Using the Assessment Criteria Indicative of Deception (ACID) to detect deception in child

eyewitness testimonies

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Abstract

In police and legal investigations of child maltreatment, the victim's eye-witness testimony is often a crucial source of evidence. Nevertheless, previous research suggests that children can be persuaded to tell a lie by falsely denying an event to protect an offender or by falsely accusing another of a transgression (Lisak et al., 2008; Popliger et al., 2011). The Assessment Criteria Indicative of Deception (ACID) has been used to detect lies in the testimonies of adults (Colwell, 2009); nevertheless, little research has evaluated whether ACID can successfully detect lies in the testimonies of children. The present study examined the lie-telling behaviour of children when they were asked to falsely deny a crime (FD condition) or falsely accuse another of a crime (FA condition) that did not take place, as well as whether ACID can successfully detect lies in children's testimonies. Over half of the participants (56%) told a lie in the lie-telling conditions, while no significant differences were found in the rate of lie-telling behaviour between the FD and FA conditions. ACID was effective in detecting truths and lies in the FD condition, as truth-tellers were more willing to discuss the transgression as the interview progressed; however, no significant differences were found between truth and lie-tellers in the FA condition. Results were also consistent across the age-groups and genders of the participants. For these reasons, it is presently unclear whether ACID can be used to successfully detect truths and lies in the testimonies of children.

Résumé

Dans les investigations policières et légales de maltraitance en enfance, le témoignage d'une victime est une source cruciale d'éléments de preuve. Néanmoins, des recherches antérieures démontrent que les enfants peuvent être persuadés de mentir en niant un évènement pour protéger un contrevenant ou en accusant de façon mensongère une tierce personne d'une transgression (Lisak et al., 2008; Popliger et al., 2011). Le "Assessment Criteria Indicative of Deception" (ACID) a été utilisé afin de détecter les mensonges chez les témoignages d'adultes (Colwell, 2009); malgré cela, peu d'études ont évalué si ACID peut détecter, avec succès, les mensonges dans les témoignages d'enfants. La présente étude examine le comportement mensonger des enfants lorsqu'ils sont demandés de faussement nier un crime (condition FD) ou de faussement accuser une autre personne d'un crime (condition FA) qui n'a pas eu lieu. Aussi, elle examine si ACID peut détecter avec succès les mensonges dans les témoignages d'enfants. Plus de la moitié des participants (56%) ont divulgué un mensonge dans les conditions mensongères alors qu'aucune différence significative n'a été trouvée dans le comportement mensonger entre les conditions FD et FA. ACID fut efficace dans la détection des vérités et des mensonges dans la condition FD, telle que les participants qui disaient la vérité étaient plus disposés à discuter de la transgression lorsque se déroulait l'entrevue; toutefois , aucune différence significative ne fut trouvée entre les personnes qui disaient la vérité et les menteurs dans la condition FA. Les résultats ont également démontré la cohérence selon les groupes d'âge et le sexe des participants. Pour ces raisons, il n'est pas clair si ACID peut être utilisé afin de détecter avec succès les vérités et les mensonges dans les témoignages d'enfants.

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Rates of fictitious allegations of abuse have ranged from 1% to 10% of total accusations

(Everson & Boat, 1989; Jones & McGraw, 1987; Mikkelsen, 1992; Oates et al., 2000; Trocme et

al., 2001; Trocme & Bala, 2005). For example, during the McMartin Preschool case in the

1980s, panic from parents, and coercive police and forensic interview techniques caused many

children to provide false allegations of child abuse and satanic ritual abuse (Garven et al., 1998;

Kelley, 1996; Nathan & Snedeker, 1995). False allegations can cause many individuals to be

wrongfully convicted of crimes they did not commit (Garven et al., 1998; Kelley, 1996; Nathan

& Snedeker, 1995), which can result in emotional strain for the falsely accused and the accuser

(Gries et al., 2000; Savvidou, Bozikas & Karavatos, 2002; Stahl, 1999). Children's false

allegations, such as those in the McMartin Preschool case, have also lowered the public's trust in

the validity of child testimonies because of the potential negative consequences to the accused,

accuser and criminal justice system (Brennan, 1994; Gardner, 1992; Garven et al., 1998; Pipe et

al., 2013).

