# Assessing the Veracity of Children's Reports: The Influence of Cognitive Load and

Cross-Examination Questioning

Christine Saykaly

Department of Educational and Counselling Psychology PhD School/Applied Child Psychology McGill University, Montreal

July 7, 2015

A thesis submitted to the Faculty of Graduate and Postdoctoral Studies of McGill University in partial fulfillment of the requirements of the degree of Doctor of Philosophy in School/Applied

Child Psychology

© Christine Saykaly, 2015

### Abstract

Lie-telling reflects a child's emerging cognitive maturity, as the child begins to understand others' mental states and behaviours, while simultaneously learning to control his or her own. Given the importance of obtaining and assessing the veracity of children's reports, there is a need for developmentally appropriate interview procedures for children. This dissertation is comprised of three manuscripts that collectively contribute to the literature by documenting: (1) children's ability to maintain the veracity of their reports about an event; (2) adults' ability to detect deception in children's true and false reports of the event; and (3) the individual cognitive factors of children that predict detection rates while undergoing a highly taxing cognitive load cross-examination procedure. The current research examines children's true and false reports during cross-examination procedures that are non-suggestive and non-leading but tax cognitive load (i.e., reverse order questioning). The three manuscripts are unique as they include children reporting true denials, true assertions, false denials or false assertions. The first manuscript reports on 9 to 12 year old ( $M_{age in months} = 131.00$ , SD = 14.77) children's ability to maintain a true or false statement across four question types including open-ended, prompted, reverse and chronological sequencing questions. Results of the first study indicate that overall, 69% of children were able to maintain their reports. However, truth-tellers demonstrated greater ease at maintaining their condition across all questions. Regardless of question type (reverse-order or chronological order), children had difficulty recalling information sequentially. The second manuscript reports on adults' ability to accurately identify the veracity of children's statements, as well as to rate perceived credibility and believability of the child undergoing the aforementioned cross-examination procedure. Adults ( $M_{age in years} = 20.43$ , SD = 1.45) detection rates hovered at chance levels for both direct- (49.40%) and cross-examination (52.30%). In

comparison to accuracy judgments after direct-examination, when children were reporting a false event, accuracy judgments increased after cross-examination. The third manuscript explored which cognitive factors are predictive of detection rates. Inhibitory control, as measured by the Stroop task, was the only measure that predicted accuracy judgments during the directexamination. Theory of mind, planning, and working memory predicted accuracy rates, regardless of the veracity of the child's statement, during the cross-examination. Taken together, findings from these three studies provide insight into how to interview children and assess their eye-witness reports in forensic settings. Specifically, the current study proposes that high cognitive load questions are used as an alternative to the current courtroom and forensic interviewing procedures. Also discussed are the implications of this research for school psychologists who work with children who may disclose abuse.

Keywords: Deception detection, lie-telling, question type, cross-examination

### Résumé

L'acte de dire un mensonge reflète la maturité des capacités cognitives d'un enfant. L'enfant doit comprendre les états mentaux et les comportements d'un autre tout en contrôlant ses propres pensées et comportements. Étant donné l'importance d'obtenir et d'évaluer la véracité des déclarations des enfants, il est nécessaire de trouver une procédure d'entrevue qui tient compte du niveau développemental de l'enfant. Cette thèse est composée de trois manuscrits qui contribuent collectivement à la littérature en documentant : (1) l'habileté des enfants à maintenir un rapport à propos d'un événement; (2) le taux de détection, par des adultes, de la véracité d'un témoignage honnête ou faux d'un enfant; et (3) les facteurs cognitifs individuels des enfants qui permettent de prédire la détection de la véracité du témoignage lors d'un contre-interrogatoire avec une charge cognitive très taxante. Cette thèse examine les vrais et faux témoignages des enfants qui subissent un contre-interrogatoire avec une charge cognitive, sans questions suggestives. C'est-à-dire, un questionnement à l'ordre inversé. Le premier manuscrit examine la capacité des enfants de 9 à 12 ans ( $M_{\text{âge en mois}} = 131.00$ , SD = 14.77) à maintenir un témoignage vrai ou faux lors de quatre types de questions : de sonde non-suggestives, de clarification, à séquence inversée et à séquence chronologique. Les résultats de cette étude indiquent que plus de 69% des enfants, peu-importe de la véracité de leur témoignage, étaient capable de maintenir leur condition à travers les questions. Les enfants ont eu de la difficulté avec toutes les questions séquentielles. Le deuxième manuscrit décrit l'habileté de l'adulte à identifier la véracité et la crédibilité d'un témoignage véridique ou déceptif lors du contreinterrogatoire avec une charge cognitive élevée. Les taux de détection des adultes ( $M_{age} = 20.43$ , SD = 1.45) étaient semblables au niveau de chance pour l'interrogatoire principal (49.40%) et le contre-interrogatoire (52.30%). En ce qui concerne les jugements de

### QUESTION TYPE AND CROSS-EXAMINATION

véracité de témoignages non-véridiques, il y a eu une amélioration après le contreinterrogatoire. Le troisième manuscrit explore les facteurs cognitifs qui peuvent prédire les taux d'identification de véracité du témoignage des enfants. Le contrôle inhibitoire, mesuré par le Stroop, était le seul qui pouvait prédire les jugements après l'interrogatoire principal. Par contre, peu-importe la véracité du témoignage, la théorie de l'esprit, la planification et le mémoire de travail sont les facteurs cognitifs qui peuvent prédire les jugements après le contreinterrogatoire. En bref, les résultats de ces trois études contribuent à nos connaissances sur la façon d'évaluer les rapports d'enfants témoins et comment d'interroger les enfants dans les milieux judiciaires. Plus précisément, ce programme d'étude présente une alternative de questionnement à la salle d'audience et lors des procédures d'entrevue judiciaire. Les implications pour psychologues qui travaillent avec des enfants, qui peuvent révéler un abus, sont également discutées.

*Mots-clés* : Détection de la déception, témoignage véridique ou faux, contr<u>e</u>interrogatoire, types de questions

### Acknowledgements

First and foremost, I would like to acknowledge the guidance and the support of my Master's and doctoral supervisor, Dr. Victoria Talwar. The knowledge I have gained from your supervision is unquantifiable. The opportunities, skills and experiences gained while being one of your graduate students has afforded me are countless and very much appreciated. You believed in me, event in moments when I did not believe in myself and pushed me to attain both academic and professional goals. I am grateful for your mentorship, and look forward to many years of collaboration.

I would also like to acknowledge the members of my advisory committee for your support and guidance throughout the dissertation process. Dr. Angela Crossman for your insightful guidance and encouragement from the conceptualization to the writing of these manuscripts, as well as Drs. Ron Stringer, and Nancy Heath for your contributions towards the successful completion of this dissertation.

There were many weekends and summers spent in Duggan House collecting data for this research, and for many other projects associated with the Talwar Research Team. Countless laughs heard and tears shed, while in the process, friendships forged that I would forever cherish. Mina Poliger, Cindy Arruda, Sarah-Jane Renaud, Kelsey Moore and especially Shanna Williams, your support, countless edits, words of encouragement, and most importantly your comradery define my doctoral experience. To Sarah Yachison, thank you for all your help on the COURT project. My graduate school experience would not be complete without acknowledging the friends I have made within the program, especially those of my cohort. You have challenged me to think, grow, and believe in myself, and for that I thank you.

Most importantly, I would like to thank my parents Mark and Louise, and family, especially Michelle and Greg, for their endless love and support throughout this journey. Mom and dad, you have encouraged me from day one to be a strong and confident woman, to follow my dreams as there was never to be a glass ceiling for their "baby girl". There are no words to express how grateful I am for believing in me, and supporting me through this long process. I am blessed to be able to call you family.

I am indebted and grateful to the many families who willingly opened their homes, and gave of their time to contribute to this research endeavor. Without this generosity, this research, and degree, would not have been attainable. Finally, the completion of this research and my doctoral degree was made possible by doctoral research fellowships granted from the Fonds de recherche sur la societé et la culture (FQRSC).

### **Contribution of Authors**

The manuscripts presented in this dissertation are co-authored however I am the primary author on each. The first manuscript is co-authored by Dr. Angela Crossman, Mary Morris, and Dr. Victoria Talwar. The second and third manuscripts are co-authored by Drs. Victoria Talwar and Angela Crossman. As primary author, I have written each manuscript and this dissertation in its entirety. I have developed the studies included in this document, from design and selection of instruments, hypotheses and data analyses. My doctoral supervisor, Dr. Talwar, as well as my doctoral committee member Dr. Crossman, have supported this dissertation in an advisory capacity during conceptualization and formulation of research questions, as well as provided feedback and editorial revisions for all three manuscripts. Finally, Mary Morris served in an editorial capacity during the writing of the first manuscript.

# **Table of Contents**

Abstract	ii
Résumé	iv
Acknowledgments	vi
Contribution of Authors	viii
Table of Contents	ix
List of Tables and Figures	xii
List of Appendices	xiii
Introduction	14
CHAPTER 1: Review of the Literature	18
Development of Children's Lie-Telling Behaviour	18
Maintaining lie	19
Coaching Children to Give False Statements	22
Cognitive Abilities	25
ToM and lie-telling	25
EF and lie-telling.	26
Inhibitory control	26
Working memory	27
Planning	27
Cognitive load	28
Cross-Examination	30
Deception Detection	32
Principle Aim of Research Program	35
CHAPTER 2: Manuscript 1	37
Abstract	38
Question Type and Its Effect on Children's Maintenance and Accuracy During	
Courtroom Testimony	39
Children's Lie-Telling	39
Cognitive Load	40
False Reports	42
Cross-Examination	44
Current Study	45
Method	46
Participants	46
Procedure	46
Play session	46
The interview	47
Coding	48
Results	49
Open-ended Free Recall	49
Prompted Recall	50
Reverse Order Recall	51
Chronological Recall	52
Consistency Across Reverse and Chronological Questioning	52

Discussion	52
Maintenance	53
Accuracy	54
Limitation and Future Directions	55
References	57
Bridging Manuscripts 1 and 2	63
Chapter 3: Manuscript 2	65
Abstract	66
High Cognitive Load During Cross-Examination: Does It Improve Detection of	
Children's Truths and Lies	67
Children's Lie-Telling	67
Deception Detection	68
Taxing cognitive load	69
Current Study	71
Method	73
Participants	73
Video Stimuli	73
Design	75
Procedure	75
Results	76
Accuracy of Lie Detection	76
Credibility and Believability	79
Credibility	79
Believability	80
Discussion	81
Limitations and Future Directions	84
Conclusion	85
References	86
Bridging Manuscripts 2 and 3	96
Chapter 4: Manuscript 3	98
Abstract	99
How Individual Cognitive Factors Influences Detection of Child Witness Deception	100
Deception Detection of Children's Veracity	101
Emergence of Children's Lie-Telling	102
Lie-Telling and Cognitive Skills	102
ToM	103
Executive functions	103
Planning	104
Inhibitory control	104
Working memory	105
Cross-Examination	106
Current Study	106
Method	108
Participants	108
Materials	108
ToM measures	108

Executive function measures	109
Planning	109
Stroop	109
Working memory	110
The memory game	110
Hasbro's Operation Game	110
Procedure	111
Play session with children	111
Children's testimony- stimulus videos	111
Adult participants' lie detection	112
Results	112
Accuracy	113
Direct-examination	113
Cross-examination	114
Effectiveness	114
Believability	114
Credibility	115
Discussion	115
Accuracy	116
Perceptions of Child Witnesses	118
Limitation and Future Directions	119
Conclusion	119
References	121
Chapter 5: General Discussion	130
General Discussion and Original Contributions to Knowledge	130
Implications for School Psychology	135
Limitations and Future Directions	137
Summary	141
Bibliography	142

## List of Tables and Figures

### Manuscript 2

Table 1. Accuracy Ratings Compared to Chance
Figure 1.Veracity by interview interaction effect on accuracy of participants' lie detection93
Figure 2. Child witness credibility as a function of child age and veracity of children's reports
Figure 3. Child witness credibility as a function of child veracity and story type (assertion versus denials)
Manuscript 3
Table 1. Pearson Correlations of Cognitive Measures with Age [N=88]

	•	٠
X	1	1

# List of Appendices

Appendix A. Consent for Courtroom Study (Child Participants)	160
Appendix B. Consent for Detection Deception Study (Adult Participants)	162
Appendix C. Script for Courtroom Study	163
Appendix D. Opinion Questionnaire	166
Appendix E. Research Ethics Certificate	167

### Introduction

In recent years there has been an increased interest in child witness reports and in empirically examining children's lie-telling behaviour, especially in the forensic literature (e.g., Ceci & Bruck, 1993; Goodman & Melinder, 2007; London, Bruck, Wright, & Ceci, 2008). One reason for the increased interest is that children are often asked to testify in divorce and sexual abuse proceedings. As a result, there is much debate over the credibility and veracity of child witnesses and whether children understand what is being asked of them (London & Nunez, 2002; Morris, Laney, Bernstein, & Loftus, 2006; Robinson & McGuire, 2006; Talwar, Lee, Bala, & Lindsay, 2004). Although research findings indicate that younger children can be more suggestible than older children (Bruck & Ceci, 1999), researchers have also found that children as young as 3 years of age are able to accurately respond to questions (Ornstein, Gordon, & Larus, 1992). Also, it appears that children as young as 7 years old are able to report about past events and to produce accurate accounts of an event (Koriat, Goldsmith, Schneider, & Nakash-Dura, 2001) which indicates that overall, children's ability to recall is not as poor as once was assumed. Thus, children make capable witnesses when recalling an event they have experienced.

In legal contexts, one concern is whether children can tell plausible fabricated reports at the behest of another adult (e.g., the accused; Bond & DePaulo, 2006; Edelstein, Luten, Ekman, & Goodman, 2006; Talwar, Lee, Bala, & Lindsay, 2006), particularly in forensic settings. The few studies that have investigated children's false reports have found that children's ability to tell and maintain false reports improves with age, and is related to children's developing cognitive abilities (Talwar & Lee, 2008; 2011; Talwar, Gordon, & Lee, 2007). However, most of these studies lacked ecological validity in relation to clinical and judicial contexts as their findings were based on children providing only one or two short statements. When testifying in court,

witnesses usually receive both direct-examination from the prosecutor as well as crossexamination from the defense. Theoretically, cross-examination is used by lawyers to assist others in determining the accuracy and credibility of the witness' statements. In practice, lawyers may use cross-examination questioning to persuade the judge and jury of the lack of credibility of a given witness or argument rather than as a tool to accurately identify the truth (Henderson, 2002). With the increase in the rate of children being asked to testify (Bala, Lindsay, Lee, & Talwar, 2000), research is needed to examine the impact of cross-examination can also assist researchers in understanding the impact of cross-examination on adults' assessment of the veracity of children's statements.

The purpose of the current program of study is to identify questions that would facilitate the identification of false reports made by children. Additionally, this program of research will examine the influence of cognitive factors on children's abilities to maintain true and fabricated reports when cross-examined. The proposed program of research aims to determine whether children of 9 to 12 years of age are able to give accurate and consistent reports while being questioned by interviewers using different types of questions; namely, open-ended and prompted recall during direct-examination, and reverse-order and chronological-order recall during crossexamination. In addition, the relation between children's abilities to maintain their reports and their cognitive abilities, such as executive functioning and theory of mind, will be investigated. Given the scarcity of research on children's truth- and lie-telling *and* the lack of forensically relevant research, this program of research will have important implications for understanding both the development of children's ability to make false statements and applied questions regarding the impact of questioning techniques on children's reports.

This research program includes three manuscripts that explore: (a) children's ability to give and to maintain true or false reports about an interaction, (b) adults' ability to detect the veracity of their statements, and (c) whether there are any individual cognitive factors that can predict detectability. All of these studies are presented in separate manuscripts. However, each study represents a continuous progression in this field of research. Specifically, the first manuscript, "Question Type and Effect on Children's Maintenance and Accuracy During Courtroom Testimony" (Saykaly, Crossman, Morris, & Talwar, under review at the Journal of Forensic Practice), presented in Chapter 2, describes children's ability to maintain a truth or a lie across four different question types (open-ended recall, prompted recall, reverse-order recall, and chronological recall). Children participated in activities during a home visit and were asked to recount this interaction in a mock-courtroom proceeding approximately one week later. The second manuscript, "High Cognitive Load During Cross-Examination: Does It Improve Detection of Children's Truths and Lies?" (Saykaly, Crossman, & Talwar, under review at Behavioural Sciences & the Law), described in Chapter 3, adults were asked to judge the veracity of children's statements using a high cognitive load cross-examination procedure. Finally, the third manuscript, "How Individual Cognitive Factors Influence Detection of Child Witness Deception" (Saykaly, Talwar, & Crossman, under review, Applied Cognitive Psychology), described in Chapter 4, investigates whether there are individual child factors that predict detection rates, and whether these factors also influence adults' perceptions of children during courtroom testimony. Each manuscript contains its own introduction, methods, results and discussion sections. Chapter 1 reviews the literature on children's lie-telling and maintenance of lies, on cross-examination, and on recent trends in deception detection research,

and Chapter 5 integrates and discusses the findings of the three manuscripts and their contributions to the fields of forensic, cognitive, and developmental psychology.

### **Chapter 1: Review of the Literature**

In forensically relevant settings, children's willingness and ability to lie at the request of another continues to be an under-explored area of research. It is well documented that children can and will lie (e.g., Talwar & Lee, 2002a), but less is known about the factors that influence their ability to lie. The intent of this program of research is to gain a better understanding of children's abilities to report true and false accounts in courtroom proceedings. Specifically, to gain a better understanding of the individual child factors that may influence the detectability of false statements, to explore children's abilities to maintain a false account, and to evaluate the effectiveness of a high cognitive load cross-examination procedure with children. As such, this chapter includes a review of the literature on children's lie-telling in relation to their age, on the influences and implications of coaching, on the cognitive factors association with lie-telling, on deception detection, on the impact of taxing cognitive load, and on cross-examination.

### **Development of Children's Lie-Telling Behaviour**

The development of children's lie-telling has been documented in research since the early part of the 20th century (Piaget, 1932, 1965). A false memory occurs when a person incorporates information into memory from external or internal influences and truly believes their memory is accurate and truthful (Reyna & Lloyd, 1997). Contrary to a false memory, a lie or false statement, is a fabricated story such that a person knowingly provides false information with the intent to deceive another. Previously, adults thought young children were unable to, or very poor at, producing false statements (Yang et al., 2005). However, recent studies have found that children below the age of 3 are able to make a false statement (Ahern, Lyon, & Quas, 2011), are able to lie intentionally to deceive another, and can engage in some types of deceptive behaviour (Chandler, Fritz, & Hala, 1989), such as keeping a secret or lying to protect

themselves from getting into trouble (Lewis, Stanger, & Sullivan, 1989; Polak & Harris, 1999; Talwar & Lee, 2002a, 2008). Although research findings have shown that even 2 year olds are able to tell lies to conceal a transgression (e.g., Evans & Lee, 2013), it is not until 4 years old that this behaviour becomes normative (e.g., Talwar & Lee, 2002a, 2008), as lie-telling rates of transgressors exceed 70% (Lee, 2013).

Toddlers and preschoolers' lies are simple, using few words (Evans & Lee, 2013; Lewis et al., 1989; Talwar & Lee, 2002a). However, older children are able to formulate more complex and elaborate lies, which suggests that older children's lies may be more difficult to identify (Talwar, Gordon, et al., 2007). As children grow older, their reports, regardless of their veracity, increase in verbosity, complexity, and descriptive detail (Craig, Sheibe, Raskin, Kircher, & Dodd, 1999; Goodman & Reed, 1986; Pipe, Lamb, Orbach, & Esplin, 2004; Vrij, 2005). Children also become better at maintaining their reports, even across multiple questioning sessions (Gilbert & Fisher, 2006; La Rooy, Pipe, & Murray, 2005; La Rooy, Katz, Malloy, & Lamb, 2010). Indeed, lie-telling is a complex task that requires cognitive maturity; a child must be able to understand others' mental states and behaviours, while simultaneously learning to control both their verbal and non-verbal behaviours.

**Maintaining lies.** There are two components one must remember in order to lie successfully. First, a lie-teller must be aware of the mental state of the lie-recipient. Second, the lie-teller must simultaneously maintain their expressive behaviour in order to remain consistent with their lie. In other words, the lie-teller must regulate his or her expressive behaviours to avoid inconsistencies between the behaviours and the lie (Saarni, 2011). This involves both verbal and non-verbal expressive control. This requires one to plan a story, either immediately or with some rehearsal, in order to appear truthful and convincing. Although some researchers posit that there are non-verbal cues to deception (e.g. Ekman & Friesen, 1969), none are universal. As such, although children may have their own individual non-verbal cues, there are no universal non-verbal cues that may help adults to reliably ascertain the veracity of children's statements (Lewis et al., 1989; Talwar & Lee, 2002a; Talwar, Murphy, & Lee, 2007). For instance, Talwar and Lee (2002a) found when evaluating truth- and lie-tellers between 3 and 7 years of age, raters were unable to accurately evaluate the veracity of the statements. Although analysis of children's non-verbal behaviours revealed that smiling was the only non-verbal marker of deception, adults were not able to differentiate lie-tellers from truth-tellers when watching video-clips on the basis of their non-verbal behaviours. However, non-verbal behaviour is not the only means through which children's lies can be detected. Verbal behaviours have the potential to be revealing as well. For example, Saykaly, Talwar, Lindsay, Bala, and Lee (2013) found that temporal markers (e.g., first, then, after, before) and selfreferences (e.g., I, me, we) differ between truth-tellers and lie-tellers. In order to lie successfully, a liar must monitor the content of their statements to ensure they remain consistent, particularly in subsequent false statements that are related to their initial lie. Sustaining an elaborate lie necessitates a situation-specific evaluation of what should be said or omitted, and this is different from denying a transgression, which often requires a simple one to two word response (Lee, 2013; Polak & Harris, 1999; Talwar & Lee, 2008). Children must regulate and monitor their verbal cues as well as statements made in the context of a lie to avoid leaking information that might reveal their transgression.

Indeed, several studies have found age differences between preschool children and older children's abilities to maintain their lies (Talwar, Gordon, et al., 2007; Talwar & Lee, 2002b). In one study, although younger children disclosed significantly more incriminating information

when answering follow-up questions after falsely denying a transgression, approximately half of 6 and 7 year-olds maintained their lies, as they were able to conceal information that would reveal deceit (Talwar & Lee, 2002a). Based on transcriptions of children's reports, when adults were asked to judge which children were lying and which were telling the truth, they were able to easily detect the veracity of younger children who revealed their transgressions verbally. However, older children who were able to maintain their lies were indistinguishable from children who were telling the truth. This age trend continued with older children between 6 and 11 years of age (Talwar, Gordon et al., 2007). Children's ability to maintain false denials about a transgression through repeated questioning significantly improved with age. Thus, it appears that young children are inadequate in their ability to maintain their lies and as a result, are not skillful lie-tellers. However, as children get older, their ability to conceal their verbal lies significantly improves.

Adults perceive older children's statements to be more credible, and as such, are less able to accurately distinguish between their true and intentionally false statements (Feldman & White, 1980; Leach et al., 2004; Talwar et al., 2006). In other words, as children age, their ability to convincingly deceive others improves. It should be noted that in these studies children were only giving short reports and were only asked a handful of follow-up questions to assess their veracity. It remains unclear how well children are able to maintain fabricated reports that involve more complex accounts (i.e., more details to recount) and extended questioning. Most studies that have investigated children's deception have focused primarily on the child's willingness and ability to conceal their *own* transgression. Few studies have investigated children's about an event which involved another.

### **Coaching Children to Give False Statements**

There are a number of factors that influence the likelihood that children will lie. For example, an adult's behaviour can influence children's honest reporting. In a study by Hays and Carver (2014), children 3 to 7 years of age were invited into the testing room, either under a false pretense of a large bowl of candy when there was none, or by the truth of a really fun game. Results showed that children who saw a researcher lie were more likely to subsequently lie about their own transgression, compared to those who witnessed the researcher tell the truth. Talwar, Arruda, and Yachison (2015) found that children were more likely to be honest about a transgression when given external praise (i.e., it would make me happy if you told the truth) versus internal praise (i.e., it is really important to tell the truth). This influence was also observed when children were read books about the benefits of truth-telling verses the consequences of lie-telling. Talwar, Yachison, and Leduc (under review) found that children who were read George Washington and the Cherry Tree (a story promoting truthfulness) were significantly more likely to be honest about an adult's transgression than children who were read The Boy Who Cried Wolf (a story highlighting the negative consequences of lying). To further strengthen the influence that adults' behaviours have on children, Fu, Heyman, Chen, Liu, and Lee (2015) found that children were more likely to trust adults who lied to benefit others, versus adults who told a self-serving lie. The results of these empirical studies have highlighted the influence that an adult can have on children's honesty and trust. However, in legal settings, the concern is that children may be asked to lie on behalf of another.

Research investigating coached reports is especially relevant to forensic settings given children's involvement in custody proceedings or child abuse cases. Unfortunately, parents often use their children as pawns during custody proceedings in order to ensure that they obtain guardianship (Weisz, Beal, & Wingrove, 2013). Parents may ask their children to lie about the other parent to show the courts that their spouse is unfit to care for their child. As for victims of abuse, there is often pressure placed on the child by his or her abuser, and at times even by his or her family, to conceal the transgression of the abuser. Abusers often place enormous pressure on their victims in the hopes that their victims will not disclose the transgressions (Herman, 1981; Summit, 1983). Claims of coaching are a recurrent defense strategy, particularly during cases of alleged sexual abuse or guardianship during divorce, with some experts estimating rates of false reports to be as high as 20% (Jones & Seig, 1988). Furthermore, in such cases, children are often testifying about an interaction between themselves and an adult transgressor. An issue that arises for both psychologists and legal professionals is the difficulty in identifying children who are lying to cover for their parents or other adults. At times, the adult involved may ask the child to protect him or her by persuading the child to withhold information, to fabricate information, or to keep a secret (Lyon, et al., 2008; Talwar et al., 2004; Yachison & Talwar, 2012). Based on previous literature, older children are more likely than younger children to conceal the transgressions of an adult (see Talwar & Crossman 2012 for a review). Given adults' difficulties in identifying deceptive statements of children (e.g., Edelstein et al., 2006; Orcutt, Goodman, Tobey, Batterman-Faunce, & Thomas, 2001; Vrij, Akehurst, Soukara & Bull, 2004), investigating older children's abilities to create and maintain complex lies, particularly when coached, is of vital importance.

There have been mixed findings regarding the influence of coaching on children's willingness to lie. Some researchers have found that children were more likely to lie and to maintain their lie through follow-up questions after being coached (Lyon et al., 2008; Yachison & Talwar, 2012); however, other researchers have found that even when coached, children will

often confess to the transgression of another (Talwar et al., 2004). In each of these studies, children were asked to lie about a transgression, during which they had to conceal or omit information about an event that had actually occurred. In other studies, adults have coached children to fabricate stories about events that have never happened. For instance, Lyon et al. (2008) found that children lied in order to conceal the transgression of an adult. When asked by the transgressor, children were capable of fabricating details about an event.

Few researchers, however, have investigated children's false denials and false assertions, and children's ability to maintain such reports when being questioned. Further, few studies have explored the effect of coaching on children's false denials and false assertions and liemaintenance. Thus, examining whether children can be coached to conceal the transgression of another, or fabricate false details of an interaction to protect the adult, is of great interest to this field of research. Furthermore, maintenance of such reports should be investigated given the important implications in forensic and judicial settings.

Investigating the factors that may influence children's abilities to maintain believable false reports, including cognitive factors and questioning style is of particular importance. For example, older children sometimes invent elaborate lies, especially in cases of abuse or neglect. Coulbourn Faller (2007) found that non-disclosure rates of child abuse can be high as 33 to 94 percent, as admitted by individuals in adulthood. These findings suggest that many children do not speak of their abuse until adulthood, which highlights the need to help children feel comfortable disclosing when the abuse is actually occurring. In addition, older children may be able to provide more detailed and accurate false allegations (Lyon, 1995; Trocmé & Bala, 2005), specifically in divorce or abuse proceedings and particularly at the behest of an adult. As such, it is important to investigate the lie-telling abilities of older children.

### **Cognitive Abilities**

Research has found that the emergence and development of children's lie-telling abilities are related to their cognitive development (e.g., Evans & Lee, 2011; Talwar & Crossman, 2011). Specifically, lie-telling is associated with the development of theory of mind (ToM) and executive functioning (EF) abilities. Therefore, cognitive factors and EF skills, and their relationship to lie-telling, will be briefly explored to highlight existing research.

**ToM and lie-telling.** ToM is the ability to attribute mental states to others, as well as an understanding that others have mental states that differ from one's own (Perner, Ruffman, & Leekam, 1994). Specifically, ToM is the understanding that both beliefs and desire determine behaviour, and that other people's beliefs and desires are not necessarily the same as one's own (Perner et al., 1994). As the goal of deceit is to convince another of an alternative to the truth, one must understand the difference between what they know to be true, and what must be conveyed to convince the other of a false truth. Typically, false belief tasks or appearance reality tasks are used in order to assess one's ToM development. False belief can be further divided into first-order false belief (i.e., an attribution of a false belief with regards to an actual event) and second-order false belief (i.e., the attribution of a false-belief based on the thoughts of another) (Perner & Wimmer, 1985; Wimmer & Perner, 1983). In other words, second-order belief requires one to predict what another's thoughts are, and to successfully convey such thoughts to someone else.

