In this way, individuals may begin to learn more appropriate social functioning as opposed to simply learning what they should not do. To this end, interventions related to deception should also emphasize the merits of truth-telling and positive reinforcement for honesty should be a message consistently delivered to children by adults. However, future work would have to empirically evaluate the effects of positive psychology approaches on increasing honesty within educational settings.

Additionally, the current findings suggest that children with CP may require direct instruction and overt teaching about prosocial lying. By having children practice such scenarios and describe the social expectations, these children may behave more prosocially and avoid blunt truths, which are generally perceived as rude. These skills may have immediate benefits for children with CP as they interact with their typically-developing peers.

These results contribute to a growing body of literature regarding the development of deception. Further, the current study may assist in better understanding the early signs of CP as deception appears to develop atypically. By addressing potential cognitive weaknesses for children with CP while simultaneously teaching about the merits and shortcomings of deception, children may adopt less antisocial behavioural patterns. Through increasing our understanding of a common symptom in a clinical population, we may be able to better target interventions in a way that may potentially impact the course of development for children with CP.
REFERENCES


The


APPENDIX A

Ethics Approval Letter

UNIVERSITY OF TORONTO

OFFICE OF THE VICE PRESIDENT, RESEARCH

PROTOCOL REFERENCE # 25664

October 20, 2011

Dr. Kang Lee
DEPT OF HUMAN DEVEL & APPL. PSYCHOLOGY
OISE/UT

Dear Dr. Lee,

Re: Your research protocol entitled, “Deception in Children with Disruptive Behaviour Disorders”

ETHICS APPROVAL

Original Approval Date: November 3, 2010
Expiry Date: November 2, 2012
Continuing Review Level: 2
Renewal: 1 of 4

We are writing to advise you that you have been granted annual renewal of ethics approval to the above-referenced research protocol through the Research Ethics Board (REB) full board review process. Please note that all protocols involving ongoing data collection or interaction with human participants are subject to re-evaluation after 5 years. Ongoing research under this protocol must be renewed prior to the expiry date.

Please ensure that you submit an Annual Renewal Form or a Study Completion Report 15 to 30 days prior to the expiry date of your protocol. Note that annual renewals for protocols cannot be accepted more than 30 days prior to the date of expiry as per our guidelines.

Any changes to the approved protocol or consent materials must be reviewed and approved through the amendment process prior to its implementation. Any adverse or unanticipated events should be reported to the Office of Research Ethics as soon as possible. If your research is funded by a third party, please contact the assigned Research Funding Officer in Research Services to ensure that your funds are released.

Best wishes for the successful completion of your research.

Yours sincerely,

Margaret Schneider, Ph.D.,
REB Chair

Dean Sharpe, Ph.D.
REB Manager

OFFICE OF RESEARCH ETHICS
McMurtry Building, 12 Queen’s Park Crescent West, 2nd Floor, Toronto, ON M5S 1S8 Canada
Tel: +1 416 946-3273 Fax: +1 416 946-5763 ethics.review@utoronto.ca
http://www.research.utoronto.ca/for-researchers-administrators/ethics/
Dear Parent/Legal Guardian,

You and your child are invited to participate in a study looking at why children may lie that is being conducted by the Child Development Research Group at the University of Toronto and the Child Development Institute. This study involves a 1-hour session with your child as well as your participation in providing information on your child’s behaviour. Our goal is to gain a better understanding of how your child thinks, uses his/her memory, processes and organizes information during various situations in which some may lead to a possible lie-telling.

In this study, your child will participate in interactive games with our researchers and will be informed that for some games they will receive a prize for completing the task and for others they will not. Your child will also be encouraged to take part in an activity that they were previously asked not to do. Your child’s behaviour and responses to questions about this activity will be recorded with several hidden cameras. Your child will also participate in a variety of memory, organization and language activities. We would also like to gain an understanding of your child’s behaviour in multiple settings so in addition to your ratings of their behaviour at home, we would like to send a brief questionnaire to his/her teacher.

Participation in the study is completely voluntary. You or your child may withdraw from the session at any time, for any reason, without loss of compensation which will be given to all children regardless of performance or completion of tasks. Risks to participants are considered. We will explain the study in more detail to your child at the end of the session. In addition to keeping this consent form, you will also receive a form that includes a detailed explanation of the study’s purpose and our contact information should you have any questions or concerns.

The information gathered for the study is confidential, except as required by law and is secured at the Institute of Child Study. All gathered information will be combined with data collected from other participants and only group norms will be reported. Please feel free to call Dr. Kang Lee at (416) 934-4597 if you have any questions about the study. You may also call the Ethics Review Office at (416) 946-3273 to inquire about your child’s rights as a research participant, or to report research-related problems.