Research on lie-telling in child testimonies have primarily focused on examining factors

that may influence a child to lie, and ways to promote truth-telling (Conch et al., 2006; Evan &

Lee, 2010; London & Nunez, 2002; Lyon & Dorado, 2008; Popliger, Talwar & Crossman, 2011;

Talwar & Lee, 2002). On the other hand, little is known about methods that can be used to help

police investigators detect truths and lies in children's testimonies (Leach et al., 2004; Orcutt et

al., 2001; Talwar & Crossman, 2012). The majority of research has examined adult detection

rates for children's lies, rather than methods that could aid police investigators in detecting

deception (Bond & DePaulo, 2006; Edelstein et al., 2006; Talwar et al., 2006). Although some

research has been conducted regarding techniques for improving the detection of lies in adult

testimonies (Heussen, Binkofski & Jolij, 2010; Leach et al., 2004; Suckle-Nelson et al., 2010;

Vrij et al., 2011); there are developmental differences in regards to the way children disclose

information and tell truth and lies (Feldman & White, 1980; Leach et al., 2009; Talwar et al.,

2006), which can hinder the reliability of the lie-detection methods commonly used with adults.

Lie-telling in Child Testimonies

Children who witness or experience a crime are often asked to provide detailed reports of

the events to police officers and/or forensic interviewers; in some cases, a child is asked to give a

statement and answer questions under oath in a courtroom setting. Police interviews with

children generally occur at the site of the crime, the child's home, or a police station (Davies &

Westcott, 1999), while forensic interviews usually take place at a forensic interviewing agency

or police station (Cross et al., 2007). Forensic interviews are used mostly in cases that involve

child maltreatment (Center on Child Abuse and Neglect, 2000), and police interviews may be

used for a wider range of crimes. Children are sometimes asked to provide a testimony and/or

answer questions about a crime they witnessed in a courtroom setting. The purpose of the

testimony is to provide credible details about a crime from a witness' point of view (Mays &

Winfree, 2005). Forensic and police interviews utilize a fact-finding approach, with the primary

goal of obtaining reliable and accurate information (Center on Child Abuse and Neglect, 2000;

Davies & Westcott, 1999; Mays & Winfree, 2005).

Children can be convinced to provide deceptive statements in their testimonies. Lying is

the deliberate attempt to mislead others; they are verbal statements with the intention to deceive

others (Talwar & Crossman, 2012; Wescott, Davies & Bull, 2008). A lie is a deliberate

statement, that the lie-teller does not believe, but wishes the lie-recipient to accept as true.

Children as young as two-and-a half years of age can identify the differences between truths and lies (Evans & Lee, 2013). By school age, children are capable of telling convincing lies (Evans & Lee, 2010; Talwar & Crossman, 2012; Talwar & Lee, 2008). For instance, adults often find older children's statements to be credible, and experience greater difficultly in differentiating between their true and deceptive statements (Leach et al., 2004; Talwar et al., 2006).

The frequency of lie-telling generally increases with age (Wilson, Smith & Ross, 2003), as does the ability to maintain a lie and/or convince another of a lie (Talwar & Lee, 2002b). Factors that have shown to influence children's lie-telling behaviour in their testimonies include: the age of the child (Bussey, 1992; Lyon & Saywitz, 1999; Talwar & Lee, 2002b; Wilson, Smith & Ross, 2003), coaching (Lyon et al., 2008), the perceived consequences to the victim, family and/or perpetrator (Popliger, Talwar & Crossman, 2011), vulnerability to develop false memories (Loftus, 1997), and a child's relationship to the offender (Conch et al., 2006; Lyon, 2000; Tye et al., 1999; Williams et al., 2011).

False allegations include testimonies or descriptions of an event that may be partially or completely false. Children's false statements about an event can take two forms: (1) False denials; and (2) False accusations. False denials involve deliberately denying an event that had occurred. For example, in cases involving child maltreatment, the child has had prior interaction with the perpetrator more than 80% of the time (U.S. Department of Health & Human Services, 2012). A family friend, relative or parent may ask the child to conceal the criminal behaviour of the offender (Black, Schweitzer & Varghese, 2012). In addition, the victim may feel that providing a truthful statement that incriminates a friend or relative will result in the impairment or loss of relationships with these individuals. Children may also feel a sense of loyalty to the potential perpetrator, and the obligation to protect them from getting in trouble (Lyon, 2000).