Evidence exists to support the relationship between lie-telling and ToM because telling a false statement necessitates one to deliberately create a false belief in the mind of another (Polak & Harris, 1999; Talwar & Lee, 2008). For instance, Polak and Harris (1999) found that children between 3 and 5 years of age, who had higher ToM scores, were more likely to give a false

denial when asked if they had peeked at a forbidden toy. This finding was corroborated by Ma, Evans, Liu, Luo and Xu (2015) found 3 year olds with better developed ToM also were more likely to lie about a dishonest act. Furthermore, Talwar and Lee (2008) found that false denials were related to first-order belief understanding (deliberately creating a false belief in another), and that the ability to maintain a lie through follow-up questions was related to second-order false belief (understanding that other people may know things that we do not). Therefore, the authors suggested that older children, who have developed second-order ToM, are better able to maintain their lie across repeated questioning. Thus, increased ability to understand the perspective of another can increase one's ability to strategically craft one's lie to appear plausible to the questioner. To further strengthen the link between ToM and lie-telling, one can turn to the literature on children with an Autism Spectrum Disorder (ASD). Children with ASD who have poorly developed ToM (Baron-Cohen, 2001) are also unable to effectively be deceptive, therefore highlighting the link between ToM and deceptive behaviours (Talwar, et al., 2012).

**EF and lie-telling**. Researchers have posited a relationship between deception and executive functions (Carlson & Moses, 2001). Executive functioning is a set of higher order psychological processes (Zelazo & Muller, 2002), such as decision-making, inhibitory control, planning, and other goal oriented behaviours (Welsh, Pennington, & Groisser, 1991). Lying is goal oriented as it is the attempt to convince others of an alternative reality to the truth. Previous research has investigated the relationship of children's lie-telling and executive function (Talwar & Lee, 2008). In particular, inhibitory control, planning and working memory are likely related to lie-telling (Evans & Lee, 2011; Lee, 2013; Talwar & Crossman, 2011).

*Inhibitory control.* Inhibitory control is the ability to suppress one's thoughts, feelings and actions (Carlson, Moses, & Breton, 2002). This EF is important when lying as one must

inhibit what one knows to be true, to generate a false statement that will instill a false belief in another (Carlson, Moses, & Hix, 1998; Carlson et al., 2002). Furthermore, through additional questioning, one must inhibit the truth time after time to remain consistent. Talwar and Lee (2008) found that children 3 to 8 years with better-developed inhibitory control were more likely to lie than those who confessed to a transgression, providing further evidence that inhibitory control has an influence on children's ability to produce deceptive statements. It is not clear how it influences credibility, however, though it is expected that poor inhibitory control would undermine a child's ability to appear credible when lie-telling.

*Working memory.* Working memory (WM) is the ability to temporarily hold information in one's mind, and manipulate the information to generate a response (Baddeley, 1986). When fabricating a false story beyond one or two short statements, working memory plays a central role in deceptive ability (Gombos, 2006). Working memory capacity develops from preschool to later elementary school (Geary, Hoard, Byrd-Craven, & DeSoto, 2004). Many studies have used tasks that combine WM with inhibitory control (e.g., day/night Stroop; Evans & Lee, 2013; Talwar & Lee, 2008). To date, no study has investigated the link between a pure WM task and deception abilities during long narratives.

*Planning.* Longer, more elaborate lies require an element of planning, as the liar must prepare their story prior to reporting it to maintain consistency. In a study investigating the neural correlates associated with verbal deception, Ding, Sai, Fu, Liu, and Lee (2014) used functional near-infrared spectroscopy to determine that during verbal deceptive tasks, the regions of the brain associated with planning complex actions are activated. Furthermore, Evans and Lee (2011) investigated the executive functioning skills related to lie-telling among 8 to 16 year old children, and found that children with greater planning abilities were better able to conceal

information and construct more sophisticated lies. Thus, it seems likely that children with better planning abilities would make more credible lie-tellers.

Lie-telling seems to reflect children's emerging cognitive maturity as they begin to understand others' mental states and behaviours, while at the same time learning to control their own behaviour. Although a number of developmental studies have examined the relationship between the development of lying and cognitive abilities such as ToM and EF, these studies were not designed to address applied issues that are relevant to clinical and forensic settings. Due to this, most of the studies only required children to give brief reports (one or two sentences). As a result, these studies do not reflect the type of lies that children may fabricate in forensic contexts, nor would the experimental procedures reflect the types of interviews children may undergo. Specifically, these studies fail to address intentionally fabricated reports involving both the child and another adult. They also do not examine children's maintenance of a fabricated report over multiple questionings, something which is evident within legal contexts. Given that inhibitory control and working memory develop with age, adolescents may be better able to conceal the truth. The current program of research seeks to address the gap in the literature by investigating fabricated reports made by children over multiple interviews about an interaction between themselves and another adult.

**Cognitive load**. Although developmental researchers have examined cognitive abilities such as ToM and EF in relation to children's lying, forensic researchers investigating deception detection have turned their attention to cognitive load as a possible method to increase detection accuracy. Cognitive load refers to the total amount of mental effort used during information-processing (i.e., attentional or working-memory) (Block, Hancock, & Zakay, 2010). Previous research has elucidated the impact lying has on adults' cognitive load. For example, a truth-teller

28

recalls information from a past event, while a liar must simultaneous manage their verbal and non-verbal behaviours, assess the mental states of the lie-recipient in order to appear truthful and consistent with their lie (DePaulo et al., 2003; Lee, 2013; Talwar & Lee, 2002a). There are many factors that are attributed to the increase in cognitive demand: (a) creating a lie that is believable can be cognitively taxing; (b) liars may not take their credibility for granted (DePaulo et al., 2003; Kassin, 2005), and will subsequently make more of an effort to control their emotional, physical, and mental states (Vrij et al.,2008); (c) liars may be watching the interviewer's reactions in order to adjust their lie accordingly and ensure believability (Buller & Burgoon, 1996); (d) liars have to monitor their non-verbal behaviours (DePaulo et al., 2003); (e) liars must suppress the truth while simultaneously creating a false report (Spence et al., 2001); and (f) reconstruction of a story is more cognitively taxing than the recall of an event (Gilbert, 1991). When someone is giving an elaborative false report, many of these factors may be influencing the quality of the report, particularly if one's planning abilities, working memory, and abilities to read social cues are less developed.

In itself, the act of lying is a complex mental task and as such, increases cognitive load. Van't Veer, Stel and van Beest (2014) supported this theory, as participants in their study were more likely to lie when their cognitive load was not limited than when it was taxed by other tasks. As such, researchers have suggested that one method of increasing detection of liars is to use questioning that further taxes their cognitive load (e.g., Vrij, Fisher, Mann, & Leal, 2006; Vrij et al., 2008). For example, Vrij et al. included reverse-order questions in their interview procedure to tax working memory demands, which resulted in an increase of the cognitive load demands of the participants. A comparison of Vrij and colleagues procedure to traditional interview procedures yielded better detection rates. In yet another study, Vrij, Leal, Mann, and Fisher (2012) further supported the reverse-order hypothesis as observers were better able to detect truth-tellers from lie-tellers when asked reverse-order questions than chronological order questions.

Liu et al. (2010) postulated that liars must plan what to say for an upcoming interview. Therefore, in creating their stories, liars attempt to anticipate what questions the interviewer may ask, so they can plan for the correct or plausible response. However, if asked an unanticipated question, liars are faced with the difficult task of attempting to reconcile their story and create a plausible response or, feign ignorance by stating "I don't know," or "I cannot remember." The latter responses may lead the audience to question the credibility of the statement; therefore, the lie-teller has to determine the best course of action in the moment. Liu et al. asked unanticipated questions to children 10 to 12 years of age, reporting a true or false event. Children reporting a false event reported planning their stories significantly more than children reporting a truthful event. Results of their study indicated differences in responses to unexpected questions between truth-tellers and lie-tellers. Liu et al. is the only paper to date to investigate the influence of taxing cognitive load demands with children. As yet, there has been little examination of children's lie-telling abilities and the manipulation of cognitive load. The current program of study will examine both the role of ToM and EF on children's abilities to maintain their lies when cognitive load is increased through questioning.

### **Cross-Examination**

The goal of cross-examination is to elicit new facts, elicit facts that incriminate, and to test the details previously provided (Park, 2003). Colloquially, cross-examination attempts to evaluate a witness' credibility based on the perception, memory, ambiguity, and sincerity of their statements (Park, 2003). Unfortunately, defense attorneys are often permitted to use leading and

30

suggestive questioning during cross-examination, which often confuses witnesses. This effect is exacerbated when the witness is a child (Goodman, Golding, & Haith, 1984; Henderson, 2002). In some situations cross-examination is effective, however in other situations truthful witnesses are perceived to be lying due to their difficulty in responding to cross-examination inquiries. For example, preschoolers may have difficulty under cross-examination, regardless of the veracity of their statements (Crossman, Segovia, & Miller, 2009). Furthermore, attorneys often use misleading questioning techniques during cross-examination. In a study conducted by Tobey, Goodman, Batterman-Faunce, Orcutt, and Sachsenmaier (1995), 6 and 8 year-old children truthfully recounted events that occurred with an unknown male research assistant a few weeks after the event. Results indicate that younger children were more likely to appear confused when responding to misleading questions during cross-examination.

Recently, Righarts, Jack, Zajac, and Hayne (2015) interviewed children 5 and 6 years old to better understand the influence that persuasive cross-examination techniques have on children's accuracy and consistency. Children were interviewed with direct-examination questions one to three days after an event. They were interviewed with the persuasive cross-examination either one day, three days, or eight months after their direct-examination. Results indicated that children were less accurate after the persuasive cross-examination regardless of time-delay (onethree days or eight months), and their reports were different from their original directexamination. However, when comparing the initial report to their second direct-examination interview occurring one week later, accuracy and consistency were similar. The negative impact of using misleading and suggestive questioning during cross-examination can also be observed with older children. In a study by Zajac and Hayne (2006), children 6 to 10 years of age changed approximately 40% of their responses during cross-examination. Furthermore, in another study of child sexual abuse victims between the ages of 5 and 13 who testified in court, three quarters of children changed at least one detail during cross-examination (Zajac, Gross, & Hayne, 2003). Thus, children have a tendency to change a significant amount of detail from their original true reports when questioned using suggestive questioning styles in cross-examination (Zajac & Hayne, 2006). This effect can also be seen even with older adolescents and adults as well. Jack and Zajac (2014) compared the accuracy of children (9-11 years), adolescents (14-16 years) and adults (25-60 years). All participants, regardless of age, made changes to their responses during cross-examination. As such types of questioning do not increase the accuracy of reports, child witness experts warn against using suggestive and misleading questions with children (Endres, 1997). Research with adults has suggested that using non-suggestive questioning, such as taxing cognitive load, increases deception detection rates (e.g., Vrij et al., 2008; Vrij et al., 2009). To date no research has examined the manipulation of cognitive load during cross-examination with children and if it influences adults' perceptions of children's testimony.

### **Deception Detection**

In line with research on child witness testimony, many researchers have focused their attention on identifying ways to detect deception. The majority of deception detection research has investigated the ability of legal professionals and lay-person's ability to "intuitively" judge the veracity of children's statements. Intuitive lie detection implies that veracity judgements are made instinctually, and are not grounded in any deception detection theory or technique (i.e., expert witness or polygraph; Leach et al., 2004). As previously discussed, even young children are able to provide reports containing deceit. How can one tell if a child is lying? This question is crucial, as children's accounts can be a deciding factor in courtroom proceedings and may be particularly influential in custody cases and cases involving abuse (Edelstein et al., 2006).

Although the majority of research on deception detection has focused on adults' lies, there are a handful of studies that have investigated deception detection in children. Recent research on adults' assessments of children's true and fabricated reports has found similar results to the adult literature. Many researchers who have investigated deception detection of children by untrained observers have found that detection rates of truthful and deceitful statements hover around chance levels (e.g., Bond & DePaulo, 2006; Edelstein et al., 2006; Honts, Kassin, & Craig, 2014; Stromwall, Granhag, & Landstrom, 2007). For instance, Talwar, et al. (2006) examined undergraduate student's ability to judge the veracity of 4 to 7 year old children given coached true and fabricated reports of an innocuous event. When the undergraduate students viewed videos of the children given either a true or a false account, they were not able accurately differentiate the veracity. Interestingly, the adult detectors did, however, demonstrate a truth bias. Although unable to discriminate, adult raters tended to rate the accounts as truthful, regardless of the veracity. Audio and video presentations of lies appear to yielded better detection rates than transcript presentations (Honts et al., 2014).

In another study by Edelstein et al. (2006), observers viewed videos of undergraduate students and 5 to 7 year old children discussing an interaction involving a research assistant (RA). The interaction consisted of playing a game with the RA, where half the participants were touched on their bare stomach, nose and neck, and half were asked to state they had been, even though they were never touched. Although observers were significantly better at accurately detecting the veracity of children's statements, the overall detection rate for both children and adults was 50%. Interestingly, results indicate that observers yielded better detection rates for true accounts of adults than the true account of children. Furthermore, Leach et al. (2009) found that across five experiments, adults had poor deception detection abilities when assessing the lies

of both adults and children. In summary, it appears that, overall, lay-people are not very accurate at detecting differences between children's true and fabricated reports.

However, current research investigating alternative questioning styles of adults' deception have found higher detection rates than in previous research. Vrij et al. (2008) investigated whether increasing cognitive load would facilitate deception detection. Researchers asked adult participants to recount their stories in reverse order in order to see if this questioning technique would facilitate deception detection. Half the participants (control group) played a game with a confederate in which a second confederate entered the room to find a lost wallet, and claimed money had been stolen. The other half (experimental) were instructed to take money from the wallet, and to state that they played a game with the confederate, but that they did not take the money from the wallet. Half of each group (control and experimental) were assigned to the high cognitive load condition where they were asked to recount their story in reverse order (regardless of veracity), while the other half were asked to recount their story in chronological order. Twelve video clips (all high cognitive load, or all chronological order) were then shown to police officers. Results indicate that accuracy was superior in the high cognitive load condition than in the chronological condition, which indicates that increasing cognitive load during questioning yields higher detection rates. Similarly, Vrij et al. (2009) found that asking unanticipated questions also improves lie detection. In their study, lie-tellers experienced significant more difficulty in answering unanticipated questions than truth-tellers.

There has been no investigation of the influence of increasing cognitive load during questioning on children's courtroom based reports. Given that the developmental research suggests that children's abilities to be skilled lie-tellers are still developing, and that these

abilities are related to their cognitive development, it may be that such questioning techniques may significantly increase adults' abilities to detect children's veracity.

### **Principle Aim of Research Program**

The findings from previous research have demonstrated that children are able to give false reports of an event at the behest of another (Talwar & Lee, 2008; 2011; Talwar, Gordon, & Lee, 2007). Results have shown that taxing the cognitive load of adults can lead to higher deception detection rates (Vrij et al., 2006; Vrij et al., 2012). The primary aim of this research program is to extend the literature on children's ability to testify in court. Specifically, the primary aim is to investigate whether the effects of taxing cognitive load will help or impede the detection of children's deception in courtroom settings. To address this goal, the current program of research will present three studies investigating the effects of using a high cognitive load cross-examination procedure on children's abilities to give a false statement, and adult's perception and detection of these statements. Each of these manuscripts contributes to the field of psycho-legal research in an effort to gain a better understanding of children's abilities to lie and maintain their lie across direct- and cross-examination, as well as adults' perceptions of child witnesses.

Manuscript 1 investigates children's ability to maintain a truth or a lie across both directand cross-examination. Specifically, their ability to maintain true/false denials/assertions across four different question types, as well as their consistency for sequential recall. The study offers insight in children's ability to maintain their story across multiple question types, yet highlights the difficulties children have with sequential recall. Manuscript 2 investigates adults' ability to detect the veracity of children's statements under a high cognitive load cross-examination. Research with adults has yielded better detection rates when cognitive load of the interviewee was being taxed, therefore the current manuscript sought to determine if the results were replicable with children. Finally, Manuscript 3 investigates whether individual cognitive factors associated with lie-telling, namely inhibitory control, planning, WM, and ToM, predict detectability of child witnesses. This program of study provides insight not only to the psycholegal research, but also discusses implications in the developmental and forensic research, as well as the implications for school psychology. Further, these three manuscripts are all interconnected. Manuscript 1 investigates children's ability to maintain a truth or a lie under direct-and cross-examination. Manuscript 2 builds on this study as it assesses adults' abilities to detect the veracity of these children's statements. Finally, Manuscript 3 explores, in depth, the cognitive factors associated with children's lie-telling behaviour.
# Chapter 2: Manuscript 1

Question Type and Its Effect on Children's Maintenance and Accuracy during Courtroom

Testimony

Christine Saykaly<sup>1</sup>, Angela Crossman<sup>2</sup>, Mary Morris<sup>1</sup> and Victoria Talwar<sup>1</sup>

McGill University<sup>1</sup>

John Jay College of Criminal Justice CUNY<sup>2</sup>

Author Note

This manuscript is accepted in a special interviewing edition of the Journal of Forensic Practice

# Abstract

The present study investigated the influence of question type (open-ended, prompted, reverse order and chronological order recall) on children's ability to maintain a truth or a lie in a two-part mock-courtroom study. Ninety-six children ( $M_{age} = 131.00$  months) between 9 and 12 years of age were asked to testify about an interaction with a Research Assistant the week prior. They were assigned to one of four conditions (true/false x assertion/denial). Results indicate that question type has an influence on children's ability to maintain their condition. Results also indicate that regardless of question type, children have difficulty recalling information sequentially. Implications of the current research support the use of various question types, including increasing the cognitive load demands, when interviewing children.

Question Type and Its Effect on Children's Maintenance and Accuracy during Courtroom

# Testimony

Concerns about child custody and abuse cases going to court suggest the importance of understanding children's lie-telling abilities. Truthfulness is a central issue for the justice system and failure to accurately assess the honesty of a child can result in very serious consequences for the child, the accused, and society as a whole. Thus, there is a great need to develop forensically and developmentally appropriate techniques that help front-line workers (e.g., police, social workers) obtain accurate and truthful reports. As research has shown that adults have difficulty assessing the veracity of statements, regardless of the age of the witness (Bond & De Paulo, 2006), more information is needed to better understand children's abilities and how they are affected by courtroom proceedings. In particular, there has been little research on the impact of different types of questions on children's ability to tell and maintain intentionally false reports, which was the focus of the current investigation.

### **Children's Lie-Telling**

Many children begin to lie at a very young age (e.g., Ahern, Lyon, & Quas, 2011; Evans & Lee, 2011, 2013; Talwar & Lee 2002, 2008). As children grow older, their reports, regardless of veracity, increase in length, complexity, and descriptive detail (Craig, Sheibe, Raskin, Kircher, & Dodd, 1999; Goodman & Reed, 1986; Pipe, Lamb, Orbach, & Esplin, 2004; Vrij, 2005) and children become increasingly better at maintaining their lies, even across multiple questioning sessions (Gilbert & Fisher, 2006; La Rooy, Katz, Malloy, & Lamb, 2010; La Rooy, Pipe, & Murray, 2005). For example, Talwar, Arruda and Yachison (2015) found that children were more likely to lie for another and that their ability to lie about another's transgression and maintain this lie across multiple questions improved with age. By age 8, children can maintain a

lie by either feigning ignorance, or providing plausible information to support their lie (Talwar, Gordon, & Lee, 2007). Hence, as children age, adults find them more credible thus the differentiation between true statements and intentionally false statements is more challenging (Feldman & White, 1980; Leach, Talwar, Lee, Bala, & Lindsay, 2004; Talwar, Lee, Bala, & Lindsay, 2006).

The chronological development of children's improved lie-telling and the extent of their success likely reflects children's emerging cognitive maturity, as they begin to understand others' mental states and behaviours while simultaneously learning to control their own. Specifically, emerging executive functions, such as inhibitory control, are related to lie-telling abilities. Talwar and Lee (2008), for instance, found that children (3 to 8 years) with better-developed inhibitory control were more likely to lie. Lie-telling also involves working memory, as a lie-teller is trying to both suppress the truth and inhibit the truth from interfering with the false information in order to produce a plausible account (Gombos, 2006; Vrij & Mann, 2001). However, much of the prior research on children's lie-telling involved brief interviews with one or two follow-up questions, which did not necessarily tax children's evolving cognitive abilities. More extensive interviews with children may provide a more detailed picture of children's ability to tell convincing lies – and uncover more effective means of differentiating their truths from lies.

### **Cognitive Load**

Cognitive load refers to the total amount of mental effort used during informationprocessing (i.e., attentional or working-memory) (Block, Hancock, & Zakay, 2010). Since the act of lying can tax cognitive load, researchers in the area of deception detection have recently turned their attention to cognitive load as a potential mechanism for improving the detection of adults' lies (Vrij et al., 2008; Vrij et al., 2009). A similar approach might be effective with children.

As noted above, the act of lying can increase one's cognitive load. Several factors likely contribute to this increase: (a) lie-tellers might expend effort to control their expressed emotional, physical and mental states to appear convincing (Vrij, et al., 2008); (b) lie-tellers might monitor an interviewer's reactions in order to evaluate whether they are being perceived as credible (Buller & Burgoon, 1996); (c) lie-tellers might expend effort to ensure that their false story remains consistent and defensible (DePaulo et al., 2003); (d) lie-telling involves actively suppressing the truth while simultaneously replacing it with the lie (Spence et al., 2001); and (e) constructing a false story requires more cognitive effort than does recalling the truth (Gilbert, 1991). These factors can influence the quality of a false report.

Researchers have suggested that one method of increasing detection of liars is to use questioning that further taxes their cognitive load (e.g., Vrij, Fisher, Mann, & Leal, 2006; Vrij et al., 2008). In order to manipulate cognitive load, Vrij et al. (2008) asked half the participants to recount the story in chronological-order, and the other half in reverse-order. Consequently, raters were better lie detectors in the high cognitive load (reverse-order) condition than in the chronological condition, indicating that increasing cognitive load during questioning yields higher detection rates. To date, only one study has examined the impact of taxing cognitive load on children. Liu et al. (2010) asked unanticipated questions of 10- to 12-year-olds. Results indicated that lie-tellers responses to unexpected questions were different that those of truthtellers. However, no study has looked at the influence of reverse order questioning with children. Reverse order questioning might be particularly effective with children, as they may have difficulty recounting their stories in chronological order. Friedman, Reese and Dai (2011) asked 8- to 11-year-olds to report on past true events (nominated by their parents). Results indicated that although their memory was accurate for details, ordering them chronologically was significantly more difficult given children's developing temporal abilities. Hence, a questioning strategy that requires children to maintain their true and false reports in chronological or reverse order might improve the discriminability of children's truths and lies.

# **False Reports**

When testifying, children are often reporting about another's transgressive behaviour. However, they are usually reporting about an event that involved an interaction between them and an adult. Research has shown that children do lie to protect the wrongdoing of an adult (Lyon, Malloy, Quas, & Talwar, 2008; Talwar, Lee, Bala, & Lindsay, 2004). In laboratory studies, older children are more likely than younger children to conceal the transgressions of an adult (Bottoms, Goodman, Schwartz-Kenney, & Thomas, 2002; Tye, Amato, Honts, Devitt, & Peters, 1999). Lyon et al. (2008) found that, when asked, children are willing to fabricate details about an event in order to protect an adult. In contrast, Talwar et al., (2004) found that most children confessed to the transgression of their parent, even though they had been told by their parent to lie. However, there has been no other investigation of children's false denials and false assertions or children's abilities to maintain such reports when questioned. Thus, it is imperative to investigate: (a) whether children would not only conceal the transgression of another but fabricate false details of an interaction to protect the adult, and (b) whether children would consistently maintain this stance across various question types. Children's abilities to maintain such false reports are of particular importance to investigate, as they can be influential in both forensic and judicial settings.

Although the proportion of false denials of abuse, also referred to as nondisclosures, is difficult to calculate, large numbers of victims never tell the truth about their abuse. Based on data of adult disclosures of childhood abuse, nondisclosure rates have been reported to be as high as 33% to 92% for females, and 42% to 88%, for males (Coulborn Faller, 2007). Thus, false denials are a significant problem. In a field study, Lawson and Chaffin (1992) were able to assess non-disclosure rates by interviewing children who were not suspected of being abused, but tested positive for a sexually transmitted infection (STI). Of the 28 children interviewed, fewer than 43% disclosed abuse, highlighting that even with substantiated proof, nondisclosure rates were high. Thus, both field and laboratory studies demonstrate children's willingness to lie for adults, loved ones, and strangers. Working memory, inhibitory control and subsequently cognitive load demands likely impact children's abilities to maintain these false denials convincingly. Although false denials are perceived to be less difficult that than false assertions, they require the lie-teller to suppress the truth, and continue to monitor both their verbal and nonverbal communication in order to be perceived as being truthful. Thus, it is possible that increasing cognitive load demands while interviewing would tax children's immature cognitive skills (i.e., working memory and inhibitory control) and either increase disclosure rates or increase detectability of false denials.

In other situations, children might be coached by a parent or adult figure to create (i.e., fabricate) a story of events that never transpired. In one of the few studies that investigated actual allegations of abuse, Trocmé and Bala (2005) investigated the characteristics associated with false allegations and denials of abuse in the 1998 Canadian Incidence Study of Reported

Child Abuse and Neglect (CIS-98). Trocmé and Bala found that 4% of abuse allegations were intentionally false and that this represented 12% of custody and access cases. Earlier studies found rates of false allegations by children to be between 2% and 5% (Graham & Watkeys, 1991; Horowitz et al., 1995). Although these figures appear to be small, the consequences for the accused are severe. Hence, we examine the impact of taxing cognitive load on the detectability of children's false allegations as well.

# **Cross-Examination**

Theoretically, cross-examination is used to determine the accuracy, veracity and reliability of a witness's statements. However, in most circumstances, cross-examination is used to undermine the testimony given by a witness during direct-examination by eliciting contradictory facts and details, or to elicit new facts to support the argument of the cross-examiner (Myers, 1986; Park, 2003). Currently, cross-examination strategies seem to hinder, not improve, children's testimony. For example, children may have difficulty under cross-examination, regardless of the veracity of their statements (Crossman, Segovia, & Miller, 2009), particularly when asked misleading or confusing questions (Tobey, Goodman, Batterman-Faunce, Orcutt, & Sachsenmaier, 1995). Indeed, even older children have a tendency to change a significant amount of detail from their original true reports when questioned using suggestive questioning styles under cross-examination (Zajac & Hayne, 2006), which impacts their accuracy (Zajac & Haynes, 2003).

As cross-examination occurs after direct-examination, the consistency across both is of interest. Lie maintenance (often reported as consistency) refers to the reporter's ability to consistently maintain their lie across multiple questions. Given that consistency in testimony may be used as a marker of veracity by potential jurors (e.g., Stromwall & Granhag, 2007), it is

important to investigate children's ability to maintain their lies over both forms of questioning. However, the impact of consistency on credibility has been unreliable. Some researchers have found that jurors are less likely to "convict" someone if the testimony of the witness has inconsistencies (Berman & Cutler, 1996); while others have found that inconsistencies in testimony do not have a strong link to a juror's judgments (Brewer & Burke, 2002). Nevertheless, it is possible that an interview strategy, such as taxing cognitive load, could improve the consistency of truth-tellers, while reducing the consistency of lie-tellers, and create a more meaningful and reliable form of cross-examination. To date, there have been no studies investigating the impact of taxing cognitive load on the maintenance of children's true and false reports in a courtroom setting.

### **Current Study**

The aim of the current study is to determine whether taxing cognitive load influences a child's ability to maintain the truth or a lie during both direct- and cross-examination. To address the issue, children participated in a two-part study where they were asked to testify in a mock-courtroom setting about games they played with a research assistant (RA). Children were randomly assigned to one of four conditions with regard to the target event with the RA: false denial, true denial, false assertion, true assertion. Approximately one week later, children testified in a mock-courtroom setting. During direct-examination, children were asked free-recall and prompting questions (e.g. "I was told you played X, is that true? Can you tell me more about it", Friedman et al., 2011), while under cross-examination, they were asked to recount the events in both reverse order and chronological order. Therefore, children had four opportunities to maintain their accounts of the target event. Later, the interviews were transcribed and coded

to determine whether question type influenced children's ability to maintain both the story type (assent or denial) and veracity (truth or lie) of the event.

First, we expected that children assigned to a true condition would be more likely to maintain consistency than children assigned to a false condition. Also, as assertions require children to provide false details, whereas a denial simply requires negation, it was hypothesized that children in the assertion conditions would have more difficulty maintaining than children in the denial conditions.

In line with Friedman et al. (2011), it was hypothesized that children would have difficulty recalling the order of the events accurately. As a result, we expected that children would have more difficulty recalling events in reverse than chronological order or in free-recall questioning.

Finally, we also expected that the question type would affect children's maintenance. Specifically, we hypothesized that children would have more difficulty with prompted questions. As children were directly asked about a target event during prompted recall, we hypothesized that children would have more difficulty maintaining their false stories. We also expected that reverse order questioning would be more difficult for children to maintain false stories than chronological order questioning.

### Method

# **Participants**

Participants were 96 children ( $N_{females}$ = 45), 9 to 12 years of age ( $M_{age in months}$  = 131.00, SD = 14.77), from a North American major metropolitan area. Participants were recruited through a database of families who previously consented to, or participated in, research across the university. Parental consent was obtained for all participants prior to the start of the study.

Participants were given stickers, and a small toy at the home visit, and \$20 dollars after the mock-courtroom interview.

# Procedure

**Play session:** Participants engaged in a play session with a research assistant (RA) in the child's home. Participants were instructed to remember as many details as possible, as they would be asked to testify about the interaction approximately one week later in a mock-courtroom at one of the local universities. All children played five small games/tasks. Half of the participants also played Hasbro's <sup>TM</sup> Operation Game, Toy Story 3 Edition, which is a board game in which game pieces are placed in small openings. The goal of the game is for the player to remove the small pieces with tweezers, without touching the edge of the opening. If the edge is touched, a buzzer sounds. Children had to successfully remove three pieces from the board without sounding the buzzer.