Sincerely,

Dr. Kang Lee  
Professor & Director  
OISE/University of Toronto  
Phone: 416-934-4503  
Email: kang.lee@utoronto.ca

Megan Brunet  
Graduate Research Assistant  
OISE/University of Toronto  
Phone: 416-934-4503  
Email: megan.brunet@utoronto.ca
Having read the enclosed materials, I (check one):

_____ Allow my child to participate       _____ Do not allow my child to participate

Child’s name: __________________________ Child’s birth date: __________________ (day/month/year)

Mailing Address: __________________________ Phone #: __________________

.................................................................................................................................

Email: __________________

In order to gain a complete understanding of my child’s behaviour, I understand that my child’s teacher will be contacted to complete a questionnaire. I understand that my child’s teacher will not be informed of how my child performs in this study.

_____ I consent to my child’s teacher being contacted       _____ Do not contact my child’s teacher

Teacher Name: _________________________________________

Contact info (email address, phone number, school name, etc):

________________________________________________________________________________

Parent/Guardian signature: __________________________ Date: ________________

I would like to ask your permission to use your child’s video tape in a future study. This study will involve adults viewing many video clips from the present study and attempting to determine if the child is lying or telling the truth. The following standards apply to these videos:

1) No identifying information about me or my family will be available to viewers or published without my permission.
2) Recordings are available for my viewing and will be erased at my request.
3) Recordings will NOT be used for television or internet broadcasts.
4) Videos are kept on password protected electronic storage and will be destroyed in 7 years.

Please feel free to ask us for more information about this study.

_____ Yes, my child’s video may be used in a future study

_____ No, my child’s video may not be used in your future study

Parent’s/Guardian’s signature: __________________________ Date: ________________

Please provide your contact information if you would like a summary of the results:

☐ Same as above

Mailing Address: __________________________ Email: __________________

Would you be willing to have us contact you at a later time for related research?

_____ YES       _____ NO

If yes, please provide your contact information (if not provided above)

☐ Same as above

Mailing Address: __________________________ Phone #: __________________

.................................................................................................................................

Email: __________________
APPENDIX C

Child Assent Form

You understand that you are being asked to help with a study where you will play many different games, like games with numbers, words and pictures. You do not have to participate if you do not want to. Being in this study is up to you and no one will be upset if you don’t want to participate, or if you change your mind and want to stop. You know that you can ask any questions, take a break if you need to, or you can stop participating at any time for any reason.

Signature of an adult witness ____________________________ Date ________________
APPENDIX D

Parent and Child Debriefing Procedure

Parents and children will be debriefed separately, given an opportunity to ask questions, and then be reunited. Once together, parents and children will have an additional opportunity to ask questions. Though they will be debriefed separately, both debriefings will follow the same general format and be developmentally appropriate:

**Purpose of the study**
Children and parents will be informed of the purpose of the study. We will explain that we asked the other research assistant to play with games in the red bin that the child was not supposed to play with. We will state that we want to know what children would do when they break a rule and think that there might be consequences, like not getting a prize. We will explain that some of the boys and girls who break the rules tell us the truth, and some do not. We will assure the child that no one did anything wrong; these games were for fun and this was a special situation.

**Video cameras**
We will show children the video cameras and discuss the purpose of them. We will reassure participants that no one will be able to see these videos without permission. We will also inform participants that we will erase the DVD recording within seven years.

**Previous findings**
The experimenter will explain to children (and their parents) the general findings of earlier studies using the same procedure. For example, we will tell children that sometimes boys and girls do not tell the experimenter that they played with the games and sometimes boys and girls tell the experimenter that they did. We will also tell the child that the games we play are special and, because we are only playing games. However, we will also tell children that it is not always a good idea to pretend they didn’t do something they really did. Noting the difference between our experimental situation and the child’s life outside the laboratory will allow us to begin discussing situations in which lie-telling may be a good/bad idea. We will also discuss with the children (and their parents) about the contexts in which truth-telling is expected. For example, we may talk with the child about how lying about doing something bad might get them into more trouble; they might get into trouble for committing some kind of transgression and also for lying about it. Historically, this discussion is difficult to script exactly the same for each child, as parents often contribute by providing examples of the child’s life at home and situations in which the child’s lie-telling or secret-keeping may have been a good decision or a bad decision.

**Contact information**
We will give a debriefing document to parents (see brochure following this page). Parents will be informed of the person and phone number to contact should there be any concerns or questions. Parent will also be asked for their oral permission to include their names and information (i.e., contact information, name, date of birth, and sex of child(ren), languages spoken) in our participant database.