Children as young as three years of age are able to falsely deny their own transgression (Bussey,

Lee, & Brimbeek, 1993; Polak & Harris, 1999; Talwar, Gordon & Lee, 2007). Lie-telling

research suggests that children are willing to tell a prosocial lie to protect another (Popliger,

Talwar & Crossman, 2011), especially in cases where they had prior interactions with the

instigator (Tye et al., 1999). Previous research has also shown that children are willing to conceal

a transgression to protect an offender (Bottoms et al., 2002; Lyon et al., 2008; Talwar et al.,

2004).

False accusations incorporate an allegation of an event that may or may not have

occurred, but was perpetrated by an individual who is not the accused, and in which the accused

person is innocent (Ney, 1995). Children can be persuaded to falsely accuse someone of

committing a transgression (Kopetski, Rand & Rand, 2006; Lyon et al., 2008; Trocme & Bala,

2005). For instance, children are sometimes asked to falsely accuse someone of physically or

sexually abusing them. These types of false accusations commonly occur in custody battles

(Black & Schweitzer, 2012; Ney, 1995), to divert authorities from the actual perpetrator (Engle

& O'Donohue, 2012), and/or to receive attention or support from others (Engle & O'Donohue,

2012). The majority of developmental research on child lie-telling has focused on children's

ability to falsely deny a crime (Bottoms et al., 2002; Ceci & Leichtman, 1992; Pipe &Wilson,

1994; Talwar, Lee, Bala, & Lindsay, 2004; Wilson & Pipe, 1989); yet, considerably less is

known regarding their abilities to make a false accusation (Lyon et al., 2008; Quas, Davis,

Goodman, & Myers, 2007; Tate, Warren, & Hess, 1992; Tye et al., 1999). The previous research

on false accusations has primarily focused on children's vulnerability to develop false memories

(Loftus, 1997), such as the effects of coaching on children's lie-telling behaviours (Lyon et al.,

2008). However, many of these studies had children falsely accuse someone in a low cost

situation (Kassa et al., 2013; Lyon et al., 2008). Little research has actually recreated a situation

where a child is asked to intentionally falsely accuse someone of a crime (Tye et al., 1999), and

whether there are methods that can be used to detect those lies.

Lie-Detection

Both laypersons and "experts" (e.g., police officers) are unable to successfully detect lies

in the testimonies of adults (Aamodt & Mitchell, 2006; Akehurst et al., 2004; Bond & DePaulo,

2006; Vrij, 2008). For example, Akehurst and colleagues (2004) conducted a 4-hour training

session about criterion-based content methods of credibility assessment with 58 police-officers,

social workers and students. None of the groups improved in their abilities to detect truth-tellers

and liars, with the police officers' accuracy rates actually declining from their pre-test

performance (Akehurst et al., 2004).

Although children as young as two and a half years of age are able to tell a lie (Evans &

Lee, 2013), little is known about how to improve the detection of lies in children. Some research

suggests that children's lies are easier to detect compared to those of adults (Feldman et al.,

1979; Feldman & White, 1980); however, more recent research has shown that when adults and

children were asked to voluntarily tell a truth or lie, the ability to deceive did not vary based on

age (Edelstein, Luten, Ekman, & Goodman, 2006; Vrij, Akehurst, Brown & Mann, 2006). In

addition, increased exposure to the lie-teller did not improve lie-detection accuracy. (Leach et al.,

2004). Even when evaluating children as young as 3 years old, Lewis and colleagues (1989)

found that undergraduate students were unable to successfully differentiate the truth-tellers from

the lie-tellers.

There are several reasons for why lay persons and "experts" are unable to detect lies at a

rate above chance-level in children and adults. First, there are very few nonverbal indicators of

truths and lies (DePaulo et al., 2003; Sporer & Schwandt, 2006, 2007; Vrij, Granhag, Mann, & Leal, 2011); there also appears to be misconceptions regarding which nonverbal cues are actually indicative of deception (Miller & Stiff, 1993; Stromwall, Granhag, & Hartwig, 2004). Second, humans have the presumption that other people are being truthful the majority of the time; thus, it takes greater cognitive effort to evaluate information as untruthful (Gilbert, Tafarodi, & Malone, 1993; Levine, Park, & McCornack, 1999). Third, previous research suggests that police officers may not benefit from lie-detection training using nonverbal cues due to the difficulty associated with ignoring learned (and often inaccurate) habits for detecting deception (Akehurst et al., 2004; Mermon et al., 1994). Furthermore, police officers often display over-confidence in their abilities to detect lies compared to laypersons (DePaulo & Pfeifer, 1986; Frank & Ekman, 1997; Kassin et al., 2007); therefore, police officers may not be able to recognize their potential errors or misconceptions when detecting lies (Leach et al., 2004). For these reasons, recent research on lie-detection has focused on devising interview methods to aid in the detection lies.