Prior to arrival, children were randomly assigned to one of the following groups: (a) *false denial* (*FD*): children played the Operation Game (i.e., target game) and were asked to lie on behalf of the RA and state when interviewed that they did <u>not</u> play the game; (b) *true denial* (*TD*): children did not play the target game and were not given further instructions; (c) *false assertion* (*FA*): children did not play the target game and were asked to lie on behalf of the RA and state when interviewed that they <u>had</u> played the game; or (d) *true assertion* (*TA*): children played the target game and were not given further instruction had n = 24 participants. To ascertain whether participants in the TA condition knew what the operation game was, the RA asked children if they had played the game before, and to briefly describe it. All children assigned to the TA condition had previously played the game.

**The interview**. Between six to eight days later (M = 7.09 days, SD = 0.77), participants testified in a mock-courtroom setting. The mock-courtroom consisted of a wood-panelled room with a raised judge bench and a witness box which faced the two mock-lawyers tables. A mock judge and two mock lawyers were played by different RAs. Prior to being escorted into the mock-courtroom, the RA asked all children whether they remembered what they were to do in the courtroom, regardless of assigned condition. The RA reminded participants assigned to either lie condition of the request made the week prior.

Participants were asked to introduce themselves, answer some rapport-building questions, and promise to tell the truth. The direct examiner began questioning by asking open-ended questions (e.g., can you tell me what you did that day with RA), followed by open-ended prompts (e.g., can you tell me more about it). Next, the cross-examiner asked the participant to state what was done with RA in reverse order (which was clarified by the mock-judge), followed by some filler questions (i.e., questions about the interaction that were unrelated to the target event), and concluded by asking the participant to once again recount the events with RA but this time in chronological order. The courtroom session was recorded for transcription purposes.

**Coding**. Interviews were transcribed and coded for maintenance of condition and order of details recalled by question type. Direct-examiners asked both free recall and prompted questions. Cross-examiners asked reverse order and chronological order questions. Inter-rater reliability was calculated for 10% of the sample (Cohen's Kappa = .856, S.E. = .043, p < .001).

For each question type, children received a score of 1 if they maintained their condition and 0 if they did not. For the assertion conditions, a score of 1 was obtained if the child mentioned or discussed the target game and 0 if they denied or omitted playing the game. In the denial condition, a score of 1 was obtained if the child omitted/denied playing the target game, and a score of 0 if they mentioned (all or in part) or asserted playing the game.

Accuracy of order of details was calculated for the reverser order and chronological order questions. To receive a score of 1 on reverse order, children had to list the events that occurred with the RA from last to first, and a score of 0 if the order was incorrect. For chronological order questions, children received a score of 1 if they recounted the events in the correct order, and 0 if the order was incorrect. Given that consistency of information is perceived to be a marker for detecting deception, a consistency score was calculated. Regardless of accuracy, if a child provided the order consistently across reverse order and chronological order; A, B, C, D). If the child changed the order between reverse and chronological orders (i.e., D, C, B, A to A, C, B, D), they received a score of 0.

#### Results

Preliminary analyses revealed no sex differences, therefore sex was not included in further analyses. Overall, 69.7% (n = 62) of children successfully maintained their condition in response to all four question types (direct: free recall, prompted; cross: reverse, chronological).

#### **Open-Ended Free Recall**

Overall, 83.3% (n = 80) of children maintained their condition report during open-ended free recall questioning. A logistic regression analysis of children's ability to maintain their condition in response to open-ended free recall questions was conducted with Veracity (true vs false) and Story Type (assent vs deny) as predictors. Following the methodology described by Menard (2002), the independent variables were entered first as predictors in this and subsequent logistic regressions. Additional predictors (i.e., interactions) were added individually to determine whether they contributed significantly to the model. Significance was assessed by a Block chi-square test (or chi-square difference test). For maintenance of condition at free-recall, the initial model was significant,  $\chi^2$  (2, 95) = 14.652, Nagelkerke  $R^2$  = .256, p = .001. Veracity was a significant predictor of children's lie maintenance with free recall questions,  $\beta$  = -1.308, Wald (1) = 3.957, odds ratio = 0.270, (95% confidence interval: 0.074, 0.981), p = .047. More children maintained their true reports (91.5%) than their false reports (77.1%).

Story Type was also a significant predictor of children's maintenance at free-recall,  $\beta = 2.222$ , Wald (1) = 7.596, odds ratio = 9.229, (95% confidence interval: 1.900, .44.822), p = .006. Children in the denial conditions were better at maintaining (95.7%) than those in the assertion conditions (72.9%). When the interaction between Veracity and Story Type was added to the second step of the model, results were not significant  $\chi^2$  (1, 95) = 0.992, Nagelkerke  $R^2 = .261$ , p = .319.

### **Prompted Recall**

Overall, 84.4% (n = 81) of children maintained their condition report during the prompted recall questioning. A logistic regression analysis with children's ability to maintain their condition in response to prompted recall questions was conducted with Veracity (true vs false) and Story Type (assent vs deny) as predictors. The initial model was significant,  $\chi^2$  (2, 91) = 11.365, Nagelkerke  $R^2$  = .235, p = .003. Veracity was a significant predictor of story maintenance for prompted questions,  $\beta$  = -2.272, Wald (1) = 4.363, odds ratio = 0.103, (95% confidence interval: 0.021, 0.869), p = .037. More children maintained their true reports (97.7%) than their false reports (81.2%).

Story Type was not a predictor of maintenance in response to prompted questions,  $\beta = -1.561$ , Wald (1) = 3.437, odds ratio = 0.210, (95% confidence interval: 0.040, 1.093), p = .064.

The interaction between Veracity and Story Type was not significant,  $\chi^2$  (1, 91) = 0.480, Nagelkerke  $R^2$  = .244, p = .488, when added on a second step.

### **Reverse Order Recall**

Overall, 87.5% (n = 84) of children maintained their condition report during the reverse order questions. A logistic regression analysis with children's ability to maintain their condition in reverse order questioning was conducted with Veracity (true vs false) and Story Type (assent vs deny) as predictors. When asked to recount the events that transpired in reverse order, the initial model was significant,  $\chi^2$  (2, 95) = 15.008, Nagelkerke  $R^2$  = .286, p = .001. Veracity was a significant predictor of children's lie maintenance for reverse order recall,  $\beta$  = -2.611, Wald (1) = 5.766, odds ratio = 0.073, (95% confidence interval: 0.009, 0.6619), p = .016. More children maintained their true reports (97.8%) than their false reports (79.6%). Story Type was also a significant predictor of children's maintenance of reserve order recall,  $\beta$  = 1.846, Wald (1) = 4.84, odds ratio = 6.34, (95% confidence interval: 1.22, 32.80), p = .03. Children in the denial conditions were better at maintaining (95.7%) than those in the assertion conditions (81.2%). When the interaction between Veracity and Story Type was added as the second step of the model, results were not significant,  $\chi^2$  (1, 95) = 0.292, Nagelkerke  $R^2$  = .291, p = .589.

Transcripts were coded for the accuracy of the order in which details were provided Overall, 31.3% (n= 30) of children were accurate. A logistic regression analysis was conducted on children's accuracy in reverse order questioning, with Veracity (true vs false) and Story Type (assent vs deny) as predictors. The initial model was not significant,  $\chi^2$  (2, 94) = 1.932, Nagelkerke  $R^2$  = .028, p = .381.

# **Chronological Recall**

Overall, 85.4% (n = 82) of children maintained their condition report during chronological recall questioning. A logistic regression analysis with children's ability to maintain their condition when asked to recount the events in chronological order was conducted with Veracity (true vs false) and Story Type (assent vs deny) as predictors. However, the initial model was not significant,  $\chi^2$  (2, 96) = 5.671, Nagelkerke  $R^2$  = .102, p = .059.

Overall, 33.3% (n = 32) of children were accurate. A logistic regression analysis of children's accuracy in chronological order questioning was conducted with Veracity (true vs false) and Story Type (assent vs deny) as predictors. The model was not significant,  $\chi^2$  (2, 96) = .724, Nagelkerke  $R^2 = .010$ , p = .696.

# **Consistency Across Reverse and Chronological Questioning**

Consistency of recall between reverse and chronological order questioning was also examined. Overall, 41.1% (n = 40) of children were consistent when reporting the order of events. A logistic regression analysis of children's consistency was conducted with Veracity (true vs false) and Story Type (assent vs deny) as predictors. Once again, the model was not significant,  $\chi^2$  (1, 95) = 3.556, Nagelkerke  $R^2$  = .050, p = .169.

#### Discussion

Direct- and cross-examiners, as well as forensic interviewers, use various question types in an effort to obtain factual and truthful information from witnesses. Some examples of question types are open-ended recall, prompted-recall questions, and asking the witness to recount their story. Recent findings (e.g., Vrij et al., 2008) have used difficult questioning strategies, such as reverse order questioning in an effort to elicit the truth in adults. The aim of the current study is to determine whether question type influences a child's ability to maintain their story during both direct- and cross-examination, and the influence of recall order on the accuracy of reporting.

### Maintenance

It was hypothesized that regardless of question type, children assigned to a true condition would be more likely to maintain their condition than children assigned to a false condition. This hypothesis was partially supported, as significantly more truth-tellers maintained their story than lie-tellers in the open-ended free recall, prompted recall, and reverse order recall questions. However, there were no significant differences for chronological recall. Although lie-tellers had significantly more difficulty than truth-tellers, the maintenance rates for lie-tellers for all question types remained quite high (77.1% to 81.2% for lie-tellers; 91.5% to 97.7% for truth-tellers), indicating that children are willing and able to lie at the behest of another.

It was further hypothesized that children would have more difficulty maintaining their conditions during reverse order than chronological order questioning. As there were no significant differences during chronological order recall, but significant differences for both veracity and story type during reverse order questioning, this hypothesis was supported. Thus, taxing cognitive load does appear to influence children's ability to maintain their stories.

Given that assertion requires the child to generate a response, it was hypothesized that children in the assertion conditions would have more difficulty maintaining their condition than children in the denial conditions. This hypothesis was only partially supported. Although children in the assertion conditions had more difficulty maintaining their condition during openended free recall and reverse order recall questioning, there were no differences during prompted nor chronological recall. Free recall requires the witness to generate a response without any framework, which could be more difficult, or taxing, than responding to prompted questions in which a framework is provided. Reverse order questions are documented to be more cognitively taxing (e.g., Vrij et al., 2008) as well. It is possible that as the demands are greater, children had more difficulty maintaining their condition, regardless of veracity.

The use of cognitively taxing questioning to assess children's veracity appears to be promising. The current study had children recount their story in reverse order and chronological order. Veracity and story type predicted maintenance scores for reverse order responses, but not chronological. Therefore, this would be a useful strategy during examination procedures. As the open-ended free and prompted recall questions also generated significant differences, high cognitive load questioning may help substantiate the veracity of a child's statements.

# Accuracy

Friedman et al. (2011) found that children had difficulty recalling events in the order they occurred. Results of the current study support this finding as only 31.3% of children were accurate in reverse order recall, and 33.3% for chronological order recall. However, logistic regression analyses found no differences by veracity, nor story type. It was hypothesized that children would have more difficulty with accuracy of reverse order recall than chronological, given the increased demands on cognitive abilities. This hypothesis was not supported. It appears that sequential recall is difficult for children regardless of question type.

There are mixed findings regarding the impact of testimonial inconsistencies on a juror's judgments (e.g., Berman & Cutler, 1996; Brewer & Burke, 2002). As children in the current study were asked to recount the activities performed, in order, on two separate occasions, consistency within these two occasions could be calculated. Overall, 41.4% of children were consistent in reporting the order of events, regardless of accuracy. Neither veracity nor story

type predicted consistency, suggesting that children have trouble remembering order in general, and lack internal consistency, which could potentially reduce perceptions of their credibility.

Interestingly, there were no interaction effects for children's maintenance or accuracy. Thus, false statements are more difficult to maintain than true, regardless of the type of story, while assertions are more difficult to maintain than denials, regardless of veracity.

# **Limitation and Future Directions**

The current findings are representative of children 9 to 12 years of age. However victims of abuse vary in age. Furthermore, research has shown that younger children may have difficulties in maintaining false statements (e.g., Talwar et al., 2015). Therefore, a future study should investigate the effects of different question types with a broader sample of ages to determine whether these effects can be generalized to children in general, or are specific to a certain age range.

The current study suggests that questions that tax cognitive load may be useful in assessing the veracity of children's reports. Research on cognitive load and deception detection in adults has not only investigated the use of reverse order questioning, but also the use of unanticipated questions (e.g., Vrij 2009). Although Liu et al. (2010) did investigate the use of unanticipated questions with 10- to 12- year olds, they did not evaluate the influence on maintenance or accuracy. As veracity and story type predicted maintenance, future studies should include the use of unanticipated questions and other types of questioning that taxes cognitive load to see if the results could be replicated.

The current study has attempted to bridge the gap in the literature on the impact of question type during courtroom procedures on children's ability to maintain and accurately recount their story. By asking children open-ended recall, prompted recall, reverse order recall

and chronological recall questions, results of the current study gives a better understanding of the influence of questions asked by investigators, lawyers and, at times, judges on the veracity of children's statements. Translating the current findings into applied settings (e.g., including questions that tax cognitive load in the direct- and/or cross-examination of children) may be useful for helping legal and other professionals to differentiate between children's true and false denials and allegations. Finally, it appears that children have difficulty with sequential recall and, as such, interviewers should not expect children to remember information in chronological or reverse order. The focus should be on the veracity of the details and information provided during their testimony rather than the accuracy of order recall.

#### References

- Ahern, E. C., Lyon, T. D., & Quas, J. A. (2011). Young children's emerging ability to make false statements. *Developmental Psychology*, 47, 61-66. doi:10.1037/a0021272
- Berman, G. L., & Cutler, B. L. (1996). Effects of inconsistencies in eyewitness testimony on mock-juror decision making. *Journal of Applied Psychology*, 81, 170-177. doi:10.1037/0021-9010.81.2.170
- Block, R. A., Hancock, P. A., & Zakay, D. (2010). How cognitive load affects duration judgments: A meta-analytic review. *Acta Psychologica*, *134*, 330-343.
  doi:10.106/j.actpsy.2010.03.006
- Bond, C. F., & DePaulo, B. M. (2006). Accuracy of deception judgments. *Personality and Social Psychology Review*, 10, 214-234. doi:10.1207/s15327957pspr1003\_2
- Bottoms, B. M., Goodman, G. S., Schwartz-Kenney, B. M., & Thomas, N. (2002).
  Understanding children's use of secrecy in the context of eyewitness reports. *Law and Human Behavior*, 26, 285-313. doi:10.1023/A:1015324304975
- Brewer, N., & Burke, A. (2002). Effects of testimonial inconsistencies and eyewitness confidence on mock-juror judgments. *Law and Human Behavior*, 26, 353-364. doi:10.1023/A:1015380522722
- Buller, D. B., & Burgoon, J. K. (1996). Interpersonal deception theory. *Communication Theory*, 6, 203–242. doi:10.1111/j.1468-2885.1996.tb00127.x
- Coulborn Faller, K. (2007). *Interviewing children about sexual abuse*. New York: Oxford University Press.

- Craig, R. A., Sheibe, R., Raskin, D. C., Kircher, J. C., & Dodd, D. H. (1999). Interviewer questions and content analysis of children's statements of sexual abuse. *Applied Developmental Science*, *3*, 77-85. doi:10.1207/s1532480xads0302\_2
- Crossman, A. M., Segovia, D., & Miller, S. (2009). Cross-examination: Friend or foe of the child witness? Unpublished manuscript.
- DePaulo, B. M., Lindsay, J. J., Malone, B. E., Muhlenbruck, L., Charlton, K. & Cooper, H. (2003). Cues to deception. *Psychological Bulletin*, *129*, 74-118. doi:10.1037/0033-2909.129.1.74006-9038-8
- Evans, A. D., & Lee, K. (2011). Verbal deception from late childhood to middle adolescence and its relation to executive functioning skills. *Developmental Psychology*, 47, 1108-1116. doi:10.1037/a0023425
- Evans, A. D., & Lee, K. (2013). Emergence of lying in very young children. *Developmental Psychology*, 49, 1958-1963. doi:10.1037/a0031409
- Feldman, R. S., & White, J. B. (1980). Detecting deception in children. *Journal of Communication*, 30, 121-128. doi:10.1111/j.1460-2466.1980.tb01974.x
- Friedman, W. J., Reese E., & Dai X. (2010). Children's memory for the times of events from the past years. *Applied Cognitive Psychology*, *25*, 156–165. doi: 10.1002/acp.1656
- Gilbert, D. T. (1991). How mental systems believe. *American Psychologist, 46*, 107–119. doi:10.1037/0003-066X46.2.107
- Gilbert, J. A. E., & Fisher, R. P. (2006). The effects of varied retrieval cues on reminiscence in eyewitness memory. *Applied Cognitive Psychology*, *20*, 723-739. doi:10.1002/acp.1232

- Gombas, V. A. (2006). The cognition of deception: The role of executive processes in producing lies. *Genetic, Social, and General Psychology Monographs, 132*, 197–214.
  doi:10.3200/MONO.132.3.197-214
- Goodman, G. S., & Reed, R. S. (1986). Age differences in eyewitness testimony. *Law and Human Behavior*, *10*, 317-332. doi:10.1007/BF01047344
- Graham, A., & Watkeys, J. (1991). False allegations in child sexual abuse: The pattern of referral in an area where reporting is not mandatory. *Children and Society*, *5*, 111-122. doi:10.1111/j.1099-0860.1991.tb00377.x
- Horowitz , S. W. Lamb , M. E. Esplin , P. W. Boychuk , T. D. Reiter-Lavery , L. Krispin , O. (1995). Establishing ground truth in studies of child sexual abuse. *Expert Evidence*, *4*, 42-52.
- La Rooy, D., Katz, C., Malloy, L. C., & Lamb, M. E. (2010). Do we need to rethink guidance on repeated interviews. *Psychology, Public Policy, and Law, 16*, 373-392. doi:10.1037/a0019909
- La Rooy, D., Pipe, M. E., & Murray, J. E. (2005). Reminiscence and hypermnesia in children's eyewitness memory. *Journal of Experimental Child Psychology*, 90, 235-254. doi:10.1016/j.jecp.2004.11.002
- Lawson, L., & Chaffin, M. (1992). False negatives in sexual abuse disclosure in interviews. *Journal of Interpersonal Violence*, 7, 532-542. doi:10.1177/088626092007004008
- Leach, A., Talwar, V., Lee, K., Bala, N. & Lindsay, R. C. L. (2004). "Intuitive" lie detection of children's deception by law enforcement officials and university students. *Law & Human Behavior*, 28, 661-685. doi:10.1007/s10979-004-0793-0

- Liu, M., Granhag, P. A., Landstrom, S., Roos af Hjelmsater, E., Stromwall, L., & Vrij, A.
  (2010). "Can you remember what was in your pocket when you were stung by a bee?":
  Eliciting cues to deception by asking the unanticipated. *The Open Criminology Journal, 3*, 31-36. doi:10.2174/1874917801003010031
- Lyon, T. D., Malloy, L. C., Quas, J. A., & Talwar, V. A. (2008). Coaching, truth induction, and young maltreated children's false allegations and false denials. *Child Development*, 79, 914-929. doi:10.1111/j.1467-8624.2008.01167.x
- Myers, J. E. (1986). Child Witness: Techniques for direct examination, cross-examination, and impeachment. *The Pacific Law Journal*, *18*, 801-827. Retrieved from <a href="http://heinonline.org/HOL/LandingPage?handle=hein.journals/mcglr18&div=68&id=&page="http://heinonline.org/">http://heinonline.org/</a>
- Park, R. C. (2003). Adversarial influences on the interrogation of trial witnesses. In P. J. van Koppen & S. D. Penrod (Eds.), *Adversarial versus inquisitorial justice* (pp. 131-166). New York: Springer US.
- Pipe, M. E., Lamb, M. E., Orbach, Y., & Esplin, P. W. (2004). Recent research on children's testimony about experienced and witnessed events. *Developmental Review*, 24, 440-468. doi:10.1016/j.dr.2004.08.006
- Spence, S. A., Farrow, T. F. D., Herford, A. E., Wilkinson, I. D., Zheng, Y., & Woodruff, P. W.
  R. (2001). Behavioural and functional anatomical correlates of deception in humans. *Neuroreport: For Rapid Communication of Neuroscience Research*, *12*, 2849–2853.
  doi:10.1097/00001756-200109170-00019
- Stromwall, L. A., & Grahang, P. A. (2007). Detecting deceit in pairs of children. *Journal of Applied Social Psychology*, *37*, 1285-1304. doi:10.1111/j.1559-1816.2007.00213.x

- Talwar, V., Arruda, C., & Yachison, S. (2015). The effects of punishment and appeals for honesty on children's truth-telling behavior. *Journal of Experimental Child Psychology*, 130, 209-217. doi:10.1016/j.jecp.2014.09.001
- Talwar, V., Gordon, H., & Lee, K. (2007). Lying in the elementary school: Verbal deception and its relation to second-order belief understanding. *Developmental Psychology*, 43, 804-810. doi:10.1037/0012-1649.43.3.804
- Talwar, V., & Lee, K. (2002). Emergence of white-lie telling in children between 3 and 7 years of age. *Merrill-Palmer Quarterly*, *48*, 160-18. doi:10.1177/0165025406073530
- Talwar, V., & Lee, K. (2008). Social and cognitive correlates of children's lying behavior. *Child Development*, *79*, 866-881. doi:10.1111/j.1467-8624.2008.01164.x
- Talwar, V., Lee, K., Bala, N., & Lindsay, R. C. L. (2004). Children's lie-telling to conceal a parent's transgressions: legal implications. *Law and Human Behavior*, 28, 411-435. doi:10.1023/B:LAHU.0000039333.51399.f6
- Talwar, V., Lee, K., Bala, N., & Lindsay, R. C. L. (2006). Adults' judgments of child witness credibility and veracity. *Law and Human Behavior*, 30, 561-570. doi:10.1007/s10979-
- Tobey, A. E., Goodman, G. S., Batterman-Faunce, J. M., Orcutt, H. K., & Sachsenmaier, T. (1995). Balancing the rights of children and defendants: Effects of closed-circuit television on children's accuracy and jurors' perceptions. In M. S. Zaragoza, J. R. Graham, G. C. Hall, R. Hirschman, & Y. S. Ben-Porath (Eds.). *Memory and testimony in the child witness* (pp. 214-239). Thousand Oaks, CA: Sage.
- Trocmé, N., & Bala, N. (2005). False allegations of abuse and neglect when parents separate. *Child Abuse and Neglect, 29*, 1333-1345. doi:10.1016/j.chiabu.2004.06.016

- Tye, M. C., Amato, S. L., Honts, C. R., & Devitt, M. K. (1999). The willingness of children to lie and the assessment of credibility in an ecologically relevant laboratory setting. *Applied Developmental Science*, *3*, 92-109. doi:10.1207/s1532480xads0302\_4
- Vrij, A. (2005). Criteria-based content analysis: A qualitative review of the first 37 studies. *Psychology, Public Policy, and Law, 11*, 3-41. doi:10.1037/1076-8971.11.1.3
- Vrij, A., Fisher, R., Mann, S., & Leal, S. (2006). Detecting deception by manipulating cognitive load. *Trends in Cognitive Science*, 10, 141-142. doi:10.1016/j.tics.2006.02.003
- Vrij, A., Leal, S., Granhag, P. A., Mann, S., Fisher, R. P., Hillman, J., & Sperry, K. (2009).
  Outsmarting the liars: The benefit of asking unanticipated questions. *Law and Human Behavior*, *33*, 159-166. doi:10.1007/s10979-008-9143-y
- Vrij, A., & Mann, S. A. (2001). Telling and detecting lies in a high-stake situation: The case of a convicted murderer. *Applied Cognitive Psychology*, 15, 187–203. doi:10.1002/1099-0720(200103/04)
- Vrij, A., Mann, S. M., Fisher, R. P., Leal, S., Milne, R., & Bull, R. (2008). Increasing cognitive load to facilitate lie detection: The benefit of recalling an event in reverse order. *Law and Human Behavior*, 32, 252-265. doi:10.1007/s10979-007-9103-y
- Zajac, R., Gross, J., & Hayne, H. (2003). Asked and answered: Questioning children in the courtroom. *Psychiatry, Psychology and Law, 10*, 199-209.
  doi:10.1375/132187103322300059
- Zajac, R., & Hayne, H. (2006). The negative effect of cross-examination style questioning on children's accuracy: Older children are not immune. *Applied Cognitive Psychology*, 20, 3-16. doi:10.1002/acp.1169

### **Bridging Manuscripts 1 and 2**

Early investigation of children's ability to lie during interviews suggested that children are willing to lie at the request of another (Lyon et al., 2008; Talwar et al., 2004), and are able to maintain such lies during follow-up questions (Talwar et al., 2007, Talwar & Lee 2002a). However, most studies had only examined children's short reports. The first step in establishing the current program of research was to extend this investigation by evaluating whether children are able to maintain complex lies (such as true denials, true assertions, false denials and false assertions) across four different question types. Thus, the aim of the first manuscript was to determine whether children were able to maintain their true or false accounts of an interaction with an unfamiliar adult across both direct- and cross-examination during a mock-courtroom procedure. Specifically, to determine if children are able to maintain a truth or a lie when asked open-ended, prompted, reverse order and chronological order recall questions. The first manuscript in this program of research provided evidence that children are able to maintain both true and false reports across various question type, including the reverse order recall. Overall, over 69.7% of children were able to maintain their conditions across all four question types. However, sequential recall of the events appears to be significantly more difficult for children 9 to 12 years of age.

The next step in this line of inquiry was to examine whether these question types would improve adults ability to accurately judge the veracity of children's statements. Given that previous research has found that taxing cognitive load during interviewing procedures significantly improved detection rates when judging adult testimony (Vrij et al., 2008), it was of interest to explore whether this type of questioning would also improve detection rates of children's lies. As previous deception detection research has found that adults have difficulties detecting children's lies (Bond & DePaulo, 2006; Saykaly et al., 2013), Manuscript 2 explores whether taxing the cognitive load demands of children at cross-examination would significantly improve veracity judgments of the mock-jurors. Jurors may perceive consistency in testimony, described within this program of research as condition maintenance, as an important marker of veracity (Berman & Cutler, 1996). As the results of Manuscript 1 have shown that children are able to maintain their accounts across question type, Manuscript 2 builds on this line of inquiry be evaluating whether adults are able evaluate the veracity of the children's accounts.

Chapter 3: Manuscript 2

High Cognitive Load During Cross-Examination: Does It Improve Detection of Children's

Truths and Lies?

Christine Saykaly<sup>1</sup>, Angela Crossman<sup>2</sup> and Victoria Talwar<sup>1</sup>

McGill University<sup>1</sup>

John Jay College of Criminal Justice CUNY<sup>2</sup>

Author Note

This manuscript is currently under review at Behavioural Sciences & the Law

### Abstract

There has been recent and growing interest in the possibility of taxing cognitive load as a means of improving the detection of deception. The current study used a high cognitive load cross-examination procedure to determine whether this would improve undergraduate students' ability to detect deception by children 9 to 12 years of age. Participants (n = 88) were asked to determine whether children's accounts of an event included a true denial, false denial, true assertion or false assertion about a game played during a home-visit occurring one week prior. Overall, the high cognitive load cross-examination did not improve detection rates in that participants were at chance level for both direct-examination (49.4%) and cross-examination (52.3%). Accuracy for true stories was greater than for false stories. Cross-examination improved the detection rates of the false stories, but worsened the accuracy for the true stories. Participants however did rate younger children's true reports to be more credible and believable than their false reports. Developmental differences and legal implications are discussed.

High Cognitive Load at Cross-Examination:

Does It Improve Detection of Children's Truths and Lies?

Professionals working with children may often be challenged to decide whether a child's convincing statement is true or false – such as an assertion or denial of bullying or abuse. When the statement is intentionally false, detecting the deception is crucial, particularly when the deceptive statement leads to potentially serious negative outcomes, such as a false allegation against an innocent party or false denial that could result in the return of a child to an unsafe home. In cases where children are asked to testify, they might then face the additional burden of bearing witness for or against a loved one (Talwar, Lee, Bala, & Lindsay, 2004). Indeed, in some cases, children may choose to, or be coached to, lie in court in order to protect a loved one (Paine & Hansen, 2002; Yuille, Tymofievich, & Marxsen, 1995). Various professionals who work with children must be able to identify false denials and allegations, despite the fact that adults accurately determine the veracity of children's statements at chance levels (Stromwall, Granhag, & Landstrom, 2007; Tye, Amato, Honts, & Devitt, 1999; Vrij, Akehurst, Brown, & Mann, 2006). Therefore, developmental researchers, legal and forensic professionals continue to seek improved methods of differentiating between children's true and false reports. The goal of the current study was to explore one promising method of interviewing children to enhance lie detection accuracy, namely, increasing cognitive load demands.

### **Children's Lie-Telling**

In recent years, researchers have examined children's ability to tell lies and give false reports (Bottoms, Goodman, Schwartz-Kenney, & Thomas, 2002; Lyon, Malloy, Quas, & Talwar, 2008; Talwar et al., 2004; Saykaly et al., 2013; Williams, Kirmayer, Simon, & Talwar, 2013). While preschool children's lies are simple, using few words (Evans & Lee, 2013; Lewis, Stanger, & Sullivan, 1989; Talwar & Lee, 2002b), older children are able to formulate more complex and elaborate lies, suggesting that older children's lies may be more difficult to identify. As children develop, their reports, regardless of their veracity, increase in length, complexity, and descriptive detail (Craig, Sheibe, Raskin, Kircher, & Dodd, 1999; Goodman & Reed, 1986; Pipe, Lamb, Orbach, & Esplin, 2004; Vrij, 2005) and children become increasingly better at maintaining their lies (Evans & Lee, 2011). Indeed, lie-telling may reflect a child's emerging cognitive maturity, as the child begins to understand others' mental states and behaviours while simultaneously learning to control his/her own behaviour (Lee, 2013; Talwar & Crossman, 2011; Talwar & Lee, 2008).

When asked to testify in court, children often report an event that involved an interaction between them and an adult transgressor. At times, the child may be asked to keep a 'secret' and thus to lie in order to protect the adult who committed the wrongdoing (Lyon et al., 2008; Talwar et al., 2004; Yachison & Talwar, 2012). Older children are more likely than younger children to conceal the transgressions of an adult (Bottoms et al., 2002; Tye et al., 1999). Since such lies are about an interaction involving themselves and another person, children may feel as though they too are implicated in the transgression, causing many to believe that they must cover-up their own perceived wrong-doing, a concern substantiated in real-life cases (Katz, 2013). Research further confirms that the majority of children are able to lie for another person to an unfamiliar adult to cover-up a transgression (Redlich & Goodman, 2003; Williams et al., 2013).

### **Deception Detection**

Children's lies would not be problematic if they were readily detected, but this does not seem to be the case (e.g., Gomez-Garibello, Saykaly, Moore, & Talwar, 2013; Honts, Kassin, & Craig, 2014; Nysse-Carris, Bottoms, & Salerno, 2011; Saykaly et al., 2013). As such, many

researchers have focused their attention on identifying better ways to detect deception. The majority of research has focused on the abilities to "intuitively" assess the veracity of children's statements. Intuitive detection implies that raters are assessing testimony and making their decision based on their "gut feeling", or intuition, and not from a theoretical or research-based rationale. Therefore, decisions regarding the veracity of a child's report are based exclusively on the adult's opinion (Leach, Talwar, Lee, Bala, & Lindsay, 2004).

Previous research on intuitive lie detection has indicated that adults are poor at determining the veracity of children's statements (Gomez-Garibello et al., 2013; Saykaly et al., 2013; Stromwall, et al., 2007; Talwar, Crossman, Gulmi, Renaud, & Williams, 2009), although findings have been inconsistent. Some studies have found a tendency in adult raters to hold a truth bias when evaluating children's statements (Saykaly et al., 2013; Stromwall et al., 2007; Talwar, Lee, Bala, & Lindsay, 2006), while others report higher accuracy rates in assessing deceptive statements (Crossman & Lewis, 2006; Edelstein, Lutin, Ekman, & Goodman, 2006; Talwar, Crossman, Williams, & Muir, 2011). Regardless of biases, researchers who have investigated deception detection of children by untrained observers have found that overall, detection rates hover around chance levels (e.g., Edelstein et al., 2006, Saykaly et al., 2013; Talwar et al., 2006).

**Taxing cognitive load.** One recent, promising development in the adult literature on lie detection is the finding that interviewers can increase lie detectability by taxing the interviewee's cognitive load (e.g., Vrij et al., 2008; Vrij, 2009). The act of lying itself is cognitively taxing, given the amount of information one must create, maintain, and recount consistently (Gilbert, 1991; Zuckerman, DePaulo, & Rosenthal, 1981). Research with adults' reports has found that further taxing the cognitive load of interviewees by using alternative questioning styles can yield

higher lie detection rates. For instance, Vrij et al. (2009) questioned pairs of adult participants individually about an outing at a restaurant. Half the pairs had actually gone to the restaurant, while the other half were asked to create a story about a dinner at the restaurant. Researchers hypothesized that asking unanticipated questions would yield higher deception detection rates. Unanticipated questions were questions related to an outing at a restaurant, but that are not typically asked, such as spatial questions (e.g., where were you sitting in relation to the door) and temporal questions (e.g., who finished first). Results indicated that asking unanticipated questions enhanced lie detection, as lie-tellers' responses to the unanticipated questions were significantly worse than truth-tellers'. Therefore, the use of unanticipated questions may increase deception detection in forensic settings.

Exploring another alternative questioning strategy, Vrij and colleagues (2008) investigated whether increasing cognitive load through story order would facilitate deception detection. That is, half of their subjects were asked to recount their story in reverse order to tax cognitive load (high cognitive load condition), while controls were asked to recount their story in chronological order. Then, video of these participants' stories were shown to police officer trainees. Results indicated that accuracy was superior in the high cognitive load condition than in the control condition. Raters reported that liars looked more nervous and appeared to have to think more about their responses. Thus, this interviewing strategy yielded more accurate detection rates than traditional interview procedures.

Finally, Liu et al. (2010) asked unanticipated questions of children 10 to 12 years of age who were reporting a true or a false event. Children asked to give a false account reported planning their story more than truth-tellers and were more willing to respond and provide information to the unexpected questions compared to truth-tellers. With the exception of Liu et al., there has been no investigation of the influence of increasing cognitive load during questioning (either through unexpected questions or reverse order reporting) on children's reports or their credibility. Given that developmental research suggests that children's abilities to be skilled lie-tellers are still developing (Evans & Lee, 2010), it may be that such questioning techniques significantly increase adults' abilities to detect children's veracity.

As indicated by Liu et al. (2010), because liars are creating their stories, they must plan what to say during an interview in advance. They must anticipate what questions the interviewer may ask so they can plan for the correct or plausible response. However, if asked an unanticipated question, liars are faced with the difficult task of attempting to reconcile their story and create a plausible response or, feign ignorance by stating, "I don't know" or "I cannot remember". The latter responses may lead the interviewer to question the credibility of the whole statement; therefore, the lie-teller must determine, on the spot, what their best course of action may be. This task may be more difficult for younger children, and therefore, their perceived credibility and believability may be questioned. However, the impact of the combination of unanticipated questions and story order, in terms of increasing cognitive load, has yet to be examined among children.

#### The Current Study

The aim of the current research was to examine whether raters could more accurately discriminate between children's truthful and deceitful statements when cognitive load demands on child witnesses were increased. Specifically, we examined whether increasing cognitive load with the use of unanticipated questions and reverse-order questions during cross-examination would yield more accurate judgements regarding the veracity of children's statements during a mock judicial proceeding.

To do so, children were asked to play games with a research assistant during a home visit. Only half the children played the target game, but all children were told they would be interviewed about what they did with the researcher a week later. Children were given different instructions based on condition assignment: (a) false denial: children played the target game and were asked to lie on behalf of the researcher and state that they did not play the game; (b) true *denial:* children did not play the target game and were not given further instructions; (c) *false* assertion: children did not play the target game and were asked to lie on behalf of the researcher and state that they had played the game; or (d) *true assertion:* children played the target game and were not given any further instructions. One week later, children were questioned in a mock-courtroom context, with mock-lawyers and a mock-judge. These interactions were videotaped and clips of their direct- and cross-examinations were generated. Adult participants later viewed the direct- and cross-examinations of four children: one from each condition. After both direct- and cross-examination, participants were asked to determine the veracity of each child's statements. Adults were also asked follow-up questions about the credibility and believability of each child's testimony. Although in practice, jurors are not asked to do so between direct-examination and cross-examination, the current procedures were used to determine whether cross-examination would lead adult participants to change their initial decisions.

Research clearly shows that adults have difficulty determining the veracity of children's statements during open-ended questioning (e.g., Bond & DePaulo, 2006; Edelstein et al., 2006, Saykaly et al., 2013; Talwar et al., 2006). Recent research on the detection of adults' lies (Vrij, Fisher, Mann, & Leal, 2006; Vrij, Granhag, Mann, & Leal, 2011; Vrij, Granhag, & Porter, 2010) has yielded significant improvements in detection rates when the cognitive load of the adult
interviewees is taxed. Therefore, the first hypothesis is that increasing the cognitive load demands on children under cross-examination would also yield lie detection rates significantly above chance, compared to direct examination. The second hypothesis is that participants would find children in the control group (true assertion, true denial) more credible and believable across both direct-examination and cross-examination than children in the false conditions (false assertion, false denials). In addition, developmental trends in children's lie-telling behaviour have shown that younger children are more likely to reveal incriminating information than older children (Evans & Lee, 2011; Polak & Harris, 1999; Talwar & Lee, 2002a). Therefore, the third hypothesis is that adults would be more accurate at determining the veracity of younger children than older children. Finally, given that false assertions may require more elaboration than false denials, the fourth hypothesis is that false assertion would be easier to detect.

### Method

#### **Participants**

Participants included 88 undergraduate students ( $M_{age in years} = 20.43$ , SD = 1.45,  $N_{females} =$  74) from a major metropolitan area. Participants were recruited through an undergraduate psychology research pool as well as advertisements placed on a university classified website. Participants recruited through the psychology research pool received one extra percent on their psychology course final grade. Half (n = 44) of the participants were recruited through the advertisements and received no compensation.

#### Video Stimuli

Eighty-eight children between the ages of 9-10 years (M = 9.31, SD = 0.66) and 11-12 years (M = 11.58, SD = 0.55) previously took part in a mock-courtroom study. Children reported on an interaction with a research assistant (RA), with whom they played games in their own

homes. Children were randomly assigned to one of four groups: (a) true assertion (TA) - children played Hasbro's Operation Game® (Toy Story 3 Edition); (b) false assertion (FA) - children did not play the operation game, and were asked to lie on behalf of the research assistant by stating that they did in fact play the operation game when interviewed; (c) true denial (TD) - children did not play the operation game; or (d) false denial (FD) - children played the operation game and were asked to lie on the behalf of the research assistant by stating that they did not play the operation game. There were equal amounts of children (boys vs girls; old vs young) assigned to each condition.

Six to eight days after their interaction with the RA, children were asked to testify in a mock-courtroom before a mock judge (0% attrition rate). Direct- and cross-examination procedures were reviewed by a lawyer, and piloted, to validate the likelihood of such questions being asked in a courtroom setting. Research assistants were trained to follow the standardized script.

There were two mock lawyers present who conducted the direct- and cross-examinations. The direct-examination included open-ended (e.g., "*I was told you played some games with the RA when she came to visit you last week, can you tell me what happened?*") and specific questions (e.g., "*Can you tell me more about that?*"). Cross-examination differed from direct-examination in that its primary purpose was to increase the cognitive load demands on children while they answered questions. First, children were asked to recall their story in reverse order. They were provided with an example of reverse order testimony. Next, children were asked unanticipated questions (e.g., "*What colour was the operation board?*", "*Did you remove the broken shield when playing the operation game?*", "*Who was sitting closest to the door while you were playing together*"). These questions were related to the main event, but were not core

details of the interaction. They were designed to add to the cognitive demands on the lie-tellers to rapidly think of a plausible response. Finally, children were asked to once again recount the events of the interaction, but this time in chronological order. This placed an extra demand on the children given that they needed to appear consistent with their reverse-order recounting. Ground truth was established as the RA from the home-visit validated the group assignment post-courtroom procedure. All children included in the videos reported accurately about the Operation Game.

Each child's video segment included both direct and cross-examination. Adult participants viewed the direct and cross-examinations of four different children, one from each condition. Participants rated the credibility, believability, and accuracy of lie detection of each child after their direct testimony and again after their cross-examination, making a total of six credibility, believability and veracity assessments per video. Video segments were counterbalanced using a Latin-square design resulting in each child being viewed by four different participants. To control for age and gender biases, participants viewed children of the same age range (9-10 or 11-12 years) and of the same gender.

## Design

A 2 (Veracity: true or false) by 2 (Story Type: assertion or denial) by 2 (Interview: direct or cross) within-subjects design, with age of child (younger (9-10 years) or older (11-12 years)) as the only between subjects variable, was used to examine participants' lie detection accuracy.

#### Procedure

Participants were tested individually, with sessions lasting approximately 50 minutes. Each observer viewed a total of eight video clips, with testimony provided by four different children. Participants were instructed that they would be watching videos of children reporting about an interaction that occurred with a RA in the child's home approximately one week before the courtroom interview. They were told that children could be telling the truth or lying and that the child may or may not have played the game. Participants were informed that after viewing each video clip, they would be asked several questions about the credibility and veracity of the testimony they just viewed.

Participants then viewed four pairs of video segments (two per child). After each child's direct testimony, participants rated the child's credibility, believability, and veracity and they did so again, after viewing each child's cross-examination. Specifically, after each video segment, participants were asked the following three questions: (1) "*Do you think the child would make a credible witness?*" ["Credibility"]; (2) "*Overall (ignoring minor errors or omissions of detail and focusing only on the central clams of the story), if you were a jury member, would you believe the testimony of this child?*" ["Believability"]; (3) participants were asked to think back to the testimony about the operation game, and to select whether they believed the children to telling the truth or to be telling a lie ["Accuracy of Lie Detection"].

#### Results

## **Accuracy of Lie Detection**

Our first hypothesis was that lie detection rates would be better under cross-examination, with its heightened cognitive load, compared to direct examination. In order to assess this, we examined participants' assessments of veracity judgments, after each video clip, for each of the conditions (TA, FA, TD, FD). Accuracy was calculated based upon whether participants selected the correct veracity (true or false reports). Overall accuracy and accuracy by story type were calculated based on those judgments. Overall accuracy across all eight ratings was found to be 50.90%, which was not significantly above chance (see Table 1). One-sample t-tests were

used to compare accuracy to the level of chance (50%) for total accuracy after direct and again after cross-examination, collapsing across story types. As seen in Table 1, observer accuracy rates after direct (49.40%) and after cross-examination (52.30%) were not significantly different from chance. A paired-samples t-test was conducted to compare the accuracy ratings between direct-examinations and cross-examinations. There was not a significant difference between the post-direct-examination and post-cross-examination accuracy scores, t(87)=-1.06, p=.30. Thus, our first hypothesis was not supported.

One-sample t-tests were used to compare accuracy of final decisions (i.e., after crossexamination) to the level of chance (50%) for each story type. As seen in Table 1, participants' accuracy ratings for TA (61%) and TD (64%) were significantly above chance levels. Participants' accuracy for FA (39%) was significantly below chance levels. However, the accuracy ratings for FD (45%) were not significantly different from chance. Thus, our fourth hypothesis, that false assertions would be more easily detected than false denials was not supported.

Accuracy judgements were entered in a 2 (Veracity: true or false) by 2 (Story Type: assertion or denial) by 2 (Interview: direct or cross) repeated measures ANOVA with age of child (younger (9-10 years) or older (11-12 years)) as a between subjects variable. A significant main effect for Veracity was found, F(1, 86) = 60.95, p < .001,  $\eta^2_{\ p} = .42$ . Participants had a higher accuracy rate for true (M = .66, SE = .03, 95% CI [.61 to .72]) compared to false stories (M = .35, SE = .02, 95% CI [.28 to .41]). There was also a main effect for Age, F(1, 86) = 6.13, p = .02,  $\eta^2_{\ p} = .07$ . Consistent with our third hypothesis, participants were more accurate at determining the veracity of younger children (M = .56, SE = .03, 95% CI [.50 to .62]) than older children (M = .45, SE = .03, 95% CI [.39 to .51]). There was a significant Veracity x Interview interaction, F(1, 86) = 16.72, p <.001,  $\eta^2_{\rho} = .16$  (see Figure 1). Participants were the least accurate at correctly identifying false statements after direct-examination (M = .28, SE = .04, 95% CI [.21 to .35]), but most successful at accurately detecting true statements after direct-examination (M = .70, SE = .03, 95% CI [.64 to .76]). This difference was statistically significant t(87)=2.10, p = .04. Interestingly, participants' accuracy increased after cross-examination for false statements (M = .41, SE = .04, 95% CI [.34 to .49]) and decreased after cross-examination for true statements (M = .62, SE = .04, 95% CI [.55 to .69]), with each rate approaching chance (See Figure 1). This difference was statistically significant t(87)=-3.71, p < .01. These findings do not support our hypothesized main effect of interview on lie detection rates (hypothesis one).

Signal detection analysis was used to ascertain adults' sensitivity across all four ratings in discriminating between true and false reports. Signal detection theory is based on the proportion of hit rates (accurately detecting a lie) and false alarms (rating an account as a lie when it is actually a truthful statement). Discrimination (*d'*) between true and false reports at both direct-examination and cross-examination ranged from -0.95 to 0.95, where a score of zero indicates that there is no discrimination between true and false reports. A one-sample t-test of participants' discrimination (*d'*) at direct-examination was not significantly different from zero (M = -0.01, SD = 0.44); t(87) = -0.23, p = .82. However, participants did hold a significant truth bias (criterion c = 0.28, SD = 0.28; t(87) = 9.52, p = .00), as participants had a tendency to favor a true versus a false response (i.e., to over-assess children as truthful). The analysis was repeated for cross-examination. Again, discrimination (*d'*) was not significantly different from zero (M = 0.04, SD = 0.49); t(87) = 0.83, p = .41). However, participants no longer had a truth bias and did not favor a particular response (criterion c = 0.13, SD = 0.33; t(87) = 3.97, p = .06) under cross-

examination indicating that the use of cognitively-taxing cognitive load questions may have a negative impact on the perceptions of truthfulness of children's reports.

## **Credibility and Believability**

**Credibility.** Our second hypothesis was that truth-tellers would be perceived as more credible and believable overall than lie-tellers. After viewing all eight clips (both the direct and cross-examination of four different children), participants were asked, "Overall (ignoring minor errors or omissions of detail and focusing only on the central claims of the story), do you believe this child makes a credible witness?" Therefore, participants made a total of eight credibility judgements (two per child). Credibility judgements were entered in a 2 (Veracity: true or false) by 2 (Story Type: assertion or denial) by 2 (Interview: direct or cross) repeated measures ANOVA with age of child (younger (9-10 years) or older (11-12 years)) as a between subjects variable. There was a significant main effect for Interview, F(1, 85) = 6.99, p = 0.01,  $\eta^2_{\rho} = .08$ . Children were judged as more credible after direct-examinations (M = .70, SE = .04, 95% CI [.62] to .77]) than after cross-examinations (M = .60, SE = .03, 95% CI [.54 to .64]). There was a significant Veracity x Child Age interaction, F(1, 85) = 6.47, p = .01,  $\eta^2_{\rho} = .07$  (see Figure 2). Participants viewed younger children's true reports as more credible (M = .67, SE = .04, 95% CI [.58 to .75]) than younger children's false stories (M = .56, SE = .06, 95% CI [.44 to .67]). However, the opposite results were found for older children, as participants viewed older children's true reports as less credible (M = .60, SE = .05, 95% CI [.51 to .69]) than their false reports (M = .76, SE = .06, 95% CI [.64 to .89]). This result provides partial support for our hypothesis, but only for younger children. There was also a significant Story Type x Veracity interaction F(1, 85) = 4.22, p = .04,  $\eta^2_{\rho} = .05$  (see Figure 3). Children in the TA condition were seen as least credible (M = .58, SE = .05, 95% CI [.48 to .68]) while children in the FA condition

were seen as most credible (M = .70, SE = .08, 95% CI [.56 to .85]). For the denial conditions, children were perceived to be slightly more credible in the true conditions (M = .69, SE = .04, 95% CI [.60 to .77]) than in the false conditions (M = .62, SE = .04, 95% CI [.53 to .70]).

Believability. After viewing all eight clips (both the direct and cross-examination of four different children), participants were asked, "Overall (ignoring minor errors or omissions of detail and focusing only on the central claims of the story), if you were a jury member, would you believe the testimony of this child?" Therefore, participants made a total of eight believability judgements (two per child viewed). Believability judgements were entered in a 2 (Veracity: true or false) by 2 (Story Type: assertion or denial) by 2 (Interview: direct or cross) repeated measures ANOVA with age of child (younger (9-10 years) or older (11-12 years)) as a between subjects variable. There was a significant main effect for Interview, F(1, 86) = 6.05, p =0.02,  $\eta^2_{\rho}$  =.07. Children's reports were judged to be more believable after direct-examination (M = .70, SE = .02, 95% CI [.65 to .74]) than after cross-examination (M = .63, SE = .03, 95% CI [.58 to .68]). There was a significant Veracity x Child Age interaction, F(1, 86) = 6.82, p =.01,  $\eta^2_{\rho} = .07$ . Participants viewed younger children's true reports as more believable (M = .73, SE =.04, 95% CI [.65 to .81]) than younger children's false stories (M = .61, SE = .04, 95% CI [.54 to .68]). However, the opposite results were found for older children, as participants viewed older children's true reports as less believable (M = .61, SE = .04, 95% CI [.53 to .70]) than their false reports (M = .70, SE = .04, 95% CI [.62 to .78]). Hence, as with the credibility ratings, we found partial support for the hypothesis that participants would find children in the true conditions more credible and believable than children in the false conditions, regardless of story type or interview condition. While this was true for younger children, older children were perceived differently.

### Discussion

Consistent with previous lie detection literature (e.g., Bond & DePaulo, 2006; Gomez-Garibello et al., 2013; Saykaly et al., 2013; Vrij, 2000), participants made accurate veracity judgements at chance levels, as well as after direct-examination and cross-examination. It was hypothesized that observers would discriminate between true and fabricated reports more effectively after cross-examination, given the recent research findings on the improvement of deception detection in adults when taxing the cognitive load demands of interviewees (e.g., Vrij et al. 2008; Vrij et al., 2009). Yet, the findings of the current study did not support the stated hypothesis, as participants were not able to discriminate between children's true and false accounts above the level of chance. Furthermore, contrary to the stated hypothesis, participants rated children to be more credible and more believable after direct-examination than they did after cross-examination, regardless of age. These results are consistent with those of Talwar et al. (2006), who found that adults rated children as more credible after direct-examination with open ended-questions than after viewing a child's cross-examination. However, in line with previous studies (Saykaly et al., 2013; Talwar et al., 2006), signal detection analyses illustrated a truth-bias. Although accuracy of detection was poor, it appears that participants were more likely to assess a child's statements as being true, rather than false. This truth bias, however, was only found for judgements made after viewing the direct-examinations. After participants saw the cross-examinations, there was no longer a significant truth bias thus indicating that taxing cognitive load demands of children while being interviewed has a negative impact on potential juror's perceptions of truthfulness in children.

Indeed, analyses of accuracy after cross-examination suggest that taxing cognitive load may negatively influence on adults' perceptions of children. Participants were able to correctly identify true assertions (61%) and true denials (64%) significantly above chance levels in their post cross-examination assessments. However, these rates were lower than judgements made after direct-examination. These findings suggest that while taxing cognitive load reduced raters' truth biases, it also reduced the credibility of truthful children (as well as improving the detection of deceptive children). Following cross-examination under high cognitive load, raters were more skeptical of children's reports. Although correct discrimination of truthful accounts was above chance levels, it was significantly below chance when children falsely stated that they played the operation game with the RA. Participants appeared to think that the reports of the events were truthful even though they were not. In other words, adults had difficulty labelling a story as being false when the child described a false interaction. This result was also replicated by the main effect for Veracity in which participants had significantly higher accuracy rates for true accounts than false accounts. In a forensic context, this finding is of concern given the potential for children to falsely accuse others at the behest of a loved one. Specifically, it appears that cross-examination with high cognitive load demands make adults' accuracy for both true and false account hover closer to chance. It may be that raters find it more difficult to believe the accounts, and therefore rate the stories as deceitful.

It was also hypothesized that participants would perceive children's true reports as more believable than their false reports. Although participants had significantly higher accuracy rates for true accounts than false accounts, findings on the perceived credibility and believability of children's statements were moderated by child age and story type. That is, children's true reports were more credible in some instances, but not others. These were results that were contrary to the stated hypotheses. Notably, children's false assertions were perceived to be the most credible of all story types and true assertions the least credible of all story types. This result is worrisome as it suggests that true stories of child witnesses may be less likely to be believed. If there is a link between the perceived credibility of a child and judgments of the veracity of a child's statements, the current findings suggest that there may be negative consequences for child witnesses who are truthfully reporting an interaction with an adult.

Previous researchers have found a developmental trend when assessing the deception of children (Chahal & Cassidy, 1994; Saykaly et al., 2013), in which younger children are more easily detected than older children. In the current research, participants were also more accurate at detecting younger children than older children's false statements. Therefore, the third hypothesis was supported. In contrast, credibility and believability of children's testimony was influenced by age. Specifically, younger children's true reports were seen as more credible and believable than their false reports; however older children's true reports were seen as less credible and believable than their false reports.

Based on the current results, it appears that taxing the cognitive load of children does not improve adults' overall ability to detect deceptive statements of children, but instead might simply make them more suspicious. It appears that cross-examination actually alert adults to a potential credibility concern and in turn, they consider the testimony to not be true which reduces the tendency towards a truth bias. Similar to previous research findings, it is possible that trained coders analyzing the transcripts of children's accounts may be able to identify differentiations in speech between truth-tellers and lie-tellers. However, untrained individuals such as jurors or the participants in the current study, are unable to identify these subtle differences. It may be that cognitive load questioning affects adults' lie-telling and makes their false reports more transparent because their overall cognitive capacities are greater than those of children. Though, when children give a report, whether truthful or deceitful, they may already be experiencing cognitive overload, making high cognitive load questioning less likely to differentiate truths from lies. This is consistent with the way in which raters responded to the children after crossexamination; children were less credible overall, regardless of veracity.

Finally, as the results of the current study highlight, participants' accuracy after crossexamination increased when children were being deceitful, but significantly decreased when children were being truthful. It is possible that the lack of discrimination is more closely related to the act of cross-examination itself, rather than to taxing cognitive load, particularly because participants rated children as less credible and less believable after cross-examination than after direct-examination. Talwar et al. (2006) also found that children were less likely to be believed after adult raters saw their cross-examination. In that study, children answered specific questions about the veracity of their reports under cross-examination. However, in the current study, children were asked the specific details of their testimony and were not asked questions about the veracity of their testimony. It may be that seeing children further questioned about their reports in a cross-examination situation may negatively affect adults' perceptions of children's testimony. Based on the results of the current study, it appears that taxing cognitive load during the cross-examination of children may not be beneficial in allowing untrained adults to assess the veracity of their reports.

Limitations and future directions. There are some limitations to the current methodological approach. First, although it is representative of undergraduate students in a psychology class, the ratio of female to male participants was quite high. As juries tend to be gender equal, composed of community members, rather than students, and that law enforcement professionals tend to have more male staff, it would be interesting to see whether the current results would be replicated with a more equivalent female to male ratio and with jury-eligible community members. Furthermore, it is possible that undergraduate students are not representative of the variety of individuals that are found within a jury. Although research supports that undergraduate students can be better detectors than legal professionals (e.g. Leach et al., 2004) and that experience working with children is not related to better detection rates (e.g. Gomez-Garibello et al., 2013), replicating the methodology with a more stratified sample of the general public would be of interest to ensure generalizability. Second, although they testified in a realistic mock-courtroom and were asked to lie by the research assistant, it is likely that the testimony of the children did not elicit the same level of stress as would testifying against a loved one. Within the ethical limitations that arise from such research, the current study attempted to replicate the process of an interaction with an adult who asked them to lie, and the later testimony in a mock-courtroom. Nevertheless, future research is needed to determine whether more emotionally arousing deceptive requests by an adult would yield similar results.

**Conclusion.** Overall, it appears that taxing cognitive load at cross-examination with children does not yield the same results as it does in the adult literature. Specifically, cross-examination appears to be discrediting the witness, not specifically for lie-tellers but for all child witnesses. Furthermore, similar to previous research, it appears that even with the increased cognitive load demands participants demonstrate a truth bias particularly at direct-examination. Results of the current study demonstrate the use of unanticipated and reverse order questions during cross-examination does not appear to help raters arrive at the truth. The findings are important as they suggest that assessing credibility, believability and accuracy in child witnesses continues to be an area of research that warrants further investigation, given the importance of the real life implications.

#### References

- Bond, C. F., & DePaulo, B. M. (2006). Accuracy of deception judgments. *Personality* and Social Psychology Review, 10, 214-234. doi:10.1207/s15327957pspr1003\_2
- Bottoms, B. M., Goodman, G. S., Schwartz-Kenney, B. M., & Thomas, N. (2002).
  Understanding children's use of secrecy in the context of eyewitness reports. *Law and Human Behavior*, 26, 285-313. doi:10.1023/A:1015324304975
- Chahal, K., & Cassidy, T. (1994). Deception and its detection in children: A study of adult accuracy. *Psychology, Crime & Law, 1*, 237–245. doi:10.1080/10683169508411959
- Craig, R. A., Sheibe, R., Raskin, D. C., Kircher, J. C., & Dodd, D. H. (1999). Interviewer questions and content analysis of children's statements of sexual abuse. *Applied Developmental Science*, *3*, 77-85. doi:10.1207/s1532480xads0302\_2
- Crossman, A. M., & Lewis, M. (2006). Adults' ability to detect children's lying. *Behavioral Sciences & the Law, 24*, 703-115. doi:10.1002/bsl.731
- Edelstein, R. S., Luten, T. L., Ekman, P., & Goodman, G. S. (2006). Detecting lies in children and adults. *Law and Human Behavior*, *30*, 1-10. doi:10.1007/s10979-006-9031-2
- Evans, A., & Lee, K. (2010). Promising to tell the truth makes 8- to 16-year-olds more honest. Behavioral Sciences & the Law, 28, 801-811. doi:10.1002/bsl.960
- Evans, A. D., & Lee, K. (2011). Verbal deception from late childhood to middle adolescence and its relation to executive functioning skills. *Developmental Psychology*, 47, 1108-1116. doi:10.1037/a0023425
- Evans, A. D., & Lee, K. (2013). Emergence of lying in very young children. *Developmental Psychology*, 49, 1958-1963. doi:10.1037/a0031409

Gilbert, D. T. (1991). How mental systems believe. American Psychologist, 46, 107–119.