Assessment Criteria Indicative of Deception (ACID)

The Assessment Criteria Indicative of Deception (ACID) is an integrative approach to interviewing and statement analysis that was developed to facilitate the detection of deception (Colwell et al., 2008; Suckle-Nelson et al., 2010). Rather than placing emphasis on training professionals (e.g., police officers) to evaluate the nonverbal cues of deception, which are often not accurate or reliable (Miller & Stiff, 1993; Stromwall, Granhag, & Hartwig, 2004); ACID evaluates the verbal content of the testimonies that is related to the phenomenal and objective nature of deception (Colwell et al., 2008; Suckle-Nelson et al., 2010).

ACID is based on the theory that honest respondents who are attempting to be convincing during an investigative interview will believe that their honesty is transparent; thus, they will be

believed by the recipient of the information as long as they do not make any notable

contradictions (Colwell et al., 2008; Hines et al., 2010; Suckle-Nelson et al., 2010). Honest

respondents are therefore free to think in-depth about an event, and provide detailed responses

with little fear that the recipient will not believe them. Moreover, honest respondents feel

comfortable providing additional details during follow-up or recall enhancement questions.

Deceptive respondents are also concerned about making contradictions or mistakes in their

statements; nevertheless, lie-tellers are more concerned than honest respondents with avoiding

any verbal or nonverbal behaviours that could draw attention to their deception (Colwell et al.,

2008; Hines et al., 2010; Suckle-Nelson et al., 2010). Deceptive respondents will then avoid

disclosing any information that could lead to the detection of their deception; thus, they will

avoid providing additional details about their story after their initial disclosure (Colwell et al.,

2006; Granhag et al., 2004; Hines et al., 2009; Suckle-Nelson et al., 2010). For these reasons,

deceptive respondents will develop and rehearse a "lie-script", and use substantially more

cognitive effort compared to honest respondents to remain consistent with their "lie-script"

throughout the questioning. They also feel less comfortable adding additional details throughout

the questioning out of fear of making contradictions against their "lie-scripts" (Colwell et al.,

2008; Hines et al., 2010; Porter & Yuille, 1996; Suckle-Nelson et al., 2010).

   Content-Criterion. ACID begins with the Reality Interview (RI), which is used in the

facilitation of lie-detection. Statements acquired during the interview will then be assessed using

a verbal content criteria derived from Criteria-Based Content Analysis (CBCA; Colwell et al.,

2007; Vrij et al., 2009), Reality Monitoring (RM; Johnson, 1988; Sporer, 2004) and impression

management research (Colwell et al., 2006; Colwell et al., 2007; Colwell, Hiscock & Mermon,

2002; Suckle-Nelson et al., 2006).

ACID utilizes the RI, which uses specific strategies to facilitate the detection of

deception. The RI is based on the Cognitive Interview (Colwell et al., 2002; Suckle-Nelson et al.,

2010), which uses memory retrieval techniques to increase the amount of information that can be

obtained from an eyewitness (Mermon, 2006). The RI therefore utilizes techniques that are

designed to assist honest respondents to provide accurate and detailed testimonies about an

event.

The RI is also designed to increase the difficultly associated with maintaining a lie and

remaining consistent with a "lie script" (Colwell et al., 2002; Colwell et al., 2008; Suckle-

Nelson., 2010). The RI is organized into a series of free-recall (open-ended) and closed ended

questions which are used to increase the cognitive effort required to maintain a lie script. First,

multiple recall questions require the deceiver to consistently maintain their lie script in more than

one circumstance. The multiple questions increase the amount of cognitive effort required to

maintain the lie, and can make the respondent anxious (Colwell et al., 2002; Colwell et al., 2008;

Vrij et al., 2009). The first free-recall question (FR) allows the responder to openly describe the

event in question. The follow-up recall questions (mnemonic questions) promote deeper

processing, which will necessitate unrehearsed lying (Colwell et al., 2002), and increase the

likelihood of the lie-teller providing verbal cues of deception (Ansarra et al., 2011; Colwell et al.,