- Gomez-Garibello, C., Saykaly, C., Moore, K., & Talwar, V. (2013). Educators' ability to detect true and false bullying statements. *Educational Research Quarterly*, *37*, 3-23. Retrieved from http://search.proquest.com/docview/1450248607?accountid=12339
- Goodman, G. S., & Reed, R. S. (1986). Age differences in eyewitness testimony. *Law and Human Behavior*, *10*, 317-332. doi:10.1007/BF01047344

Honts, C. R., Kassin, S. M., & Craig, R. A. (2014). 'I'd know a false confession if I saw one': A constructive replication with juveniles. *Psychology, Crime & Law, 20*, 695-704. doi:10.1080/1068316X.2013.854792

- Katz, C. (2013). Internet-related child sexual abuse: What children tell us in their testimonies. *Children and Youth Services Review, 35,* 1536-1542. doi:10.1016/j.childyouth.2013.06.006
- Leach, A., Talwar, V., Lee, K., Bala, N., & Lindsay, R. C. L. (2004). "Intuitive" lie detection of children's deception by law enforcement officials and university students. *Law & Human Behavior*, 28, 661-685. doi:10.1007/s10979-004-0793-0
- Lee, K. (2013). Little liars: Development of verbal deception in children. *Child Development Perspectives*, 7, 91-96. doi: 10.1111/cdep.12023
- Lewis, M., Stanger, C., & Sullivan, M. W. (1989). Deception in 3-year-olds. *Developmental Psychology*, 25, 439-443. doi:10.1037/0012-1649.25.3.439
- Liu, M., Granhag, P. A., Landstrom, S., Roos af Hjelmsater, E., Stromwall, L., & Vrij, A.
  (2010). "Can you remember what was in your pocket when you were stung by a bee?":
  Eliciting cues to deception by asking the unanticipated. *The Open Criminology Journal, 3*, 31-36. doi:10.2174/1874917801003010031
- Lyon, T. D., Malloy, L. C., Quas, J. A., & Talwar, V. (2008). Coaching, truth induction, and young maltreated children's false allegations and false denials. *Child Development*, 79,

914-929. doi: 0.1111/j.1467-8624.2008.01167.x

- Nysse-Carris, K. L., Bottoms, B. L., & Salerno, J. M. (2011). Experts' and novices' ability to detect children's high-stakes lies of omission. *Psychology, Public Policy and Law, 17*, 76-98. doi:10.1037/a0022136
- Paine, M. L., & Hansen, D. J. (2002). Factors influencing children to self-disclose sexual abuse. *Clinical Psychology Review*, 22, 271-295. doi:10.1016/S0272-7358(01)00091-5
- Pipe, M. E., Lamb, M. E., Orbach, Y., & Esplin, P. W. (2004). Recent research on children's testimony about experienced and witnessed events. *Developmental Review*, 24, 440-468. doi:10.1016/j.dr.2004.08.006
- Polak, A., & Harris, P. L. (1999). Deception by young children following noncompliance. *Developmental Psychology*, *35*, 561-568. doi:10.1037/0012-1649.35.2.561
- Redlich, A. D., & Goodman, G. S. (2003). Taking responsibility for an act not committed: The influence of age and suggestibility. *Law and Human Behavior*, 27, 141-156. doi:10.1023/A:1022543012851
- Saykaly, C., Talwar, V., Lindsay, R. C. L., Bala, N., Lee, K., Bertrand, M., & Nugent, M.
  (2013). Adults' ability to detect deception of stressful and non-stressful stories of children *Psychology, Crime & Law, 19*, 865-879. doi:10.1080/1068316X.2012.700311
- Stromwall, L. A., Grahang, P. A., & Landstrom, S. (2007). Children's prepared and unprepared lies: Can adults see through their strategies? *Applied Cognitive Psychology*, 21, 457-471. doi:10.1002/acp.1288
- Talwar, V., Crossman, A., M., Gulmi, J., Renaud, S.-J., & Williams, S. (2009). Pants on fire?
  Detecting children's lies. *Applied Developmental Science*, 13, 119-129.
  doi:10.1080/10888690903041519

- Talwar, V., Crossman, A., Williams, S. & Muir, S. (2011), Adult detection of children's selfish and polite lies: Experience matters. *Journal of Applied Social Psychology*, *41*, 2837–2857. doi: 10.1111/j.1559-1816.2011.00861.x
- Talwar, V., Gordon, H., & Lee, K. (2007). Lying in the elementary school: Verbal deception and its relation to second-order belief understanding. *Developmental Psychology*, 43, 804-810. doi: 10.1037/0012-1649.43.3.804
- Talwar, V., & Lee, K. (2002a). Development of lying to conceal a transgression: Children's control of expressive behavior during verbal deception. *International Journal of Behavioral Development*, 26, 436-444. doi:10.1080/01650250143000373
- Talwar, V. & Lee, K. (2002b). Emergence of white-lie telling in children between 3 and 7 years of age. *Merrill-Palmer Quarterly*, 48, 160-18. doi:10.1177/0165025406073530
- Talwar, V., & Lee, K. (2008). Social and cognitive correlates of children's lying behavior. *Child Development*, 79, 866-881. doi:10.1111/j.1467-8624.2008.01164.x
- Talwar, V., Lee, K., Bala, N., & Lindsay, R. C. L. (2004). Children's lie-telling to conceal a parent's transgressions: legal implications. *Law and Human Behavior*, 28, 411-435. doi:10.1023/B:LAHU.0000039333.51399.f6
- Talwar, V., Lee, K., Bala, N., & Lindsay, R. C. L. (2006). Adult's judgment of children's coached reports. *Law and Human Behavior*, 30, 561-570. doi:10.1007/s10979-006-9038-8
- Tye, M. C., Amato, S. L., Honts, C. R., & Devitt, M. K. (1999). The willingness of children to lie and the assessment of credibility in an ecologically relevant laboratory setting. *Applied Developmental Science*, *3*, 92-109. doi:10.1207/s1532480xads0302\_4
- Vrij, A. (2000). Detecting lies and deceit: The psychology of lying and the implications for professional practice. Chichester: Wiley.

- Vrij, A. (2005) Cooperation of liars and truth tellers. *Applied Cognitive Psychology*, *19*, 39-50. doi:10.1002/acp.1050
- Vrij, A., Akehurst, L., Brown, L., & Mann, S. (2006). Detecting lies in young children, adolescents and adults. *Applied Cognitive Development*, 20, 1225-1237. doi:10.1002/acp.1278
- Vrij, A., Fisher, R., Mann, S., & Leal, S. (2006). Detecting deception by manipulating cognitive load. *Trends in Cognitive Science*, 10, 141-142. Retrieved from http://www.sciencedirect.com/science/article/pii/S1364661306000465
- Vrij, A., Granhag, P., Mann, S., & Leal, S. (2011). Outsmarting the liars: Toward a cognitive lie detection approach. *Current Directions in Psychological Science*, 20, 28-32. doi:10.1177/0963721410391245
- Vrij, A., Granhag, P., & Porter, S. (2010). Pitfalls and opportunities in nonverbal and verbal lie detection. *Psychological Science in the Public Interest*, *11*(3), 89-121. doi:10.1177/1529100610390861
- Vrij, A., Leal, S., Granhag, P. A., Mann, S., Fisher, R. O., Hillman, J., & Sperry, K. (2009)
  Outsmarting the liars: The benefit of asking unanticipated questions. *Law and Human Behavior, 33*, 159-166. doi:10.1007/s10979-008-9143-y
- Vrij, A., Mann, S. M., Fisher, R. P., Leal, S., Milne, R., & Bull, R. (2008). Increasing cognitive load to facilitate lie detection: The benefit of recalling an event in reverse order. *Law and Human Behavior*, *32*, 252-265. doi:10.1007/s10979-007-9103-y
- Williams, S., Kirmayer, M., Simon, T., & Talwar, V. (2013). Children's antisocial and prosocial lies to familiar and unfamiliar adults. *Infant and Child Development*, 22, 430-438. doi:10.1002/icd.1802

- Yachison, S., & Talwar, V. (2012). Can you keep a secret? The effect of coaching on children's lie-telling to conceal another's transgression. Paper presented at *the American Psychology and Law Society Conference*, San Juan, Puerto Rico.
- Yuille, J. C., Tymofievich, M., & Marxsen, D. (1995). The nature of allegations of child sexual abuse. In T. Ney (Ed.), *True and false allegations of child sexual abuse: Assessment and case management* (pp. 21-46). Philadelphia, PA: Brunner/Mazel
- Zuckerman, M., DePaulo, B. M., & Rosenthal, R. (1981). Verbal and nonverbal communication of deception. In L. Berkowitz (Ed.), Advances in experimental social psychology (vol. 14, pp. 1–57). New York: Academic Press.

## Table 1

# Accuracy Ratings Compared to Chance

Accuracy	М	SD	t(87)	2-tailed significance
Overall	.51	.21	0.38	.70
Total Direct	.49	.23	-0.23	.82
Total Cross	.52	.26	0.83	.41
True Assertion <sup><math>\dagger</math></sup>	.61	.49	2.18	.03*
False Assertion <sup>†</sup>	.39	.49	-2.18	.03*
True Denial <sup><math>\dagger</math></sup>	.64	.48	2.64	.01**
False Denial <sup><math>\dagger</math></sup>	.45	.50	-0.85	.40

\*  $p \leq .05$ ; \*\* $p \leq .01$ , <sup>†</sup>Final judgement after cross-examination.



Figure 1. Veracity by interview interaction effect on accuracy of participants' lie detection.



Figure 2. Child witness credibility as a function of child age and veracity of children's reports.



*Figure 3*. Child witness credibility as a function of child veracity and story type (assertion versus denial).

#### **Bridging Manuscripts 2 and 3**

As previously noted, the findings reported in Manuscript 1 highlight that children are able to give complex and detailed accounts and are able to maintain such reports at direct- and crossexamination. These results establish that children between 9 and 12 are able, and willing, to given detailed accounts about an interaction with an unfamiliar adult that is truthful or deceitful. The second step in this program of study, Manuscript 2, examined adults' abilities to detect the veracity of children's statements given during direct and a high cognitive load cross-examination procedure. This study was linked to Manuscript 1, in that it also it evaluated adults' perceptions of children answering the four question types (open-ended, prompted, reverse order and chronological recall). Although current trends in deception detection literature have highlighted the positive impact of taxing cognitive load, as a method to improve detection rates (Vrij et al., 2008; Vrij et al., 2009), the results of Manuscript 2 suggest that this methodology did not improve the detection rates of children's lies. Notably, results of the second manuscript are consistent with previous lie detection studies that did not include high cognitive load questions (Bond & DePaulo 2006; Gomez-Garibello et al., 2013; Saykaly et al., 2013) as detection rates hovered at chance levels. The second study in this program of research highlighted the influence that cross-examination may have on the perceived credibility and believability of the reports. Children were perceived to be more credible and more believable after direct-examination than after cross-examination. Thus, the next step in this line of inquiry is to evaluate whether individual child factors (e.g., cognitive abilities) influence adults' perception of children's testimony and detection rates when seeing children interviewed in a direct-examination and a high cognitive load cross-examination procedure. Since children are able to maintain their stories, and therefore appear consistent, but detection rates did not improve, it is possible that

there are features of the children, such as executive functions and theory of mind that may be influencing detection rates.

In order to evaluate this, Manuscript 3 investigates the impact that children's executive functioning and theory of mind has on their ability to deceive a potential jurors. Thus, the final manuscript of this program of study sought to complete the investigation by determining whether children's inhibitory control, planning, working memory and theory mind development could predict adults' detection rates.

Chapter 4: Manuscript 3

How Individual Cognitive Factors Influence Detection of Child Witness Deception

Christine Saykaly<sup>1</sup>, Victoria Talwar<sup>1</sup>, Angela Crossman<sup>2</sup>

McGill University<sup>1</sup>

John Jay College of Criminal Justice CUNY<sup>2</sup>

#### Abstract

There is a continued struggle to identify factors that improve the detection of children's deception. Researchers have documented that cognitive factors are associated with the development of lie-telling, yet there is little research on how these cognitive factors can help predict the veracity of children's statements. The current study explored if theory of mind, inhibitory control, planning and working memory abilities of the child witness could predict whether or not adults could accurately detect their veracity. Eighty-eight children 9 and 12 years old ( $M_{age in months} = 129.55$ , SD = 15.48) gave a true or a false testimony in a mock-courtroom study about an interaction with a research assistant one week prior. Overall, younger children were more easily detected at both direct- and cross-examination. Inhibitory control predicted accuracy judgments at direct-examination. Theory of mind, planning and working memory predicted accuracy judgments at cross-examination. Implications for courtroom procedures will be discussed.

How Individual Cognitive Factors Influence Detection of Child Witnesses

Much of the recent focus of deception detection research has been on ways to interview a witness to improve the accurate detection of lies (e.g., Sorochinski et al., 2013, Vrij & Granhag, 2012). Although there have been numerous approaches on interview strategies (e.g., Lamb, Orbach, Hershkowitz, Epli, & Horowitz, 2007; Vrij et al., 2009), little research has focused on the individual characteristics of the witness giving the report, and their influence on deception detection. Developmental researchers have shown that there are cognitive abilities that are related to the emergence of lie-telling (Evans & Lee, 2011; Talwar & Lee, 2008). However, few studies have linked how children's developing cognitive abilities may predict their capacity to successfully deceive others, nor how such cognitive abilities may affect how child witnesses are perceived when testifying. Understanding how children's development influences the way in which others perceive them is of particular interest when considering the detection of their truths and lies, especially given the variability in cognitive abilities as children age (Alloway, McCollum, Alloway, & Hoicka, 2015; Evans & Lee, 2013; Gordon, Lyon, & Lee, 2014; Talwar & Lee, 2008; Talwar, Gordon, & Lee, 2007). Yet, it is clear that adults who interview children are influenced by individual characteristics of the child, such as their cognitive abilities (Gilstrap & Papierno, 2004), suggesting it might also impact efforts to detect their lies. Nevertheless, it remains an open question whether individual differences, namely cognitive skills that are related to lie-telling, predict onlookers' perceptions of the veracity of children's statements. Specifically, the goal of the current study is to determine whether working memory (WM), theory of mind (ToM), and planning abilities of children influences veracity judgments.

## **Deception Detection of Children's Veracity**

Many studies have focused on untrained adults' abilities to correctly identify the veracity of children's statements. The majority of research has focused on the abilities of the viewer to "intuitively" identify the veracity of the child's statement (Gomez-Garibello, Saykaly, Moore, & Talwar, 2013; Saykaly et al., 2013; Talwar, Crossman, Gulmi, Renaud, & Williams, 2009). Intuitive lie detection relies solely on one's opinions and perceptions without employing researched deception detection techniques (Leach, Talwar, Lee, Bala, & Lindsay, 2004). Accurate assessment of child veracity is crucial, as children's accounts may be particularly influential in cases involving abuse (Edelstein, Luten, Ekman, & Goodman, 2006), and their testimony can be persuasive when assessing the guilt of a defendant or when determining custodianships.

Recent research on adults' intuitive assessments of children's true and fabricated reports has found similar results to the adult literature–detection rates of truthful and deceitful statements hover around chance levels (e.g., Edelstein et al., 2006; Stromwall, Granhag, & Landstrom, 2007; Talwar, Lee, Bala, & Lindsay, 2006). For instance, Stromwall et al. (2007) investigated adults' ability to assess the veracity of children's prepared and unprepared truths and lies. Undergraduate students viewed videos of children (11 to 13 years) describing an event they had experienced, and one they had not experienced. Half the children were told in advance which story to tell (truth and false) and were given time to prepare, while the other half were not advised nor given time to prepare. Results indicate that adults were unable to reliably assess the veracity of children's statements as there were no significant differences between the true and fabricated reports. However, little is known about the individual attributes of the child that may impact an adult's ability to accurately detect the veracity of their statements.

## **Emergence of Children's Lie-Telling**

Researchers have determined that lie-telling emerges in the preschool years and develops with age (e.g., Evans & Lee, 2013; Talwar, Murphy, & Lee, 2007). While preschool children's lies are simple, using few words (Lewis, Stanger, & Sullivan, 1989; Talwar & Lee, 2002a; Talwar, Gordon, et al., 2007), older children are able to formulate more complex and elaborate lies, suggesting that older children's lies may be more difficult to identify. As children grow older, their reports, regardless of veracity, increase in length, complexity, and descriptive detail (Craig, Sheibe, Raskin, Kircher, & Dodd, 1999; Goodman & Reed, 1986; Pipe, Lamb, Orbach, & Esplin, 2004; Vrij, 2005), and children become increasingly better at maintaining their lies, even across multiple questioning sessions (Gilbert & Fisher, 2006; La Rooy, Katz, Malloy, & Lamb, 2010; La Rooy, Pipe, & Murray, 2005). Although researchers have investigated false allegations and false denials of abuse or neglect (Lyon, 1995; Trocmé & Bala, 2005), very little is known about older children's ability to generate such complex lies, as most research has focused on the emergence of lie-telling in preschool aged children. Given that older children are able to produce complex lies (Evans & Lee, 2011), professionals working with children must be equipped for the possibility that they may face false statements (e.g., false allegations or false denials of bullying or abuse).

## Lie-Telling and Cognitive Skills

As noted above, the ability to lie effectively develops with age, facilitated by children's maturing cognitive skills (see Talwar & Crossman, 2011 for review). Specifically, the emergence and development of children's lie-telling abilities are related to the development of ToM, and executive functioning abilities, such as working memory, planning, and inhibitory

control. Forensic researchers have also examined the role of cognition in relation to maintaining lies in adults, focusing on the role of cognitive load (e.g., Vrij et al., 2009).

**ToM.** ToM is the ability to attribute mental states to others as well as an understanding that others have mental states that differ from one's own (Perner, Ruffman, & Leekam, 1994). This encompasses the understanding that both beliefs and desires determine behaviour, and that other people's beliefs and desires are not necessarily the same as one's own (Berk, 2001). ToM is believed to be associated with lie-telling because telling a lie requires deliberately creating a false belief in the mind of another (Talwar & Lee, 2008). In fact, Polak and Harris (1999) found that children between 3 and 5 years of age who had higher ToM scores were more likely to give a false denial when asked if they had peeked at a forbidden toy. Recently, Ma, Evans, Liu, Luo and Xu (2015) found a relationship between 3 year old lie telling and ToM. Specifically, a positive relationship was found between children who peeked at a toy and their performance on an unexpected location task (created by Wimmer & Perner, 1983). Additionally, Talwar and Lee (2008) found that false denials were related to first-order belief understanding (deliberately creating a false belief in another), and that the ability to maintain a lie through follow-up questions was related to second-order false beliefs (understanding that other people may know things that we do not). This suggests that older children, with well-developed second-order ToM, will be able to maintain their lies effectively over repeated questioning.

**Executive functions.** Another set of cognitive abilities likely related to deception skills are executive functions (Carlson & Moses, 2001). Executive functioning is a set of higher order psychological processes (Zelazo & Muller, 2002) such as self-regulation, inhibitory control, planning, and other goal-oriented behaviours (Welsh, Pennington, & Groisser, 1991). Indeed, Talwar and Lee (2008) found that children who performed well on executive functioning tasks

showed a greater ability to suppress the reporting of a transgression the child had previously committed.

Talwar and Lee's (2008) finding is not surprising, given the complexity inherent in lying convincingly. When telling a lie, the liar is motivated to fulfill the goal of convincing another that he or she is being truthful. In doing so, the lie-teller must be able to maintain their lie verbally, avoiding inconsistencies between their initial and subsequent false statements. This requires planning, inhibitory control, and working memory on the part of the deceiver, as detailed below. Although researchers have determined the importance of such skills in the development of lie-telling, the current study is the first to examine whether there is a relationship between executive functions and successful lie-telling.

*Planning.* Longer, more elaborate lies require an element of planning, as the liar must prepare their story prior to reporting it in order to maintain consistency. In a study investigating the neural correlates associated with verbal deception, Ding, Sai, Fu, Liu, and Lee (2014) used functional near-infrared spectroscopy to determine that during verbal deceptive tasks, the regions of the brain associated with planning complex actions is activated. Furthermore, Evans and Lee (2011) investigated the executive functioning skills related to lie-telling among 8 to 16 year-old children and found that children with greater planning abilities were better able to conceal information and construct more sophisticated lies. Thus, it seems likely that children with better planning abilities would make more credible respondents regardless of veracity.

*Inhibitory control.* Of particular importance to lie-telling is inhibitory control, an executive function that is defined as the ability to suppress one's thoughts or feelings in order to state or perform another thought or feeling (Carlson, Moses, & Breton, 2002). When lying, one must suppress the truth in order to produce a false statement with the intent of creating a false

belief in another (Carlson et al., 1998, 2002). Furthermore, through additional questioning, one must inhibit the truth time after time in order to remain consistent. Talwar and Lee (2008) found that children (3 to 8 years) with better-developed inhibitory control were more likely to lie than those who confessed to a transgression, providing further evidence that inhibitory control has an influence on children's ability to produce deceptive statements. It is not clear how it influences credibility, however, though it is expected that poor inhibitory control would undermine a child's ability to appear credible when reporting on a past event.

*Working memory.* Working memory, often referred to as short-term memory, is the ability to temporarily hold information in one's mind and manipulate that information to generate a response (Carlson, Moses, & Breton, 2002). Telling a lie involves working memory because the lie-teller must maintain both the truth (inhibited) and the lie in memory to avoid either revealing the truth or contradicting the lie to produce a plausible account (Gombos, 2006; Vrij & Mann, 2001). Therefore, when fabricating a false story beyond one or two short statements, working memory is likely to play a central role in deceptive ability (Alloway et al., 2015; Gombos, 2006) and is thus likely implicated in one's credibility when telling such a lie.

Overall, lie-telling seems to reflect children's emerging cognitive maturity as they begin to understand others' mental states and behaviour while at the same time learning to control their own behaviour. To date, no studies have examined the link between ToM, planning, inhibitory control, and working memory on a children's ability to conceal or fabricate in a courtroom setting. Additionally, no research has examined how children's lie-telling abilities predict adults' capacity to decipher between truth and lies. It may be that children who have not yet developed these cognitive abilities are poorer liars, and as a result are more likely to be detected. There remains a gap in the literature as to how the development of these abilities may predict, or influence, jurors' perceptions of a child witness.

#### **Cross-Examination**

One important, unique aspect of the courtroom is the existence of cross-examination. The goal of cross-examination is to elicit new facts, elicit facts that incriminate, and to test the details previously provided by a witness (Park, 2003). Although cross-examination has proven effective in many situations, at times it may cause truthful witnesses to be perceived as liars due to their difficulty in responding to cross-examination inquiries (Fogliati & Bussey, 2014, 2015). For example, Zajac and Hayne (2006) found that children 6 to 10 years of age changed approximately 40% of their responses during cross-examination. Furthermore, in another study of child sexual abuse victims between the ages of 5 and 13 who testified in court, three quarters of children changed at least one detail during cross-examination (Zajac, Gross, & Hayne, 2003). Thus, children have a tendency to change a significant amount of detail from their original true reports when questioned, and as such, appear less credible and believable. However, little is known about how children's ToM and executive functions may influence their perceived credibility and veracity in courtroom settings. As act of cross-examination may itself "tax" cognitive load, it may be that children have more difficulty maintaining their reports over extended questioning, and their ability to maintain their report increases as a function of their developing cognitive abilities.

### **Current Study**

The aim of the current study is to determine whether children's cognitive abilities influence the detection and perception of their false or true testimony. Although a number of developmental studies have examined the relation between the development of lying and cognitive abilities, such as ToM and executive functioning, these studies were not designed to address applied issues that are relevant to clinical and forensic settings. As a result, these studies did not reflect the type of lies that children may fabricate in forensic contexts or the types of interviews children may undergo. Specifically, these studies failed to address intentionally fabricated reports involving both the child and another adult. They also did not investigate children's abilities to maintain a fabricated report over multiple questionings. The current study seeks to address the gap in the literature by examining fabricated reports made by children over direct- and cross-examination about an interaction between themselves and another adult, and, how their developing cognitive abilities may affect their detection, as well as how they are perceived by potential jurors.

To address these issues, children completed cognitive measures and played a memory game in their home with a research assistant (RA). Half of the children were asked to lie about whether they played the operation game on the behalf of the RA in a mock-courtroom setting occurring approximately one week later. Courtroom sessions were recorded. Later, adult participants viewed videos of four children (honest/dishonest x played/did not play) and were asked to determine the veracity of the children's statements.

Based on the literature, two hypotheses were generated: It was hypothesized that children's cognitive abilities (ToM and executive functions) would predict adults' veracity evaluation (Hypothesis<sub>1a</sub>). Specifically, the veracity of children with lower scores for ToM, working memory, inhibitory control, and planning will be more easily identified than children with higher scores. Furthermore, given the procedure of the current study, it is hypothesized that children's cognitive abilities will predict veracity judgments more strongly after cross-examination than after direct-examination (Hypothesis<sub>1b</sub>). It is hypothesized that ToM and

executive functions will predict adult's perceptions of child witnesses (Hypothesis<sub>2</sub>). In other words, children with higher cognitive scores will be perceived as more credible and more believable than children with lower scores.

## Method

## **Participants**

Child participants (herein referred to as children) were 88 school-aged children between ages 9 and 12 years ( $M_{age in months} = 129.55$ , SD = 15.48,  $N_{females} = 40$ ) from a major metropolitan area. Participants were recruited through advertisements placed in a free, city-wide newspaper directed towards families, as well as a database of parents expressing interest in participating in research. Participants received \$20.00 compensation for their participation in the research at the end of the second session.

Adult participants (herein referred to as participants) included 88 undergraduate students  $(M_{age in years} = 20.43, SD = 1.45, N_{females} = 74)$  from the same major metropolitan area. Participants were recruited through advertisements placed on a university classified website as well as through an Undergraduate Psychology research pool. Participants recruited through the Undergraduate Psychology research pool received one extra percent on their final psychology course grade. Exactly 50.00% of participants were recruited through the advertisement and received no compensation.

#### **Materials**

**ToM measures.** The NEPSY-II is psychometric tool that assesses various neuropsychological domains of child development. The ToM subtest measures a child's ability to comprehend another's perspectives, intentions, and beliefs. Unlike standard false belief tasks that are geared for children between the ages of 3 to 7 years, the NEPSY-II includes ToM
subtests for children up to and including 16 years of age. Children are read a series of vignettes which require perspective taking in order to answer correctly. This subtest is unique as it not only measures one's false belief understanding, but also assesses one's abilities to understand a variety of mental functions (i.e., belief, intention, deception, emotion, imagination, and pretending), as well as the ability to understand others' beliefs and desires ("Psychological Corporation," 2007). Standardized scaled scores are generated based on the child's age at testing.

**Executive function measures.** In order to assess children's executive functioning abilities in the areas of planning, inhibitory control and working memory, the following assessment measures were selected:

*Planning.* The Tower Test of the Delis-Kaplin Executive Function System (D-KEFS) was administered. This task includes five disks varying in size and colour. The examiner places disks on the pegs (starting position) and displays a picture of the tower to be built (ending position). Children are asked to use only one hand, to move one disk at a time, and are told that they cannot place a larger disk above a smaller disk. The goal of this task is to reach the ending position in the fewest moves possible. This task measures spatial planning, rule learning, inhibition of impulsive responding, inhibition of perseverative responding, and establishment and maintaining of instructional set (Delis, Kaplin & Kramer, 2001). Standardized scaled scores are generated based on the child's age at testing.

*Stroop.* The Stroop Task was administered in order to assess inhibitory control. The child is first asked to read words (red, green, blue which repeat in random order) as quickly as possible for 60 seconds. Then, children are asked to state the colour of the text (XXXX in either red, green, blue). Third, children are asked to state the colour of the ink of the printed word. This

task is intentionally difficult as the word, for example "red," will be printed in blue ink, and therefore the correct answer is blue. This requires inhibition of the printed word to state the colour of the ink. Standardized scaled scores are generated based on the child's age at testing.

*Working memory.* To assess children's working memory, the Digit Span subtest from the Wechsler Intelligence Scale for Children–4th Edition (WISC-IV) was administered. In this standardized measure, children are required to repeat a series of numbers. The first set of administrations requires children to restate numbers as they are presented. In the second set, children are required to manipulate the digits and to state them in reverse order. The number of digits increases with each successful trial (Wechsler, 2003). Standardized scaled scores are generated based on the child's age at testing.

The memory game. A Sponge Bob Square Pants® memory game was used. All the cards were placed face down on a table in a random order. Both players tried to find two matching cards. If a pair was found, the player collected both cards. The player with the most cards at the end of the game won the round. This was a game and not a standardized cognitive measure.

Hasbro's <sup>™</sup> Operation Game. In this game, children were asked to remove pieces from a game board. The original version of the game features a man. However, an alternative version of the game was used: Hasbro's <sup>™</sup> Operation Game, Buzz Lightyear Edition (herein referred to as Operation game). On this version, Buzz Lightyear, a space hero from the Disney Pixar movie Toy Story, was the patient. This version was selected so that the adult participants viewing the courtroom procedures would not use their own memories of the game to determine veracity, but the facts given by the child.

## Procedure

Play session with children. During the first session, an RA interacted with the child in his or her home. Children were informed that six to eight days later they would be interviewed in a mock-court session about the events that transpired during the home-visit. The RA-child dyad played games together in a quiet area of the house, free of distraction from siblings and parents (e.g., the kitchen, the den, or the basement). The RA administered the ToM task, the Stroop Task, the Digit Span, the Tower Test, and a memory game. Half of the children played the Operation game. Once the games and subtests were complete, half the children were not given any further instruction, the other half were told that the RA had made a mistake, and asked the child to lie on her behalf when interviewed the following week. Hence, half told the truth/lied about playing Operation and half told the truth/lied about NOT playing Operation.

**Children's testimony** – **stimulus videos.** Six to eight days later, children came to a mock-courtroom located in the University. Children assigned to one of the false conditions were reminded of their condition by the RA prior to entering the courtroom. The RA reminded children of her mistake, and asked them once again if they would lie on her behalf. Upon entry in the mock-courtroom, children were escorted to the witness box. They were faced with three RAs dressed in black robes and white collars: two representing lawyers facing the witness box, and one sitting in the judge's chair to the child's right.

The judge explained to the child what would occur and asked all children whether they promised to tell the truth. Then, the RA playing the direct examiner asked children a series of open-ended questions (e.g., tell me what happened when you played with the RA last week), followed by open-ended prompts (e.g., can you tell me more about that), and then by specific questions (e.g., I was told you played the operation game, is that true). During cross-examination, the second RA asked children to recount the events that occurred the week prior in reverse order. Then, the RA asked the child open-ended, yet unanticipated questions (e.g., who was sitting closest to the door when you were playing together last week). To conclude, children were asked to recount their story one last time but in chronological order. No prompts were used during cross-examination. Courtroom sessions were video-recorded.

Adult participants' lie detection. Courtroom videos were edited to remove any identifying information. Participants viewed the direct- and cross-examination of four different children, two truth-tellers and two lie-tellers. Video reels were created using a Latin-square design; therefore each child was viewed by four different participants. Participants were asked to judge the veracity of each child's testimony [Veracity] after both the direct-, and cross-examination. Effectiveness evaluation were assessed by asking participants whether the testimony was credible [Credibility], and whether they believed the child's testimony [Believability].

### Results

Descriptive relations among measures were first examined, followed by multiple regression analyses. Alpha levels were .05 for all analyses.

To test the linear relationship between the cognitive measures and age of the participants, Pearson product-moment correlation coefficients were calculated (see Table 1). There was a significant positive relationship between ToM and working memory. There was a significant negative relationship between planning and age.

A series of stepwise regressions were conducted to examine whether any of the cognitive factors influenced judgments of veracity and effectiveness of testimony. To control for age of

the children and veracity of statements, both independent variables were entered into the model in a linear fashion at the first step, allowing the step-wise model at the second step to predict whether cognitive measures would predict accuracy, believability and credibility. Therefore, on the first step of all the analyses, child age in months and veracity were entered. Standardized scores for working memory, planning, inhibitory control, and ToM were entered in the second step to predict accuracy at direct-examination and again at cross-examination.

## Accuracy

Accuracy was calculated as a proportion score based on judgments of the adult raters. A total of two proportion scores were calculated for each child, one for direct-examination and one for cross-examination. Therefore, if a child received a score of 0 for accuracy (on either direct-or cross-examination), it meant participants were unable to accurately classify the veracity of their testimony (i.e., rating a true account as false, and a false account as true). Regardless of veracity, this child was able to "fool" the raters as none were able to accurately identify their veracity. A score of 1 indicates that all participants accurately evaluated the veracity of the child's statements.

**Direct-examination:** The prediction model included three of the six predictors and was reached in two steps with no variables removed. The model was statistically significant F(3, 84) = 27.963, p < .001, and accounted for approximately 49% of the variance in accuracy ( $R^2 = .509$ , Adjusted  $R^2 = .491$ ). Accuracy at direct-examination was primarily predicted by veracity, age and inhibitory control (See Table 2 for results). In terms of age of the child, younger children (M = .531, SD = .329) were more easily classified than older children (M = .450, SD = .321). Veracity accounted for the most variance. Truth-tellers (M = .705, SD = .260) were more easily classified than lie-tellers (M = .284, SD = .239). The only cognitive measure to predict ratings at

direct-examination was inhibitory control (as measured by the Stroop Task). For every increase in standard score on the Stroop Task, there was a .011 decrease in accuracy scores of the participants. As the direct-examination consisted of open-ended questions and prompts, results of the current study suggest that a child's inhibitory control capacity influences their interview effectiveness.

Cross-examination: The prediction model contained five of the six predictors and was reached in four steps with no variables removed. Inhibitory control did not contribute to the model. Nevertheless, the model was statistically significant, F(5, 79) = 6.66, p < .001, and overall, cognitive factors accounted for approximately 30% of the variance in accuracy ( $R^2$  = .297, Adjusted  $R^2 = .252$ ) (See Table 2 for results). Child age and veracity were entered into the first model. In terms of age of the child, younger children (M = .583, SD = .311) were more easily classified than older children (M = .450, SD = .279). Veracity accounted for the most variance. Truth-tellers (M = .625, SD = .250) were more easily classified than lie-tellers (M =.420, SD = .318). In terms of the cognitive measures, ToM was the strongest predictor of accuracy at cross-examination. Specifically, for every increase in ToM score of children, there was a .051 decrease in accuracy. Children's planning abilities also predicted accuracy at crossexamination. For every increase in standardized score on the Tower Task, there was a .044 decrease in accuracy. Lastly, for every increase in standardized score on the Digit Span, there was a .020 increase in accuracy indicating that participants had greater ease classifying children with better working memory.

### Effectiveness

**Believability.** Participants were asked whether they believed the testimony of the children after both direct- and cross-examination. The prediction model did not contain any of

the six predictors at direct nor at cross examination. Overall, the models were not significant. No cognitive factors predicted the believability of children's statements at direct- ( $R^2 = .021$ , *Adjusted*  $R^2 = -.003$ , F(2, 84) = 0.882, p = .418) or at cross-examination ( $R^2 = .001$ , *Adjusted*  $R^2$ = -.023, F(2, 84) = 0.041, p = .960).

**Credibility.** Participants were asked whether they perceived the testimony of children to be credible. The prediction model did not contain any of the six predictors at direct nor at cross-examination. Overall, the models were not significant. No cognitive factors predicted the credibility of children's statements at direct ( $R^2 = .051$ , *Adjusted*  $R^2 = .028$ , F(2, 84) = -2.206, p = .117) or at cross-examination ( $R^2 = .010$ , *Adjusted*  $R^2 = -.014$ , F(2, 84) = 0.415, p = .662).

#### Discussion

The purpose of the current study was to determine whether cognitive abilities, specifically ToM, working memory, inhibitory control, and planning, impacted perceptions of child witness testimony, as well as accuracy of detection of children giving true or false statements in a mock-courtroom procedure. Researchers have determined that such cognitive skills are needed in order to be able to lie (e.g., Carlson & Moses, 2001; Pollack & Harris, 1999) but to date, research has not probed the influence such abilities may have on the ability to accurately assess veracity. There are two other variables that make this study unique. First, many deception detection studies have asked participants to rate short narratives of children (e.g., Leach et al., 2004; Talwar & Lee, 2002a), but very few have looked at longer narratives of children (Saykaly et al., 2013), and none have looked at longer narratives of children in a mockcourtroom setting undergoing both direct- and cross-examination. Second, the current study is unique as children were asked by an unfamiliar adult to lie, and were not provided with a script or practice statement.

### Accuracy

Results indicate that at both direct- and cross-examination, younger children were more easily detected than older children. Given the research on the emergence of lying in children (e.g., Evans & Lee 2011, 2013), as well as results from previous deception detections studies (e.g., Bottoms et al., 2002; Goodman, 2006), results of the current study suggest that age may not only play a role in the development of lie-telling but also in their ability to deceive others. In addition, in line with previous research (e.g., Talwar et al. 2006; Saykaly et al., 2013), results of the current study found that truthful children were accurately categorized more frequently than lie-tellers. This is consistent with previous research that suggests adults have a bias to rate children as truth-tellers (Saykaly et al., 2013; Talwar et al., 2006). Therefore, it appears that age and veracity do account for a significant proportion of the variance for accuracy of detection at both direct- and cross-examination.

Even though some of the variance was predicted by age and veracity, individual cognitive characteristics did predict accuracy. First, it was hypothesized that children's cognitive abilities would predict accuracy rates (Hypothesis<sub>1a</sub>). As predicted all of the cognitive measures predicted participants' accuracy at either direct- or cross-examination. Results of the current study suggest that inhibitory control, as measured by the Stroop Task, influences adults' veracity judgments when children are being asked open-ended questions (at direct-examination). As previously discussed, when lying, one must inhibit the truth and subsequently provide a statement to instill a false belief into the listener (Carlson et al., 1998, 2002). Open-ended questions are less cognitively taxing, allowing the respondent to decide what information to give, and which to suppress. Adults had more difficulty accurately identifying the veracity of

testimony of the children who are better at controlling what information they provide during open-ended questioning.

Interestingly, although inhibitory control was the only measure that predicted accuracy judgments at direct-examination, it is the only cognitive measure that did not predict accuracy at cross-examination. Overall, as hypothesized, cognitive factors were more predictive of accuracy after cross-examination (Hypothesis<sub>1b</sub>). ToM, planning and working memory predicted accuracy rates, regardless of the veracity of the child's statement at cross-examination. Literature on the development of lie-telling has shown that children with better developed ToM were more likely to lie (Polak & Harris, 1999). Based on the current findings, ToM also impacts adults' detection rates as the testimony of children with lower ToM scores was more easily detected. Results indicate that better understanding of ToM, namely understanding that the mental states of the child is different than that of their audience, resulted in testimony that was more difficult to correctly identify as truthful or deceitful. Furthermore, results of the current study indicate that more developed planning abilities yielded poorer detection rates, even when controlling for veracity. Evans and Lee (2011) found that children with better planning abilities were better able to lie and conceal information. Therefore, it appears that better planning not only makes one a better lie-teller, but also makes one's veracity less detectible. Interestingly, participants had greater ease identifying the veracity of children with better developed working memory. This finding did not support the stated hypothesis (Hypothesis<sub>1a</sub>) as it was predicted that better developed executive functions would make detection more difficult, not easier. As previously described, working memory is the ability to temporarily hold information in one's mind, and manipulate the information to generate a response (Carlson, Moses, & Breton, 2002). It is

possible that in monitoring the content of their reports, children need more time to respond, which may have influenced their ratings.

## **Perceptions of Child Witnesses**

The current study found no evidence that the assessed cognitive measures predict ratings of believability or credibility at direct- or cross-examination. Therefore Hypothesis<sub>2</sub> was not supported. Whether or not a jury member believes the testimony of a child, and whether they find the child to make a credible witness is important, as it is likely to influence their verdict. Results of the current study suggest that the perceptions of a child's testimony has little to do with the child's apparent cognitive abilities. Furthermore, results of the analyses indicate that neither age, nor veracity, impacted such judgments. Previous studies have found younger children are perceived to be more believable and credible than older children (Saykaly, Talwar & Crossman (under review); Talwar et al. 2006). Perhaps, these ratings are based on the rater's own biases about children and their abilities. From a forensic perspective, these results are interesting as perceptions of child testimony do not appear to be influenced by age, veracity or individual cognitive factors.

Overall, there appears to be cognitive measures of child witnesses that facilitate adults' accurate ratings of veracity, but not their perceptions of child witnesses. Empirical research highlights the cognitive skills needed to produce and maintain a lie, however little was known on the impact these cognitive skills would have on the detection rates and perceptions of child witnesses. With the current results in mind, there appears to be a link between the development of skills required for lie-telling, and the influence such skills may have on a child's ability to successfully deceive another. More importantly, when cognitive load is being taxed, individual executive functions and ToM development predict accurate veracity judgments. Given the

previously inconsistent results of the effects of cross-examination with children, further investigation of cross-examination with questions that tax cognitive load should be considered.

## **Limitation and Future Directions**

Given the ethical constraints of research with human subjects, there are some limitations to the current study. First, although the children were asked to lie on behalf of the RA about a game they either played or did not play, in real court cases, the stakes of the testimony can be more serious. Therefore, the current study may not have elicited the same level of stress that child witnesses actually experience while testifying, particularly if they are doing so dishonestly. As seen in Saykaly et al. (2013), adults experience more difficulty accurately judging the veracity of children's stressful statements in comparison to their non-stressful ones. Perhaps children's cognitive abilities would also influence such judgments. Second, the raters of the current study were undergraduate students. Although previous studies that used professionals with greater experience with children as raters have found that experience does not improve detection abilities (e.g. Bond & DePaulo 2006; Gomez-Garibello et al., 2013; Leach et al., 2004), replicating the present methodology with professionals within the forensic and legal domains would be of interest. Finally, although representative of psychology students, the ratio of male to female adult participants was quite low. Given that most juries are gender equal, it is possible that the gender inequality in the current study may have influenced the results. Future studies should investigate whether individual factors of children giving testimony that is more emotionally harmful would yield similar results and whether gender of adult rater is influential.

## Conclusion

Overall, it appears that there are some individual differences in children that may influence accuracy of veracity judgments of their true or false reports. Inhibitory control appears

### QUESTION TYPE AND CROSS-EXAMINATION

to influence adults' accuracy when children are asked open-ended questions at directexamination, while working memory, planning and ToM influence accuracy children at crossexamination. Furthermore, there appear to be no individual cognitive factors of the child that influence as perceptions of testimony (measured by believability and credibility), suggesting that these judgments are made intuitively by the adult viewer. Such judgments may be made from their own biases and not as a function of children's veracity or cognitive abilities. Results of the current study demonstrate that working memory, planning, inhibitory control and ToM are not only cognitive skills required to make a false statement, but may also influence adults' ability to accurately assess the veracity of children's statements. They do not impact perceptions.

#### References

- Alloway, T. P., McCallum, F., Alloway, R. G., & Hoicka, E. (2015). Liar, liar, working memory on fire: Investigating the role of working memory in childhood verbal deception. *Journal* of Experimental Child Psychology, 137, 30-38. doi:10.1016/j.jecp.2015.03.013
- Berk, L. A. (2001). *Development through the lifespan*, Second Edition. Boston: Allyn and Bacon.
- Bottoms, B. M., Goodman, G. S., Schwartz-Kenney, B. M., & Thomas, N. (2002).
  Understanding children's use of secrecy in the context of eyewitness reports. *Law and Human Behavior*, *26*, 285-313. doi:10.1023/A:1015324304975
- Carlson, S. M., Moses, L. J., & Hix, H. R. (1998). The role of inhibitory control in young children's difficulties with deception and false belief. *Child Development*, 69, 672–691. doi:10.1111/j.1467-8624.1998.tb06236.x
- Carlson, S. M., & Moses, L. J. (2001). Individual differences in inhibitory control and children's Theory of Mind. *Child Development*, 72, 1032-1053. doi:10.1111/1467-8624.00333
- Carlson, S. M., Moses, L. J., & Berton, C. (2002). How specific is the relation between executive function and theory of mind? Contributions of inhibitory control and working memory.
   *Infant and Child Development*, 11, 73-92. doi:10.1002/icd.298
- Craig, R. A., Sheibe, R., Raskin, D. C., Kircher, J. C., & Dodd, D. H. (1999). Interviewer questions and content analysis of children's statements of sexual abuse. *Applied Developmental Science*, *3*, 77-85. doi:10.1207/s1532480xads0302\_2
- Delis, D.C., Kaplan, E., & Kramer, J.H. (2001). *The Delis-Kaplan Executive Function System: Examiner's Manual.* San Antonio, TX: Pearson.

- Ding, X. P., Sai, L., Fu, G., Liu, J., & Lee, K. (2014). Neural correlates of second-order verbal deception: A functional near-infrared spectroscopy (fNIRS) study. *NeuroImage*, 87, 505-514. doi:10.1016/j.neuroimage.2013.10.023
- Edelstein, R. S., Luten, T. L., Ekman, P., & Goodman, G. S. (2006). Detecting lies in children and adults. *Law and Human Behavior*, *30*, 1-10. doi:10.1007/s10979-006-9031-2
- Evans, A. D., & Lee, K. (2011). Verbal deception from late childhood to middle adolescence and its relation to executive functioning skills. *Developmental Psychology*, 47, 1108-1116. doi:10.1037/a0023425
- Evans, A. D., & Lee, K. (2013). Emergence of lying in very young children. *Developmental Psychology*, 49, 1958-1963. doi:10.1037/a0031409
- Fogliati, R. & Bussey, K. (2014). The effects of cross-examination on children's reports of neutral and transgressive events. *Legal and Criminological Psychology*, 19, 296-315. doi:10.1111/lcrp.12010
- Fogliati, R., & Bussey, K. (2015). The effects of cross-examination on children's coached reports. *Psychology, Public Policy, and Law, 21*, 10-23. http://dx.doi.org/10.1037/law0000036
- Gilbert, J. A. E., & Fisher, R. P. (2006). The effects of varied retrieval cues on reminiscence in eyewitness memory. *Applied Cognitive Psychology*, 20, 723-739. doi:10.1002/acp.1232
- Gilstrap, L. L., & Papierno, P. B. (2004). Is the cart pushing the horse? The effects of child characteristics on children's and adults' interview behaviors. *Applied Cognitive Psychology*, 18, 1059-1078. doi:10.1002/acp.1072

- Gombas, V. A. (2006). The cognition of deception: The role of executive processes in producing lies. *Genetic, Social, and General Psychology Monographs, 132*, 197–214.
  doi:10.3200/MONO.132.3.197-214
- Gomez-Garibello, C., Saykaly, C., Moore, K., & Talwar, V. (2013). Educators' ability to detect true and false bullying statements. *Educational Research Quarterly*, *37*, 3-23. Retrieved from http://search.proquest.com/docview/1450248607?accountid=12339
- Goodman, G. S. (2006). Children's eyewitness memory: A modern history and contemporary commentary. *Journal of Social Issues*, *62*, 811-832. doi:10.1111/j.1540-4560.2006.00488.x
- Goodman, G. S., & Reed, R. S. (1986). Age differences in eyewitness testimony. *Law and Human Behavior*, *10*, 317-332. doi:0.1007/BF01047344
- La Rooy, D., Katz, C., Malloy, L. C., & Lamb, M. E. (2010). Do we need to rethink guidance on repeated interviews. *Psychology, Public Policy, and Law, 16*, 373-392. doi:10.1037/a0019909
- La Rooy, D., Pipe, M. E., & Murray, J. E. (2005). Reminiscence and hypermnesia in children's eyewitness memory. *Journal of Experimental Child Psychology*, 90, 235-254. doi:10.1016/j.jecp.2004.11.002
- Lamb, M. E., Orbach, Y., Hershkowitz, I., Esplin, P. W., & Horowitz, D. (2007). A structured forensic interview protocol improves the quality and informativeness of investigative interviews with children: A review of research using the NICHD Investigative Interview Protocol. *Child Abuse & Neglect*, *31*, 1201-1231. doi:10.1016/j.chiabu.2007.03.021
- Leach, A., Talwar, V., Lee, K., Bala, N., & Lindsay, R. C. L. (2004). "Intuitive" lie detection of children's deception by law enforcement officials and university students. *Law and Human Behavior, 28*, 661-685. doi:10.1007/s10979-004-0793-0

- Lewis, M., Stanger, C., & Sullivan, M. W. (1989). Deception in 3-year-olds. *Developmental Psychology*, 25, 439-443. doi:10.1037/0012-1649.25.3.439
- Lyon, T. (1995). False allegations and false denials in child sexual abuse. *Psychology, Public Policy and Law, 1*, 429-437. doi:10.1037/1076-8971.1.2.429
- Ma, F., Evans, A. D., Liu, Y., Luo, X., & Xu, F. (2015). To lie or not to lie? The influence of parenting and theory-of-mind understanding on three-year-old children's honesty. *Journal* of Moral Education, iFirst, 1-15. doi: 10.1080/03057240.2015.1023182
- Park, R. C. (2003). Adversarial influences on the interrogation of trial witnesses. In P. J. van
  Koppen & S. D. Penrod (Eds.), *Adversarial versus inquisitorial justice* (pp. 131-166). New
  York: Springer US.
- Perner, J., Ruffman, T., & Leekam, S. R. (1994). Theory of mind is contagious: You catch it from your sibs. *Child Development*, 65, 1228-1238. doi:10.1111/j.14678624. 1994.tb00814.x
- Pipe, M. E., Lamb, M. E., Orbach, Y., & Esplin, P. W. (2004). Recent research on children's testimony about experienced and witnessed events. *Developmental Review*, 24, 440-468. doi:10.1016/j.dr.2004.08.006
- Polak, A., & Harris, P. L. (1999). Deception by young children following noncompliance. *Developmental Psychology*, *35*, 561-568. doi:10.1037/0012-1649.35.2.561
- "Psychological Corporation" (2010). Chapter 2: Design and purpose of the NEPSY-II. *The NEPSY: Second edition.* San Antonio, TX: Pearson.
- Saykaly, C., Talwar, V., Lindsay, R. C. L., Bala, N., Lee, K., Bertrand, M., & Nugent, M.
  (2013). Adults' ability to detect deception of stressful and non-stressful stories of children *Psychology, Crime & Law, 19*, 865-879. doi:10.1080/1068316X.2012.700311

- Sorochinski, M., Hartwig, M., Osborne, J., Wilkins, E., Marsh, J., Kazakov, D., & Granhag, P.
  A. (2013). Interviewing to detect deception: When to disclose the evidence? *Journal of Police and Criminal Psychology*, 29, 87-94. doi:10.1007/s11896-013-9121-2
- Stromwall, L. A., Grahang, P. A., & Landstrom, S. (2007). Children's prepared and unprepared lies: Can adults see through their strategies? *Applied Cognitive Psychology*, 21, 457-471. doi:10.1002/acp.1288
- Talwar, V., & Crossman, A. (2011). From little white lies to filthy liars: The evolution of honesty and deception in young children. *Advances in Child Development and Behaviour*, 40, 140-180. doi:10.1016/B978-0-12-386491-8.00004-9
- Talwar, V., Crossman, A., M., Gulmi, J., Renaud, S.-J., & Williams, S. (2009). Pants on fire?
  Detecting children's lies. *Applied Developmental Science*, 13, 119-129.
  doi:10.1080/10888690903041519
- Talwar, V., Gordon, H., & Lee, K. (2007). Lying in the elementary school: Verbal deception and its relation to second-order belief understanding. *Developmental Psychology*, 43, 804-810. doi:10.1037/0012-1649.43.3.804
- Talwar, V., & Lee, K. (2002). Development of lying to conceal a transgression: Children's control of expressive behavior during verbal deception. *International Journal of Behavioral Development*, 26, 436-444. doi:10.1080/01650250143000373
- Talwar, V., & Lee, K. (2008). Social and cognitive correlates of children's lying behavior. *Child Development*, *79*, 866-881. doi:10.1111/j.1467-8624.2008.01164.x
- Talwar, V., Lee, K., Bala, N., & Lindsay, R. C. L. (2006). Adult's judgment of children's coached reports. *Law and Human Behavior*, 30, 561-570. doi:10.1007/s10979-006-9038-8

- Talwar, V., Murphy, S. M., & Lee, K. (2007). White lie-telling in children for politeness purposes. *International Journal of Behavioral Development*, 31, 1-11. doi:10.1177/0165025406073530
- Trocmé, N., & Bala, N. (2005). False allegations of abuse and neglect when parents separate. *Child Abuse and Neglect, 29*, 1333-1345. doi:10.1016/j.chiabu.2004.06.016
- Vrij, A. (2005). Criteria-based content analysis: A qualitative review of the first 37 studies. Psychology, Public Policy, and Law, 11, 3-41. doi:10.1037/1076-8971.11.1.3
- Vrij, A., & Granhag, P. A. (2012). Eliciting cues to deception and truth: What matters are the questions asked. *Journal of Applied Research in Memory and Cognition*, 1, 110-117. doi:10.1016/j.jarmac.2012.02.004
- Vrij, A., & Mann, S. A. (2001). Telling and detecting lies in a high-stake situation: The case of a convicted murderer. *Applied Cognitive Psychology*, 15, 187–203. doi:10.1002/1099-0720(200103/04)
- Wechsler, D. (2003). Administration and scoring manual: Wechsler Intelligence Scale for Children (WISC-IV)- fourth edition. San Antonio: Harcourt Assessments Inc.
- Welsh, M. C., Pennington, B. F., & Groisser, D. B. (1991). A normative-developmental study of executive function: A window on prefrontal function in children. *Developmental Neuropsychology*, 7, 131-149. doi:10.1080/87565649109540483\
- Wimmer, H. & Perner, J. (1983). Beliefs about beliefs: Representation and constraining function of wrong beliefs in young children's understanding of deception. *Cognition*, *13*, 103-128.
   Retrieved from http://www.scnet.ucla.edu/polisci/faculty/chwe/austen/wimmerperner.pdf
- Zajac, R. Gross, J., & Hayne, H. (2003). Asked and answered: Questioning children in the courtroom. *Psychiatry, Psychology and Law, 10*, 199-209. doi:10.1375/pplt.2003.10.1.199

- Zajac, R., & Hayne, H. (2006). The negative effect of cross-examination style questioning on children's accuracy: Older children are not immune. *Applied Cognitive Psychology*, 20, 3–16. doi: 10.1002/acp.1169
- Zelazo, P. D., & Muller, U. (2002). The balance beam in the balance: Reflections on rules, relational complexity, and developmental processes. *Journal of Experimental Child Psychology*, 81, 458–465. doi:10.1006/jecp.2002.2667

## Table 1

# Pearson Correlations of Cognitive Measures with Age [N = 88]

	Working Memory r	Inhibitory Control	Theory of Mind $r$	Age r
Planning	.16	.07	.03	38 *
Working Memory	-	.12	.28 *	13
Inhibitory Control	-	-	.14	10
Theory of Mind	-	-	-	-0.02

\*p < .01

## Table 2

# Regression Analyses for Accuracy at Direct- and Cross-Examination

Model	В	SE-b	Beta	t	sig		
Accuracy Direct							
Constant	2.263	.301		7.509	.000		
Age	004	.002	190	-2.419	.018**		
Veracity	451	.052	699	-8.689	.000***		
Inhibitory Control	011	.003	289	-3.574	.001**		
Accuracy Cross							
Constant	2.037	.405		5.032	.000		
Age	006	.002	300	-2.773	.007**		
Veracity	170	.057	283	-2.969	.004**		
Planning	044	.016	308	-2.846	.006**		
ТоМ	051	.019	267	2.711	.008**		
Digit Span	.020	.010	.208	2.064	.042*		

\**p* <.05, \*\**p* <.01, \*\*\**p* <.001

### **Chapter 5: General Discussion**

It has been well established that children are able to make false statements about another (Craig et al., 1999; Pipe et al., 2004; Talwar et al., 2004; Vrij, 2005). However, adults, both professional and laypersons, are poor at detecting the lies of both adults and children (see Bond & DePaulo, 2006 for a review). Current trends in forensic psychology have examined the result of taxing the cognitive load demands of adults as a way to improve accurate detection of deception (Vrij et al., 2008; Vrij et al., 2009; Vrij, Granhag, Mann, & Leal, 2011). Yet, researchers continue to struggle to find an interview procedure that does not ask misleading or guiding questions that will elicit detectable cues to deceit with children. Thus the present research program investigated the potential benefits of an open-ended, but cognitively taxing cross-examination procedure and the effects on children's maintenance and detectability.

## General Discussion and Original Contributions to Knowledge

Detecting deceit is a difficult task. Researchers continue to struggle to identify interviewing procedures to better differentiate truthful and deceitful statements. When interviewing children there is also a concern about children's vulnerability to suggestibility (e.g., Ceci & Bruck, 1993; Lyon, 2014). The current program of study examined if one type of crossexamination questioning that was non-suggestive, open-ended questions would improve the ability to accurately identify the veracity of children's statements. Specifically, Manuscript 1 contributes to the literature with regards to the importance of question type during courtroom procedures. Results of the first manuscript highlight children's ability to maintain and accurately recount their story during a mock-courtroom procedure. Overall, 69.7% of children were able to maintain across all four questioning types (open-ended, prompted, reverse-order, and chronological recall). Although children in lie-telling conditions experienced more difficulty maintaining than truth-tellers, their maintenance rates were quite high (open-ended recall 77.1%, prompted recall 81.2%, reverse-order recall 79.6%). By asking children open-ended recall, prompted recall, reverse-order recall, and chronological recall questions, results of the current study give a better understanding of the influence of questions asked by investigators, lawyers and, at times, judges on the veracity of children's statements.

The current findings suggest that using such questioning techniques in applied settings (e.g., including questions that tax cognitive load in the direct- and cross-examination of children) may be useful for helping legal and other professionals who need to differentiate between children's true and false denials and allegations. Finally, it appears that children have difficulty with sequential recall. As such, interviewers should not expect children to remember information in chronological or in reverse order. Rather, the focus should be on the veracity of the content of their testimony. As maintenance and consistency are perceived to be indicators of veracity (Berman & Cutler, 1996; Brewer & Burke, 2002), investigating the effects of such questions types on adults' perceptions and ratings of veracity is of importance.

Questions that tax the cognitive load demands of adults under interrogation appear to elicit cues to deceit which help potential jurors to successfully identify the veracity of statements (Vrij et al., 2008; Vrij et al., 2009; Vrij et al., 2011). The aim of Manuscript 2 was to further explore this theory on the testimony of children. In particular, research with adults has suggested that reverse-order questioning and unanticipated questions are effective in distinguishing liars from truth-tellers. The current study is the first to examine such both techniques for taxing cognitive load with children in a court-room setting. Specifically, Manuscript 2 investigated children's ability to answer both reverse-order questioning and unanticipated questions, and the influence this would have on potential jurors. The findings of Manuscript 2 found that, in line with using only unanticipated questions with children (Liu et al., 2010), the addition of reverseorder recall does not improve overall detection rates of children's false statements. This leads one to question the factors that may explain why taxing cognitive load with children is not as useful as it was for adults. It is possible that the methodology used in both the current program of research and in Liu et al. was not adapted enough to elicit the same cues to deceit. There are potentially other question types that may the tax cognitive load of children at a more optimal level. Given that executive functioning abilities of children 9 to 12 years of age are still in development, it is probable that testifying maximized the cognitive load demands of children to the point that any additional strain did not share the same influence as it would for adults. Finally, deception detection research, including Manuscript 2, have found that adult raters often hold a truth bias towards child witnesses (Saykaly et al., 2013; Stromwall et al., 2007; Talwar et al., 2006). It is therefore conceivable that regardless of question types, adult's raters will continue to hold a bias toward the idea that children are innately good, and therefore believe them to be honest beings. Although results of Manuscript 2 did not yield significant detection rates, the current study's findings indicate that reverse-order questions does appear to influence credibility judgments as children were viewed as less credible once answering the high cognitive load questions. There was also a story by veracity interaction as false allegations were seen as most credible, while true allegations were seen as least credible.

Finally, Manuscript 3 is the first study of its kind to investigate cognitive factors and the use of cognitively taxing questions. Although a number of studies have suggested that children's ability to tell plausible false statements are related to their developing cognitive abilities such as EF and ToM (e.g., Polak & Harris, 1999; Talwar & Crossman, 2011; Talwar & Lee, 2008), most of these studies only examined children's short reports and none examined how these child

factors influenced adults' perceptions of children's testimony. Thus, Manuscript 3 contributed to the literature as to how the development of these abilities may predict, or influence, jurors' perceptions of a child witness. Based on the current findings, adults had greater difficulty determining the veracity of the testimony when the child witness had better developed ToM and planning skills. To date, this is the first study to highlight that age and cognitive ability may not only play a role in the development of lie-telling but also in their ability to deceive others, and in the perceptions of their testimony.

The proportion of false denials of abuse, also referred to as nondisclosures, is difficult to calculate as the ability to calculate prevalence rates relies on adult or adolescent disclosure of previous abuse (Coulborn Faller, 2007). Similarly, it is difficult to calculate the prevalence of false allegations although research suggests these have a smaller prevalence rate (e.g., Coulborn Faller, 2007). There are examples of both laboratory and field research that have demonstrated that children can and will make a false allegation of a wrongdoing or a false denial, either spontaneously due to misleading questioning (Righarts et al., 2015; Zajac & Hayne, 2006) or at the request of another (Lyon et al., 2008; Talwar et al., 2007). However, review of the literature indicates that the extent to which coaching influences a child's testimony is varied. Although some researchers found that children were more likely to lie to follow-up questions after being coached (e.g., Lyon et al., 2008), others found that children were likely to tell the truth regardless of coaching (e.g., Talwar et al., 2004). The current methodology included minimal coaching at both the home visit (by asking them to lie, and providing them with the alternative response) and prior to giving their testimony (by reminding them of the request to lie). Overall, 69% of children in the current study lied across all four question types. Notably, 94 % (n = 47) of children attempted to lie during the courtroom portion of the study indicating that children are

willing to lie, at a high frequency, for an unfamiliar research assistant who the child had met on only one occasion. The developmental deception literature has focused attention on younger children as they have been perceived as the most vulnerable, susceptible, and most likely to lie when coached by another (Lyon et al., 2008; Talwar et al., 2004; Talwar et al., 2006). However, the current study with older children suggests that they may also be vulnerable to coaching. These findings suggest it is important to investigate older children's likelihood and willingness to lie, and how such lies may influence forensic and legal outcomes.

Notably, the results of Manuscript 2 indicate that the accounts of children providing a false allegation were seen as most credible reports over all other story types (false denials, true allegations, and true denials). However, it is important to note that these credibility judgments are not reflected in the ability to detect deception as there are no story type effects for accuracy judgments. In fact, adults had an overall truth bias. Thus, children who gave false allegations were not detected and were perceived as being credible. This finding clearly suggests more research is needed to examine not only children's willingness to make false allegations but also how these reports are perceived by adults assessing them.

The current program of research further contributes new knowledge as it is the first of its kind to investigate children's abilities to provide elaborate true and false accounts of an interaction between both themselves and an adult. Many deception detection studies have asked participants to rate short narratives of children (e.g. Leach et al., 2004), but very few have looked at longer narratives of children (Saykaly et al., 2013), and none have looked at longer narratives of children in a mock-courtroom setting undergoing both direct- and cross-examination with such a time delay. Furthermore, many studies that have studied maintenance across multiple questions have investigated questions that elicit short statements of one to two

words responses (Talwar et al., 2004). Results of the current program of study further expands on children's abilities to repeatedly provide detailed false accounts as children in the current study lied across both direct- and cross-examination. Results indicate that while lie-tellers do have some difficulties maintaining their reports of longer reports, children's abilities at this age range of 9 to 12 years they are still fairly skilled at maintaining their reports and not easily detectable. Furthermore, children's abilities to avoid detection improved with age. Thus, the manuscripts that make up the body of work of this dissertation provide unique insight on children's longer narratives in court-room settings. Specifically, previous researchers have investigated children's abilities to give a false statement, but most reached their conclusions based on shorter narratives (e.g., semantic leakage control questions; Talwar et al., 2007). The current program of study gives awareness on children's ability generate a longer narrative, as well as maintain their story across multiple questions. Furthermore, results of previous research have found that children experienced difficulty when faced with repeated questions about an event (Andrews & Lamb, 2014; Memon & Vartoukian, 1996). However, results of the first manuscript indicate that when asking non-suggestive and non-leading questions, children do not experience the same level of difficulty.

### **Implications for School Psychology**

The results of the current program of research can inform school psychologist mainly with respect to their conversations with children. Although the manuscripts focus on forensic implications, the interview procedures utilized in the direct- and cross-examination can be added to the repertoire of interviewing techniques used by school psychologist. In a therapeutic or assessment context, school psychologists are required to inform their client of their order's confidentiality practices, as well as the limits of confidentiality. According to the Canadian

Psychological Association (2015), limits to confidentiality involve situations in which the client reports information that may lead the psychologist to suspect harm (i.e., harm to self or another). In such instances, psychologists are required to report such suspicions, which can take the form of neglect, physical or emotional abuse, to child protective services.

Although it is not the role of the school psychologist to assess the veracity of such reports, information gathering after a disclosure is within a school psychologists' scope of practice. School psychologists are not mandated to formally interview children about abuse but are mandated to report any suspicions of abuse. However, in some circumstances where the school psychologists may be the recipient of the child's first disclosure, any details disclosed must be given to child protective services. Indeed, child protective services requires that psychologists provide a brief report of the information they have received from the child in these instances. When such disclosures spontaneously occur, it is important for the school psychologist to use only of non-leading questions or prompts. In some cases, there are likely to be claims that are unsubstantiated, even though the report may appear to be detailed and credible. In such situations, it is not the psychologist's responsibility to assess the veracity of the report, but to properly document the child's account and relay this information to child protective services.

In addition, in light of the results in the current research program, age effects should be interpreted by psychologists with caution. Although significant developmental trends were evidenced in both Manuscript 2 and Manuscript 3, such that older children were better able to deceive the potential juror than younger children, this does not negate younger children's abilities to give true or false accounts of an interaction.

Moreover, in a school context, there are many cases and allegations of bullying that arise. Specifically, school psychologists are given the task of gathering information in these situations in order to better understand the bullying situation. Gomez-Garibello et al. (2013) found that school professionals were unable to accurately assess the veracity of true and false accounts of bullying. In fact, participants hovered around chance levels for the true accounts, but experienced significantly more difficulty correctly assessing false accounts. Therefore non-leading and open-ended questions used in the direct- and cross-examination procedures of the current program of study may be useful in collecting information in cases where there may be false accounts of bullying.

## **Limitations and Future Directions**

The current program of study has several limitations that should be noted. As it is the case with many studies that link forensic psychology with developmental psychology, there are questions of ecological validity. Children testifying in court are commonly testifying about another person and are about criminal offenses (e.g., abuse). In actual instances where a child would be asked to provide testimony, children may face significant emotional blackmail or coercion which will affect the content of their testimony (Bussey, Lee, & Grimbeck, 1993). For ethical reasons, it is impossible to exactly replicate such situations in experimental studies. Thus, situations must be created that seek to approximate elements of such situations but also maintain ethical standards of minimal risk or harm to the child participants. The current program of research attempted to create a realistic situation, within the ethical constraints of research, in which an adult asked children to lie about an interaction they had together in the child's home. Children were asked to protect the adult from "getting into trouble" and losing her job. In the current study the transgression was either playing or not playing a game with the child. Thus, unlike real life cases where a child's testimony may have grave consequences (e.g. jail sentence or loss of parental rights), the current study represents a relatively low stakes situation for the

child. In such a situation, almost all the children were willing to lie for the adult. More ecologically relevant research is needed to examine children's abilities to maintain false reports when extensively questioned in court-room procedures. However, it remains a challenge for researchers to create forensically significant ethically valid situations to examine children's reports.

This program of research focused on children 9 to 12 years of age. However, victims of abuse vary in age. Research has shown that younger children have difficulties in maintaining false statements (e.g., Talwar et al., 2015). Therefore, a future study should investigate the effects of different question types with a broader sample of ages to determine whether these effects can be generalized to children in general, or are specific to a certain age range.

One aim of the current research program was to evaluate the impact that taxing cognitive load may have when assessing the veracity of children's reports. Research on cognitive load and deception detection in adults has investigated the use of reverse-order questioning and unanticipated questions (e.g., Vrij, 2009). Although Liu et al. (2010) did investigate the use of unanticipated questions with 10 to 12 year olds, they did not evaluate the influence on maintenance, accuracy or veracity judgments in courtroom settings. The results of Manuscript 1 indicate that veracity and story type predicted maintenance; future studies should include the use of unanticipated questions, and other types of questioning that taxes cognitive load to see if the results can be replicated.

Some of the research investigating increased cognitive load demands to elicit cues to deceit asked raters to judge written transcripts, and not video interviews (Vrij et al., 2012). Future studies should replicate the current methodology but ask raters to judge the written transcripts of the courtroom testimony. Saykaly et al. (2013) found that when comparing

transcripts of truthful and fabricated events, there were discernible differences in the language choice such as temporal markers and cognitive processes. It is therefore possible that transcripts would allow potential jurors to notice the semantic differences between true and fabricated reports better than through the intuitive lie detection of rating videos. Furthermore, the testimony of witnesses is often compared to one another in an effort to assess veracity (Chan & Bull, 2014; Stromwall & Grahang, 2007; Vrij et al., 2008). This allows the rater to identify discrepancies of core event details between both accounts. Future research should compare the child's testimony to that of the "perpetrator" to see whether comparing two accounts of an event would improve detection rates of deception.

The second and third manuscript involved undergraduate students assessing the veracity of children's statements. Although the generalizability of the use of undergraduate samples in deception detection research is at times debated, many previous researchers have found that experience is not related to deception abilities (e.g., Bond & DePaulo, 2006). For example, Gomez-Garibello (2013) asked teachers and educators to detect true and false accounts of bullying and found that level of experience with children was not related to detection abilities. Furthermore, Leach et al. (2004) investigated police officers, customs agents and undergraduate student's abilities to detect deception. The results indicated that when using simple questions, undergraduate students had the best detection rates, with police officers having the lower detection rates. Nevertheless, replicating the current program of research with forensic professionals, as well as social workers and psychologists who work with children would be of interest. Furthermore, the current findings are representative of undergraduate students in a psychology class, the ratio of female to male participants was quite high. Juries tend to be gender equal, composed of community members, rather than students, and law enforcement

professionals tend to have more male staff. As such, it would be interesting to see whether the current results would be replicated with a more equivalent female to male ratio, with jury-eligible community members, and with professionals who work with children.

The current program of research used a high cognitive load cross-examination procedure including reverse-order questioning, as well as unanticipated questions. In the three manuscripts within the body of this dissertation, children providing truthful accounts were used at the control group for children giving false statements. This allowed for the investigation of the impact that question type, maintenance, and detectability would have for children being asked to lie. Future studies should investigate the influence that manipulating cognitive load may have on both true and false accounts of children. Results of the current program of study highlight that children are able to maintain false accounts, although with more difficulty than truth tellers. Although the current procedure yielded some improvements in detecting false statements after cross-examination, it did not improve overall detection rates. It may be the optimal level of cognitive load was not achieved in the current study. The investigation of taxing cognitive load demands, of various intensities during questioning may lead researchers to identify the correct cognitive load strain required to elicit better detection rates of lie-tellers.

Finally, it is possible that the event children were asked to describe, or feign ignorance of, was not elaborate enough to elicit cues to deceit during the modified cross-examination. In actuality, children are asked to testify about more salient details than having played or not played a game. Although there are ethical constraints to research with human participants, especially children, future research should replicate the current interview methodology, replacing the game with a more elaborate and complex target event. It is possible that children may have more

difficulty maintaining the details of the target event, and may subsequently elicit more cues to deceit in the process.

## **Summary**

The current program of research sought to examine children's ability to give true or false reports of an interaction. The main objective was to examine how different questions affected children's ability to maintain their true or false reports. Of particular interest was children's ability to deceive potential jurors, as well as how children's executive functioning and theory of mind development influenced the perceptions and veracity judgments of potential jurors. Developmental and forensic researchers have seldom investigated the use of cognitively taxing questions to interview children, favouring the investigation of leading and suggestive questioning strategies instead. Results of the current program provide significant insight into children's ability to lie when being interviewed. Further, results highlight that cognitive factors, namely planning, theory of mind, working memory, and inhibitory control, may influence accurate detection of such lies. In addition, the combined results from this research offer new evidence on children's willingness and ability to lie at the request of another, and the difficulties experienced by potential jurors on identifying and evaluating truthful and deceptive statements.

## **Bibliography**

- Alloway, T. P., McCallum, F., Alloway, R. G., & Hoicka, E. (2015). Liar, liar, working memory on fire: Investigating the role of working memory in childhood verbal deception. *Journal* of Experimental Child Psychology, 137, 30-38. doi:10.1016/j.jecp.2015.03.013
- Ahern, E. C., Lyon, T. D., & Quas, J. A. (2011). Young children's emerging ability to make false statements. *Developmental Psychology*, 47, 61-66. doi:10.1037/a0021272
- Andrews, S. J., & Lamb, M. E. (2014). The effects of age and delay on responses to repeated questions in forensic interviews with children alleging sexual abuse. *Law and Human Behavior*, 38, 171-180. doi:10.1037/lhb0000064

Baddeley, A. D. (1986). Working memory. Oxford, England: Clarendon

- Bala, N., Lindsay, R. C. L., Lee, K., & Talwar, V., (2000). A legal and psychological critique of the present approach to the assessment of the competence of child witnesses. *Osgoode Hall Law Journal, 38*, 409-452. Retrieved from http://heinonline.org/HOL/Page?handle= hein.journals/ohlj38&div=24&g\_sent=1&collection=journals
- Baron-Cohen, S. (2001) Theory of mind in normal development and autism. *Prisme*, 34, 174-183. Retrieved from http://www.autism-community.com/wpcontent/uploads/2010/11/TOM-in-TD-and-ASD.pdf
- Berk, L. A. (2001). Development Through the Lifespan, Second Edition. Boston: Allyn and Bacon.
- Berman, G. L., & Cutler, B. L. (1996). Effects of inconsistencies in eyewitness testimony on mock-juror decision making. *Journal of Applied Psychology*, 81, 170-177. doi:10.1037/0021-9010.81.2.170

- Block, R. A., Hancock, P. A., & Zakay, D. (2010). How cognitive load affects duration judgments: A meta-analytic review. *Acta Psychologica*, 134, 330-343. doi:10.106/j.actpsy.2010.03.006
- Bond, C. F., & DePaulo, B. M. (2006). Accuracy of deception judgments. *Personality and Social Psychology Review*, 10, 214-234. doi:10.1207/s15327957pspr1003\_2

Bottoms, B. M., Goodman, G. S., Schwartz-Kenney, B. M., & Thomas, N. (2002).
Understanding children's use of secrecy in the context of eyewitness reports. *Law and Human Behavior*, 26, 285-313. doi:10.1023/A:1015324304975

- Brewer, N., & Burke, A. (2002). Effects of testimonial inconsistencies and eyewitness confidence on mock-juror judgments. *Law and Human Behavior*, 26, 353-364. doi:10.1023/A1015380522722
- Bruck, M., & Ceci, S.J. (1999). The suggestibility of children's memory. *Annual Review of Psychology*, *50*, 419-139. doi:10.1146/annurev.psych.50.1.419
- Buller, D. B., & Burgoon, J. K. (1996). Interpersonal deception theory. *Communication Theory*, 6, 203–242. doi:10.1111/j.1468-2885.1996.tb00127.x
- Bussey, K., Lee, K. & Grimbeek, E. J. (1993). Lies and secrets: Implications for children's reporting of sexual abuse. In G. S. Goodman & A. L. Bottoms (Eds.) *Child victims, child witnesses: Understanding and improving testimony* (pp.301-330). New York: The Guilford Press.
- Canadian Psychological Association (2015). What to expect from a psychologist. Retrieved from http://www.cpa.ca/public/decidingtoseeapsychologist/psychologistwhattoexpect
- Carlson, S. M., Moses, L. J., & Hix, H. R. (1998). The role of inhibitory control in young children's difficulties with deception and false belief. *Child Development*, 69, 672–691.

doi:10.1111/j.1467-8624.1998.tb06236.x

- Carlson, S. M., & Moses, L. J. (2001). Individual differences in inhibitory control and children's theory of mind. *Child Development*, 72, 1032-1053. doi:10.1111/1467-8624.00333
- Carlson, S. M., Moses, L. J., & Berton, C. (2002). How specific is the relation between executive function and theory of mind? Contributions of inhibitory control and working memory.
   *Infant and Child Development*, 11, 73-92. doi:10.1002/icd.298
- Ceci, S. J., & Bruck, M. (1993). Suggestibility of the child witness: a historical review and synthesis. *Psychological Bulletin*, *113*, 403-439. doi: 10.1037/0033-2909.113.3.403
- Chan, S., & Bull, R. (2014). The effect of co-offender planning on verbal deception. *Psychiatry*, *Psychology and Law*, *21*, 457-464. doi:10.1080/13218719.2013.835703
- Chahal, K., & Cassidy, T. (1994). Deception and its detection in children: A study of adult accuracy. *Psychology, Crime & Law, 1*, 237–245. doi:10.1080/10683169508411959
- Chandler, M., Fritz, A. S., & Hala, S. (1989). Small-scale deceit: Deception as a marker for two, three-, and four-year olds' early theories of mind. *Child Development*, 60, 1263-1277. doi:10.1111/1467-8624.ep9676781
- Coulborn Faller, K. (2007). *Interviewing children about sexual abuse*. New York: Oxford University Press.
- Craig, R. A., Sheibe, R., Raskin, D. C., Kircher, J. C., & Dodd, D. H. (1999). Interviewer questions and content analysis of children's statements of sexual abuse. *Applied Developmental Science*, *3*, 77-85. doi:10.1207/s1532480xads0302\_2
- Crossman, A. M., & Lewis, M. (2006). Adults' ability to detect children's lying. *Behavioral Sciences & the Law, 24, 703-115.* doi:10.1002/bsl.731
- Crossman, A. M., Segovia, D., & Miller, S. (2009). Cross-examination: Friend or foe of the child witness? Unpublished manuscript.
- DePaulo, B. M., Lindsay, J. J., Malone, B. E., Muhlenbruck, L., Charlton, K. & Cooper, H.
  (2003). Cues to deception. *Psychological Bulletin*, *129*, 74-118. Doi:10.1037/0033-2909.129.1.74006-9038-8
- Delis, D.C., Kaplan, E., & Kramer, J.H. (2001). *The Delis-Kaplan Executive Function System: Examiner's Manual.* San Antonio, TX: Pearson.
- Ding, X. P., Sai, L., Fu, G., Liu, J., & Lee, K. (2014). Neural correlates of second-order verbal deception: A functional near-infrared spectroscopy (fNIRS) study. *NeuroImage*, 87, 505-514. doi:10.1016/j.neuroimage.2013.10.023
- Edelstein, R. S., Luten, T. L., Ekman, P., & Goodman, G. S. (2006). Detecting lies in children and adults. *Law and Human Behavior*, *30*, 1-10. doi:10.1007/s10979-006-9031-2
- Ekman, P., & Friesen, W. V. (1969). Nonverbal leakage and cues to deception. *Psychiatry: Interpersonal and Biological Processes*, 32, 88-106. doi:10.1521/00332747.1969.11023575
- Endres, J. (1997). The psychology of the child witness: The role of individual differences and their assessment. *Journal of Credibility Assessment and Witness Psychology*, *1*, 44–69.
  Retrieved from http://truth.charleshontsphd.com/journal.php#vol. 1
- Evans, A., & Lee, K. (2010). Promising to tell the truth makes 8- to 16-year-olds more honest. Behavioral Sciences & the Law, 28, 801-811. doi:10.1002/bsl.960
- Evans, A. D., & Lee, K. (2011). Verbal deception from late childhood to middle adolescence and its relation to executive functioning skills. *Developmental Psychology*, 47, 1108-1116. doi:10.1037/a0023425

- Evans, A. D., & Lee, K. (2013). Emergence of lying in very young children. *Developmental Psychology*, 49, 1958-1963. doi:10.1037/a0031409
- Feldman, R. S., & White, J. B. (1980). Detecting deception in children. *Journal of Communication*, 30, 121-128. doi:10.1111/j.1460-2466.1980.tb01974.x
- Fogliati, R. & Bussey, K. (2014). The effects of cross-examination on children's reports of neutral and transgressive events. *Legal and Criminological Psychology*, 19, 296-315. doi:10.1111/lcrp.12010

Fogliati, R., & Bussey, K. (2015). The effects of cross-examination on children's coached reports. *Psychology, Public Policy, and Law, 21*(1), 10-23. http://dx.doi.org/10.1037/law0000036

- Friedman, W. J., Reese E., & Dai X. (2011). Children's memory for the times of events from the past years. *Applied Cognitive Psychology*, 25, 156–165. doi:10.1002/acp.1656
- Fu, G., Heyman, G. D., Chen, G., Liu, P., & Lee, K. (2015). Children trust people who lie to benefit others. *Journal of Experimental Child Psychology*, 129, 127-139. doi:10.1016/j.jecp.2014.09.006
- Geary, D. C., Hoard, M. K., Byrd-Craven, J., & DeSoto, M. C. (2004). Strategy choices in simple and complex addition: Contributions of working memory and counting knowledge for children with mathematical disability. *Journal of Experimental Child Psychology*, 88, 121-151. Retrieved from

http://www.sciencedirect.com/science/article/pii/S0022096504000335

Gilbert, D. T. (1991). How mental systems believe. *American Psychologist, 46*, 107–119. doi:10.1037/0003-066X46.2.107

- Gilbert, J. A. E., & Fisher, R. P. (2006). The effects of varied retrieval cues on reminiscence in eyewitness memory. *Applied Cognitive Psychology*, 20, 723-739. doi:10.1002/acp.1232
- Gilstrap, L. L., & Papierno, P. B. (2004). Is the cart pushing the horse? The effects of child characteristics on children's and adults' interview behaviors. *Applied Cognitive Psychology*, 18, 1059-1078. doi:10.1002/acp.1072
- Gombas, V. A. (2006). The cognition of deception: The role of executive processes in producing lies. *Genetic, Social, and General Psychology Monographs, 132*, 197–214.
  doi:10.3200/MONO.132.3.197-214
- Gomez-Garibello, C., Saykaly, C., Moore, K., & Talwar, V. (2013). Educators' ability to detect true and false bullying statements. *Educational Research Quarterly*, *37*, 3-23. Retrieved from http://search.proquest.com/docview/1450248607?accountid=12339
- Goodman, G. S. (2006). Children's eyewitness memory: A modern history and contemporary commentary. *Journal of Social Issues*, 62, 811-832. doi:10.1111/j.1540-4560.2006.00488.x
- Goodman, G. S., Golding, J. M., & Haith, M. M. (1984). Jurors' reactions to child witnesses. Journal of Social Issues, 40, 139-156. doi: 10.1111/j.1540-4560.1984.tb01098.x
- Goodman, G. S., & Melinder, A. (2007). Child witness research and forensic interviews of young children: A review. *Legal and Criminological Psychology*, *12*, 1-19. doi:10.1348/135532506X156620
- Goodman, G. S., & Reed, R. S. (1986). Age differences in eyewitness testimony. *Law and Human Behavior, 10,* 317-332. doi:10.1007/BF01047344
- Graham, A., & Watkeys, J. (1991). False allegations in child sexual abuse: The pattern of referral in an area where reporting is not mandatory. *Children and Society*, *5*, 111-122. doi:10.1111/j.1099-0860.1991.tb00377.x

- Hays, C. & Carver, L. J. (2014). Follow the liar: the effects of adult lies on children's honesty. *Developmental Science*, 17. 977–983. doi: 10.1111/desc.12171
- Henderson, E. (2002). Persuading and controlling: The theory of cross-examination in relation to children. In H. L. Westcott, G. M. Davies, & R. H. Bull (Eds.), *Children's testimony: A handbook of psychological research and forensic practice* (pp. 279–283). New York: Wiley and Sons Ltd.
- Herman, J. (1981). Father-daughter incest. Cambridge, MA: Harvard University Press.
- Honts, C. R., Kassin, S. M., & Craig, R. A. (2014). 'I'd know a false confession if I saw one': A constructive replication with juveniles. *Psychology, Crime & Law, 20*, 695-704. doi: 10.1080/1068316X.2013.854792
- Horowitz , S. W. Lamb , M. E. Esplin , P. W. Boychuk , T. D. Reiter-Lavery , L. Krispin , O. (1995). Establishing ground truth in studies of child sexual abuse. *Expert Evidence*, *4*, 42-52.
- Jack, F., & Zajac, R. (2014). The effect of age and reminders on witnesses' responses to crossexamination-style questioning. *Journal of Applied Research in Memory and Cognition*, *3*, 1-6. doi:10.1016/j.jarmac.2013.12.001
- Jones, D., & Seig, A. (1988). Child sexual abuse allegations in custody or visitation cases: A report of 20 cases. Sexual abuse allegations in custody and visitation cases, 2, 27-45. doi:10.1177/088626087002001002
- Kassin, S. M. (2005). On the psychology of confessions: does innocence put innocents at risk? *American Psychologist*, *60*, 215-228. doi:10.1037/0003-066X.60.3.215
- Katz, C. (2013). Internet-related child sexual abuse: What children tell us in their testimonies. *Children and Youth Services Review, 35*, 1536-1542. doi:10.1016/j.childyouth.2013.06.006

- Koriat, A., Goldsmith, M., Schneider, W., & Nakash-Dura, M. (2001). The credibility of children's testimony: Can children control the accuracy of their memory reports? *Journal* of Experimental Child Psychology, 79, 405-437. doi:10.1006/jecp.2000.2612
- La Rooy, D., Pipe, M. E., & Murray, J. E. (2005). Reminiscence and hypermnesia in children's eyewitness memory. *Journal of Experimental Child Psychology*, 90, 235-254. doi:10.1016/j.jecp.2004.11.002
- La Rooy, D., Katz, C., Malloy, L. C., & Lamb, M. E. (2010). Do we need to rethink guidance on repeated interviews. *Psychology, Public Policy, and Law, 16*, 373-392. doi:10.1037/a0019909
- Lamb, M. E., Orbach, Y., Hershkowitz, I., Esplin, P. W., & Horowitz, D. (2007). A structured forensic interview protocol improves the quality and informativeness of investigative interviews with children: A review of research using the NICHD Investigative Interview Protocol. *Child Abuse & Neglect*, *31*, 1201-1231. doi:10.1016/j.chiabu.2007.03.021
- Lawson, L., & Chaffin, M. (1992). False negatives in sexual abuse disclosure in interviews. *Journal of Interpersonal Violence*, 7, 532-542. doi:10.1177/088626092007004008
- Leach, A., Lindsay, R. C. L., Koehler, R., Beaudry, J. L., Bala, N. C., Lee, K., Talwar, V.
  (2009). The reliability of lie detection performance. *Law and Human Behavior*, *33*, 96-109. doi: 10.1007/s10979-008-9137-9
- Leach, A., Talwar, V., Lee, K., Bala, N. & Lindsay, R. C. L. (2004). "Intuitive" lie detection of children's deception by law enforcement officials and university students. *Law & Human Behavior*, 28, 661-685. doi:10.1007/s10979-004-0793-0
- Lee, K. (2013). Little liars: Development of verbal deception in children. *Child Development Perspectives*, 7, 91-96. doi: 10.1111/cdep.12023

- Lewis, M., Stanger, C., & Sullivan, M. W. (1989). Deception in 3-year-olds. *Developmental Psychology*, 25, 439-443. doi:10.1037/0012-1649.25.3.439
- Liu, M., Granhag, P. A., Landstrom, S., Roos af Hjelmsater, E., Stromwall, L., & Vrij, A.
  (2010). "Can you remember what was in your pocket when you were stung by a bee?":
  Eliciting cues to deception by asking the unanticipated. *The Open Criminology Journal, 3*, 31-36. doi:10.2174/1874917801003010031
- London, K., Bruck, M., Wright, D. B., & Ceci, S. J. (2008). Review of the contemporary literature on how children report sexual abuse to others: Findings, methodological issues, and implications for forensic interviewers. *Memory*, *16*, 29-47. doi:10.1080/09658210701725732
- London, K., & Nunez, N. (2002). Examining the efficacy of true/lie discussions in predicting and increasing the veracity of children's reports. *Journal of Experimental Child Psychology*, 83, 131-147. doi: 10.1016/S0022-0965(02)00119-4
- Lyon, T. (1995). False allegations and false denials in child sexual abuse. *Psychology, Public Policy and Law, 1*, 429-437. doi:10.1037/1076-8971.1.2.429
- Lyon, T. D. (2014). Interviewing children. *Annual Review of Law and Social Science*, *10*, 73-89. doi: 10.1146/annurev-lawsocsci-110413-030913
- Lyon, T. D., Malloy, L. C., Quas, J. A., & Talwar, V. A. (2008). Coaching, truth induction, and young maltreated children's false allegations and false denials. *Child Development*, 79, 914-929. doi:10.1111/j.1467-8624.2008.01167.x
- Ma, F., Evans, A. D., Liu, Y., Luo, X., & Xu, F. (2015). To lie or not to lie? The influence of parenting and theory-of-mind understanding on three-year-old children's honesty. *Journal* of Moral Education, iFirst, 1-15. doi: 10.1080/03057240.2015.1023182

- Memon, A., & Vartoukian, R. (1996). The effects of repeated questioning on young children's eyewitness testimony. *British Journal of Psychology*, 87, 403-415. doi:10.1111/j.2044-8295.1996.tb02598.x
- Morris, E. K., Laney, C. A., Bernstein, D. M., Loftus, E. F. (2006). Susceptibility to memory distortion: How do we decide it has occurred? *American Journal of Psychology*, *119*, 255-274. Retrieved from

http://www.jstor.org/stable/20445338?seq=1#page\_scan\_tab\_contents

- Myers, J. E. (1986). Child Witness: Techniques for direct examination, cross-examination, and impeachment. *The Pacific Law Journal*, *18*, 801-827. Retrieved from <u>http://heinonline.org/</u> HOL/LandingPage?handle=hein.journals/mcglr18&div=68&id=&page=
- Nysse-Carris, K. L., Bottoms, B. L., & Salerno, J. M. (2011). Experts' and novices' ability to detect children's high-stakes lies of omission. *Psychology, Public Policy and Law, 17*, 76-98. doi:10.1037/a0022136
- Orcutt, H. K., Goodman, G. S., Tobey, A. E., Batterman-Faunce, J. M., & Thomas, S. (2001). Detecting deception in children's testimony: Factfinders' abilities to reach the truth in open court and closed-circuit trials. *Law and Human Behavior*, 25, 339–372. doi:10.1023/A:1010603618330
- Ornstein, P. A., Gordon, B. N., & Larus, D. M. (1992). Children's memory for a personally experienced event: Implications for testimony. *Applied Cognitive Development*, *6*, 49-60. doi: 10.1002/acp.2350060103
- Paine, M. L., & Hansen, D. J. (2002). Factors influencing children to self-disclose sexual abuse. *Clinical Psychology Review*, 22, 271-295. doi:10.1016/S0272-7358(01)00091-5

Park, R. C. (2003). Adversarial influences on the interrogation of trial witnesses. In P. J. van

Koppen & S. D. Penrod (Eds.), *Adversarial versus inquisitorial justice* (pp. 131-166). New York: Springer US.

- Perner, J., Ruffman, T., & Leekam, S. R. (1994). Theory of mind is contagious: You catch it from your sibs. *Child Development*, 65, 1228-1238. doi:10.1111/j.14678624. 1994.tb00814.x
- Perner, J. C., & Wimmer, H. (1985). "John thinks that Mary thinks that..." attribution of second order beliefs by 5- to 10-year old children. *Journal of Experimental Child Psychology, 39*, 437-471. Retrieved from

http://www.sciencedirect.com/science/article/pii/0022096585900517

- Piaget, J. (1932/1965). The moral judgment of the child. New York: MacMillan
- Pipe, M. E., Lamb, M. E., Orbach, Y., & Esplin, P. W. (2004). Recent research on children's testimony about experienced and witnessed events. *Developmental Review*, 24, 440-468. doi:10.1016/j.dr.2004.08.006
- Polak, A., & Harris, P. L. (1999). Deception by young children following noncompliance. *Developmental Psychology*, *35*, 561-568. doi:10.1037/0012-1649.35.2.561
- "Psychological Corporation" (2010). Chapter 2: Design and purpose of the NEPSY-II. *The NEPSY: Second edition.* San Antonio, TX: Pearson.
- Redlich, A. D., & Goodman, G. S. (2003). Taking responsibility for an act not committed: The influence of age and suggestibility. *Law and Human Behavior*, 27, 141-156. doi:10.1023/A:1022543012851
- Righarts, S., Jack, F., Zajac, R., & Hayne, H. (2015) Young children's responses to crossexamination style questioning: The effects of delay and subsequent questioning, *Psychology, Crime & Law, 21*:3, 274-296. doi:10.1080/1068316X.2014.951650

- Robinson, J., & McGuire, J. (2006). Suggestibility and children with mild learning disabilities:
  The use of the cognitive interview. *Psychology, Crime & Law, 12*, 537-556.
  doi:10.1080/10683160500337550
- Saarni, C. (2011). Emotional development in childhood. *Encyclopedia on Early Childhood Development*, 1-7. Retrieved from: http://www.child-encyclopedia.com/sites/ default/files/textes-experts/en/638/emotional-development-in-childhood.pdf
- Saykaly, C., Talwar, V., Lindsay, R. C. L., Bala, N. C., & Lee, K. (2013). The influence of multiple interviews on the verbal markers of children's deception. *Law and Human Behavior*, 37, 187-196. doi: 10.1037/lhb0000023
- Saykaly, C., Talwar, V., Lindsay, R. C. L., Bala, N., Lee, K., Bertrand, M., & Nugent, M.
  (2013). Adults' ability to detect deception of stressful and non-stressful stories of children *Psychology, Crime & Law, 19*, 865-879. doi:10.1080/1068316X.2012.700311
- Sorochinski, M., Hartwig, M., Osborne, J., Wilkins, E., Marsh, J., Kazakov, D., & Granhag, P.
   A. (2013). Interviewing to detect deception: When to disclose the evidence? *Journal of Police and Criminal Psychology*, 29, 87-94. doi:10.1007/s11896-013-9121-2
- Spence, S. A., Farrow, T. F. D., Herford, A. E., Wilkinson, I. D., Zheng, Y., & Woodruff, P. W.
  R. (2001). Behavioural and functional anatomical correlates of deception in humans. *Neuroreport: For Rapid Communication of Neuroscience Research*, *12*, 2849–2853.
  doi:10.1097/00001756-200109170-00019
- Stromwall, L. A., & Grahang, P. A. (2007). Detecting deceit in pairs of children. *Journal of Applied Social Psychology*, *37*, 1285-1304. doi:10.1111/j.1559-1816.2007.00213.x

Stromwall, L. A., Grahang, P. A., & Landstrom, S. (2007). Children's prepared and unprepared

lies: Can adults see through their strategies? *Applied Cognitive Psychology*, *21*, 457-471. doi:10.1002/acp.1288

- Summit, R., (1983). The child sexual abuse accommodation syndrome. *Child Abuse and Neglect*, 7, 177-193. doi:10.1016/0145-2134(83)90070-4
- Talwar, V., Arruda, C., & Yachison, S. (2015). The effects of punishment and appeals for honesty on children's truth-telling behavior. *Journal of Experimental Child Psychology*, 130, 209-217. doi:10.1016/j.jecp.2014.09.011
- Talwar, V., & Crossman, A. (2011). From little white lies to filthy liars: The evolution of honesty and deception in young children. *Advances in Child Development and Behaviour*, 40, 140-180. doi:10.1016/B978-0-12-386491-8.00004-9
- Talwar, V., Crossman, A., M., Gulmi, J., Renaud, S.-J., & Williams, S. (2009). Pants on fire?
  Detecting children's lies. *Applied Developmental Science*, 13, 119-129.
  doi:10.1080/10888690903041519
- Talwar, V., Crossman, A., Williams, S. & Muir, S. (2011), Adult detection of children's selfish and polite lies: Experience matters. *Journal of Applied Social Psychology*, *41*, 2837–2857. doi: 10.1111/j.1559-1816.2011.00861.x
- Talwar, V., Gordon, H., & Lee, K. (2007). Lying in the elementary school: Verbal deception and its relation to second-order belief understanding. *Developmental Psychology*, 43, 804-810. doi:10.1037/0012-1649.43.3.804
- Talwar, V., & Lee, K. (2002a). Development of lying to conceal a transgression: Children's control of expressive behavior during verbal deception. *International Journal of Behavioral Development*, 26, 436-444. doi:10.1080/01650250143000373

- Talwar, V. & Lee, K. (2002b). Emergence of white-lie telling in children between 3 and 7 years of age. *Merrill-Palmer Quarterly*, 48, 160-18. doi:10.1177/0165025406073530
- Talwar, V., & Lee, K. (2008). Social and cognitive correlates of children's lying behavior. *Child Development*, *79*, 866-881. doi:10.1111/j.1467-8624.2008.01164.x
- Talwar, V., Lee, K., Bala, N., & Lindsay, R. C. L. (2004). Children's lie-telling to conceal a parent's transgressions: legal implications. *Law and Human Behavior*, 28, 411-435. doi:10.1023/B:LAHU.0000039333.51399.f6
- Talwar, V., Lee, K., Bala, N. & Lindsay, R. C. L. (2006). Adults' judgments of child witness credibility and veracity. *Law and Human Behavior*, *30*, 561-570. doi:10.1007/s10979-
- Talwar, V., Murphy, S. M., & Lee, K. (2007). White lie-telling in children for politeness purposes. *International Journal of Behavioral Development*, 31, 1-11. doi:10.1177/0165025406073530
- Talwar, V., Yachison, S., & Leduc, K. (under review). The influence of stories on children's lietelling behaviors and moral understanding. *Infant and Child Development*.
- Talwar, V., Zwaigenbaum, L., Goulden, K. J., Manji, S., Loomes, C., & Rasmussen, C. (2012).
  Lie-telling behaviour in children with autism and its relation to false-belief
  understanding. *Focus on Autism and Other Developmental Disabilities*, 27, 122-129.
  doi:10.1177/1088357612441828
- Tobey, A. E., Goodman, G. S., Batterman-Faunce, J. M., Orcutt, H. K., Sachsenmaier, T. (1995).
  Balancing the rights of children and defendants: Effects of closed-circuit television on children's accuracy and jurors' perceptions. In M. S. Zaragoza, J. R. Graham, G. C. Hall, R. Hirschman, & Y. S. Ben-Porath (Eds.). *Memory and testimony in the child witness* (pp. 214-239). Thousand Oaks, CA: Sage.

- Trocmé, N., & Bala, N. (2005). False allegations of abuse and neglect when parents separate. *Child Abuse and Neglect, 29*, 1333-1345. doi:10.1016/j.chiabu.2004.06.016
- Tye, M. C., Amato, S. L., Honts, C. R., & Devitt, M. K. (1999). The willingness of children to lie and the assessment of credibility in an ecologically relevant laboratory setting. *Applied Developmental Science*, *3*, 92-109. doi:10.1207/s1532480xads0302\_4
- Van't Veer, A., Stel, M., & van Beest, I. (2014). Limited capacity to lie: Cognitive load interferes with being dishonest. *Judgment and Decision Making*, 9, 199-206. Retrieved from http://journal.sjdm.org/13/131120/jdm131120.html
- Vrij, A. (2000). Detecting lies and deceit: The psychology of lying and the implications for professional practice. Chichester: Wiley.
- Vrij, A. (2005). Criteria-based content analysis: A qualitative review of the first 37 studies. Psychology, Public Policy, and Law, 11, 3-41. doi:10.1037/1076-8971.11.1.3
- Vrij, A., Akehurst, L., Brown, L., & Mann, S. (2006). Detecting lies in young children, adolescents and adults. *Applied Cognitive Development*, 20, 1225-1237. doi:10.1002/acp.1278
- Vrij, A., Akehurst, L., Soukara, S., & Bull, R. (2004). Let me inform you how to tell a convincing story: CBCA and reality monitoring scores as a function of age, coaching, and deception. *Canadian Journal of Behavioural Science/Revue canadienne des sciences du comportement, 36*, 113-126. doi:10.1037/h0087222
- Vrij, A., Fisher, R., Mann, S., & Leal, S. (2006). Detecting deception by manipulating cognitive load. *Trends in Cognitive Science*, 10, 141-142. doi:10.1016/j.tics.2006.02.003
- Vrij, A., & Granhag, P. A. (2012). Eliciting cues to deception and truth: What matters are the

questions asked. *Journal of Applied Research in Memory and Cognition, 1,* 110-117. doi:10.1016/j.jarmac.2012.02.004

- Vrij, A., Granhag, P., Mann, S., & Leal, S. (2011). Outsmarting the liars: Toward a cognitive lie detection approach. *Current Directions in Psychological Science*, 20, 28-32. doi:10.1177/0963721410391245
- Vrij, A., Granhag, P., & Porter, S. (2010). Pitfalls and opportunities in nonverbal and verbal lie detection. *Psychological Science in The Public Interest*, *11*(3), 89-121. doi:10.1177/1529100610390861
- Vrij, A., Leal, S., Mann, S., & Fisher, R. (2012). Imposing cognitive load to elicit cues to deceit: Inducing the reverse order technique naturally. *Psychology, Crime & Law, 18,* 579-594. doi: 10.1080/1068316X.2010.515987
- Vrij, A., Leal, S., Granhag, P. A., Mann, S., Fisher, R. P., Hillman, J., & Sperry, K. (2009).
  Outsmarting the liars: The benefit of asking unanticipated questions. *Law and Human Behavior*, *33*, 159-166. doi:10.1007/s10979-008-9143-y
- Vrij, A., & Mann, S. A. (2001). Telling and detecting lies in a high-stake situation: The case of a convicted murderer. *Applied Cognitive Psychology*, 15, 187–203. doi:10.1002/1099-0720(200103/04)
- Vrij, A., Mann, S. M., Fisher, R. P., Leal, S., Milne, R., & Bull, R. (2008). Increasing cognitive load to facilitate lie detection: The benefit of recalling an event in reverse order. *Law and Human Behavior, 32*, 252-265. doi:10.1007/s10979-007-9103-y
- Wechsler, D. (2003). Administration and scoring manual: Weschler Intelligence Scale for Children (WISC-IV)- fourth edition. San Antonio: Harcourt Assessments Inc.

- Weisz, V., Beal, S. J., & Wingrove, T. (2013). The legal system experiences of children, families, and professionals who work with them. In M. K. Miller & B. H. Borstein (Eds.) *Stress, trauma, and wellbeing in the legal system* (pp. 63-88). New York: Oxford University Press.
- Welsh, M. C., Pennington, B. F., & Groisser, D. B. (1991). A normative-developmental study of executive function: A window on prefrontal function in children. *Developmental Neuropsychology*, 7, 131-149. doi:10.1080/87565649109540483
- Williams, S., Kirmayer, M., Simon, T., & Talwar, V. (2013). Children's antisocial and prosocial lies to familiar and unfamiliar adults. *Infant and Child Development*, 22, 430-438. doi:10.1002/icd.1802
- Wimmer, H. & Perner, J. (1983). Beliefs about beliefs: Representation and constraining function of wrong beliefs in young children's understanding of deception. *Cognition*, 13, 103-128. Retrieved from http://www.scnet.ucla.edu/polisci/faculty/chwe/austen/wimmerperner.pdf
- Yachison, S., & Talwar, V. (2012). Can you keep a secret? The effect of coaching on children's lie-telling to conceal another's transgression. Paper presented at *the American Psychology and Law Society Conference*, San Juan, Puerto Rico.
- Yang, Y., Raine, A., Lencz, T., Birhle, S., Lacasse, L., & Colletti, P. (2005). Prefrontal white matter in pathological liars. *British Journal of Psychiatry*, 187, 320-325. doi:10.1192/bjp.187.4.320
- Yuille, J. C., Tymofievich, M., & Marxsen, D. (1995). The nature of allegations of child sexual abuse. In T. Ney (Ed.), *True and false allegations of child sexual abuse: Assessment and case management* (pp. 21-46). Philadelphia, PA: Brunner/Mazel

- Zajac, R., Gross, J., & Hayne, H. (2003). Asked and answered: Questioning children in the courtroom. *Psychiatry, Psychology and Law, 10*, 199-209.
  doi:10.1375/132187103322300059
- Zajac, R., & Hayne, H. (2006). The negative effect of cross-examination style questioning on children's accuracy: Older children are not immune. *Applied Cognitive Psychology*, 20, 3-16. doi:10.1002/acp.1169
- Zelazo, P. D., & Muller, U. (2002). The balance beam in the balance: Reflections on rules, relational complexity, and developmental processes. *Journal of Experimental Child Psychology*, 81, 458–465. doi:10.1006/jecp.2002.2667
- Zuckerman, M., DePaulo, B. M., & Rosenthal, R. (1981). Verbal and nonverbal communication of deception. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (vol. 14, pp. 1–57). New York: Academic Press.

Appendix A

### **Consent for Courtroom Study (Child Participants)**



Department of Educational and Counselling Psychology Département de psychopédagogie et de counselling

Faculty of Education McGill University 3700 McTavish Street Montreal, Quebec Canada H3A 1Y2 Faculté des sciences de l'éducation Université de McGill 3700 rue McTavish Montréal, Québec Canada H3A 1Y2 Dr. Victoria Talwar (514) 398-3438 (Office) (514) 398-6968 (Fax)

#### **CONSENT FORM**

#### Dear Parent/Guardians,

We are members of the McGill's Child Development Team. We are presently conducting a study and wonder if you would give permission for you and your child to participate. The purpose of the study is to learn more about children's ability to report true or false statements of an event during questioning. We want to find out how accurate children's memory can be, and their ability to reveal or conceal information in relation to their cognitive abilities such as executive function and theory of mind.

#### What would I/my child have to do?

This study involves several different activities over two sessions. First, during a home visit, a research assistant will play some games with your child, including some subtests of the NEPSY-II and the D-KEFs, standardized test that assess executive functioning and theory of mind. These tests involve children doing mazes, card sorting tasks, and playing with blocks. Then, half the children will play a version of Hasbro<sup>TM</sup> Operation Game, and half will not. Sessions will be recorded. Children will be informed that one week later, they will be coming to McGill and questioned about the events that occurred. Half of of the children will be asked to be truthful (i.e., tell the interviewers what happened), and half the children will be asked to tell conceal (i.e., when you are questioned, tell them we did not play/did play the operation game). All play sessions will be recorded. The session should last approximately 30 minutes.

Approximately one week later, you and your child will be invited to McGill University in order to take part in the memory recall session of the project. Children will be interviewed by two research assistants in order to determine how accurate their memory was about the home visit, and if they reveal or conceal information about the Operation Game. The session will last approximately 20-30 minutes.

### Is there anything else?

Participation in this study is completely voluntary and you or your child may withdraw from the sessions at any time. Most children enjoy participating in this type of research and risks to participants are minimal. However, there is a very small chance that your child may experience negative feelings during the procedure, such as becoming concerned that they may have answered a question "incorrectly" or about having concealing/revealing information. After the end of the study, we will explain to your child about the nature of the study, explain the reasons for doing the study and how it will help other children in the future. We will answer any questions they have.

We are interested in examining the responses of groups of children of different ages rather than the response of any particular child and only aggregated data will be reported. In all cases, the responses of individual children will be kept confidential and anonymous. All information and data collected will be protected for confidentiality by assigning a random identification code to each participant. The session will be videotaped and will only be viewed by members of our research team as well as other adult subjects as part of our studies. We will not show the videotape to anyone else without your written permission.

In the event that you have any concerns or questions about this research, you may contact Christine Saykaly at (514) 398-8059 or by email at <u>christine.saykaly@mail.mcgill.ca</u>; or by contacting her supervisor, Dr. Victoria Talwar at (514) 398-8059. You can also contact the Ethics Officer, Lynda McNeil if you have any concerns about ethics at (514) 398-6831.

Thank you for your time,

Christine Saykaly, M.A. PhD Student, School/Applied Child Psychology McGill University Victoria Talwar, PhD Associate Professor and Supervisor McGill University

Yes. I,	, agree to participate in the study and give permission
for my child	to participate in the research as described above.

Signature of Parent/Guardian:	Date: //
	Day Month Year
Birth date of child: //	Home Phone
Day Month Year	
	Email:

**Appendix B** 

### **Consent for Detection Deception Study (Adult Participants)**



Department of Educational and Counselling Psychology Département de psychopédagogie et de counselling

Faculty of Education McGill University 3700 McTavish Street Montreal, Quebec Canada H3A 1Y2 Faculté des sciences de l'éducation Université de McGill 3700 rue McTavish Montréal, Québec Canada H3A 1Y2 Dr. Victoria Talwar (514) 398-3438 (Office) (514) 398-6968 (Fax)

As a participant in this study, you will see video clips of children telling you a report about an event. Their accounts of the events may be completely true or they maybe concealing the truth or fabricating some details. We are interested in your perceptions of the children and their reports. After watching each video clip on the computer, you will be asked to respond to questions about the children's reports. You will respond to the all questions on the computer and all instructions will be on the computer.

This study takes approximately 45 minutes to complete. There are no known physical, psychological, or social risks and you are free to withdraw from the study at any time without penalty. Please tell the experimenter if you no longer wish to participate. Your individual performance will remain confidential and will not be released. Only aggregate results will be reported. Dissemination of results will be presented at academic conferences and journals.

In the event that you have any concerns or questions about this research, you may contact Christine Saykaly: <u>Christine.saykaly@mail.mcgill.ca</u>. You can contact the Ethics Officer, Lynda McNeil if you have any concerns about ethics at (514) 398-6831.

Thank you for your time,

Christine Saykaly, M.A. Doctoral Student, School/Applied Child Psychology McGill University Victoria Talwar, PhD Associate Professor & Supervisro McGill University

I have read the above statements and freely consent to participate in this research.

Name (please print)

Signature : \_\_\_\_\_

# Appendix C

### Script for Courtroom Study

### **\*\*NOTE FOR JUDGE and LAWYERS:**

- 1. If a child decides to not verbalize and nods yes or shakes head no (for non yes-no questions), the JUDGE will say "Can you please use words to answer the question" and the LAWYER will re-ask their question. If the child does not verbalize, the judge is to say "let the court note that the child is nodding yes/shaking head no" and we continue.
- 2. If I child says "no" or "i dont know", DO NOT say "is there ANYTHING you can remember". As I was told, this isn't a WISC, this is a courtroom. Just move on to the next question

# Judge:

Knock gavel (2 times)

Good Morning/Afternoon [child's name], My name is Honourable [Enter your full name]

You will be asked some questions by these two individuals about the events that occurred in your home [or in the lab] last week. OK?

What is your full name?

How old are you?

What grade are you in?

[Judge may choose at this point to add more questions if the child appears nervous or hesitant. The Judge's role is to build rapport]

Do you have any questions about what will happen today?

Do you promise to tell the truth?

If you feel uncomfortable at anytime let me know and we will stop. Also you do not have to answer any questions you do not feel comfortable with.

Ok [Name of first interviewer] will be asking you some questions now:

# **Interviewer #1: Direct Examination**

Good Morning /Afternoon. I was told you did a few activities with <u>Christine [OR Sarah]</u> when she came to visit you last week. Can you tell me what happened? [hint: whoever stayed downstairs is the name to use]

- The interviewer will follow-up with open-ended questions (e.g., "<u>Can you tell more about that</u>? "<u>Can you give me more detail about that</u>", "<u>Is there anything else that happened that day</u>?") The interviewer will use these open-ended prompts until children have nothing more to add.
- Interviewer will then ask questions such as "I was told you played X, is this true?" If child says yes, interviewer will say "can you tell me about it?" (Only for those the child <u>DID NOT</u> speak of in the open recall)
  - I was told were asked questions about some **<u>stories</u>**, is that true?
    - If child says YES, say "<u>Can you tell me more about that</u>"
  - I was told you played a game where you had to <u>repeat numbers</u>, is that true?
    If child says YES, say "<u>Can you tell me more about that</u>"
  - I was told you played a game where you had to <u>read some colours</u>, is that true?
    If child says YES, say "<u>Can you tell me more about that</u>"
  - I was told you played a game where you had to <u>move some circles</u> on some pegs to match a drawing, is that true?
    - If child says YES, say "<u>Can you tell me more about that</u>"
- I was told you played <u>a memory game</u>, is that true?
  - If child says YES, say "Can you tell me more about that"

# Every child MUST is asked the following

- I was told you played the operation game, is that true?
- Did Christine touch you at any time? (if yes, where)
- Did she put stickers on you? (if child says yes....Ask Where?)
- Did she give you anything? [prompt asking "what did she give you"]
- Thank you very much. That is all your Honour

# Judge

Thank you. Next [Enter Lawyer #2's name] will be asking you some questions now.

# **Interviewer #2: Unexpected Questioning**

Good Morning /Afternoon. I am also going to ask you a few questions about what you did with Christine last week. I am going to ask you to tell me once again what happened, but this time, I want you to say the last thing that happened first, and so on and so forth. In other words, tell me what happened in reverse order.

# Judge

Do you understand what Mr/Ms X is asking you to do [let child answer]

Ok so just to make sure, let's say one day you had woke up, had breakfast, and went to the park. You would say you went to the park, had breakfast and woke up. Is that clear?

# **Interviewer #2:**

After child responds, say:

"Ok what is the last thing that you did with Christine [OR Sarah] that day".

 $\rightarrow$  After the child responds, can prompt by saying "<u>what did you do before that</u>?" until all details have been discussed.

- What was Christine wearing the day she came to visit you?
- What were the colours of the disc of the Tower Task?
- What colour was the operation board?
- Do you remember who was sitting closest to a door when you played together?
- What else was on the operation board? Any other people or things?
- Who took the first turn to flip cards when you played the memory game?
- How many times did you play the memory game?
- Did you remove a piece called the broken shield when you played operation?
- Can you repeat what you did with Christine one more time. This time say them in order, so from the first thing you did to the last thing you did

# Judge

Earlier, we spoke to Christine about the events that happened last week and she told us about everything that the two of you did last week. Are you sure about what you said today? Anything you would like to change?

Thank you, Court is adjourned (KNOW GAVEL 2x]

### **Appendix D**

### **Opinion Questionnaire**

Video Clip 1 Do you think this child would make a credible witness? YES NO

On a scale from 1 to 100 (1: not at all, and 100: extremely) how confident are you about your decision?

1. Overall (ignoring minor errors or omissions of detail and focusing only on the central clams of the story), if you were a jury member, would you believe the testimony of this child?

YES NO

On a scale from 1 to 100 (1: not at all, and 100: extremely) how confident are you about your decision?

2. Do you believe this child is telling the truth?

YES NO

On a scale from 1 to 100 (1: not at all, and 100: extremely) how confident are you about your decision?

3. When thinking back to their testimony about <u>the operation game</u>: Do you think the child was:

<u>Falsely denying</u> the operation game (saying he/she <u>did not</u> play when he/she actually did)

<u>Fabricating</u> the operation game (saying he/she <u>did</u> play when he/she actually did not)

<u>Truthfully denying</u> the operation game (saying he/she <u>did not</u> play, when he/she did not)

<u>Truthfully assenting</u> to the operation game (saying he/she <u>did</u> play, when he/she actually did)

On a scale from 1 to 100 (1: not at all, and 100: extremely) how confident are you about your decision?

Now you will view the same child being cross examined and asked to rate once again the veracity of the child's statement

#### Appendix E

#### **Research Ethics Certificate**

#### McGill University ETHICS REVIEW RENEWAL REQUEST/STUDY CLOSURE FORM

Continuing review of research involving humans requires, at a minimum, the submission of an annual status report to the REB. This form must be completed to request renewal of ethics approval. If a renewal is not received before the expiry date, the project is not considered to be approved and no further research activity may be conducted. When a project has been completed, this form can also be used to officially close the study. To avoid expired approvals and, in the case of funded projects, the freezing of funds, this form should be returned 2-3 weeks before the current approval expires. **REB File #:** 21-0610 Project Title: Chestioning Types & Children's Mernory Principal Investigator/Department: Chustine Saykaly, Educational & Counselling Psychology Email: chustine saykaly Emini megili ca Faculty Supervisor (if student is the PI): Vittona Talwar 1. Were there any significant changes made to this research project that have any ethical implications? \_Yes \_x\_No If yes, and these have not already been reported to the REB, describe these changes and append any relevant documents that have been revised. 2. Are there any ethical concerns that arose during the course of this research? \_\_\_\_ Yes \_x\_\_ No If yes, please describe. 3. Have any participants experienced any unanticipated issues or adverse events in connection with this research project? \_Yes \_x\_ No If yes, please describe. 4. Is this a funded study? Yes x No. If yes, list the agency name and project title and the Principal Investigator of the award if not yourself. This information is necessary to ensure compliance with agency requirements and that there is no interruption in funds. 5. Did this project require REB approval from another Institution/Board? \_\_\_Yes \_x\_\_No If yes, and the project is continuing, attach a copy of the current approval. \_x\_\_\_ Check here if this is a request for renewal of ethics approval. Check here if the study is to be closed and continuing ethics approval is no longer required. A study can be closed when all data collection has been completed and there will be no further contact with participants. Lefter Date: 116 **Principal Investigator Signature:** Date: Meer na Jalues Faculty Supervisor Signature: (if PI is a student ) For Administrative Use REB: REB-I REB-II X REB-III The closing report of this terminated project has been reviewed. The continuing review for this project has been reviewed and approved. \_\_\_\_\_ Delegated Review Full Review Signature of REB Chair or designate: Date: Approval Renewal Period:

Submit to Lynda McNeil(lynda.mcneil@mcgill.ca), Research Ethics Officer, James Administration Building, 845 Sherbrooke Street West suite 429, Mil., QC H3A0G4; fax: 398-4644 tel: 398-6831. Electronic submissions with scanned signatures are accepted but must come from the PI's McGill email.

(version July 2013)