2007; Suckle-Nelson et al., 2010). The mnemonic questions also enable honest responders to

have multiple opportunities to describe an event, which has shown to help enhance their memory

and the amount of details they provide about the event (Hershkowitz & Terner, 2007; Malloy,

Lyon & Quas, 2007; Sorenson & Snow, 1991). Second, reverse-order recall and unexpected

questions are used to further increase the cognitive effort required to maintain the lie script

(Colwell et al., 2002; Colwell et al., 2008; Porter & Yuille, 1996). Third, alternative forced-

choice questions are designed to make deceivers anxious and work harder as they have to think

outside of the planned lie script that they have created (Colwell et al., 2008; Colwell & Sjerven,

2005; Hiscock & Hiscock, 1989).

ACID examines the patterns of speech and detail in a testimony. Two CBCA criteria,

Unstructured Production and Quantity of Details, posit that statements derived from genuine

memory differ in the amount and distribution of detail content (Hines et al., 2010). Thus,

memories of external events are more detailed as they follow less rigid structures compared to

memories derived from internal processes, such as imagination or fabrication (Hines et al.,

2010). Similarly, RM attempts to determine whether a memory is derived from external

experiences, or from internal factors, such as imagination or fabrication (Johnson, 1988; Johnson

& Raye, 1981). Internally generated memories are expected to contain less detail and

spontaneity, while statements that describe external experiences and memories were more likely

to contain contextual details (e.g., spatial relationships) and external-sensorial details, such as

colours and smells (Hines et al., 2010; Johnson, 1988; Johnson & Raye, 1981). Masip and

colleagues (2005) conducted a meta-analysis on deception detection findings using RM, and

found the accuracy for correctly classified statements ranged between 64% and 85%, which is

higher than the average detection rates of experts and laypersons (Leach et al., 2004; Lewis,

Stanger, & Sullivan, 1989; Talwar & Lee, 2002a). Finally, impression management refers to

managing ones non-verbal and verbal behaviours to appear convincing. For example, Hines and

colleagues (2010) found that deceptive respondents attached more importance on preparing for

an interview in advance, maintaining eye contact, and monitoring and controlling their

information. In contrast, honest respondents were less concerned with monitoring the content of

their disclosure, and more focused on providing correct peripheral details about the event (Hines

et al., 2010). Based on these theories, ACID assesses the response lengths and number of

external, contextual and internal details as they are distributed across the mnemonics portion

(i.e., the follow-up FR questions) of the interview (Colwell et al., 2002; Colwell et al., 2007;

Suckle-Nelson et al., 2010).

ACID also evaluates the content criteria of coherence and type-token ratio (TTR). A

coherent statement is one that does not contain any major contradictions and that could

realistically happen (Colwell et al., 2002; Suckle-Nelson et al., 2010). Although lie-tellers will

attempt to persist with a lie-script to provide a coherent and convincing testimony (Hines et al.,

2010), Colwell and colleagues (2002) found that truthful accounts were more coherent compared

to dishonest accounts. Type-token ratio (TTR) refers to the ratio of unique words in a statement

to the number of total words in a statement (Suckle-Nelson et al., 2010). For example, the

statement, "Sally sells sea shells by the sea shore", has a TTR of 7 out of 8, or .875. TTR is a

measure of impression management, where people who are working hard to convince another

will use a wider array of vocabulary, and thus, have higher TTR. TTR has been used to detect

deception in a variety of populations, such as inmates (Colwell et al., 2002), U.S. military

personnel (Morgan, Colwell & Hazlett, 2009), and Arabic suspects interviewed in English

through an interpreter (Colwell et al., 2009). Although previous research suggests that coherence

and TTR can help experts discern between truthful and dishonest statements in adults, little is

known whether these variables can detect deception in children.

Previous Research. Previous research suggests that ACID can improve the detection of

lies in adult testimonies (Ansarra et al., 2011; Colwell et al., 2007; Suckle-Nelson et al., 2010).

In Colwell and colleagues (2007) study, 38 undergraduate students entered a professor's office

and either stole an exam, or replaced an exam that had been stolen previously. One week later,

participants were interviewed using the RI; half the participants told a lie, while the other half

told the truth. Afterwards, the number of details in the free-recall (FR) and mnemonics (MN)

phases of the interview were evaluated, as well as, whether the participants provided an

admission of error. The findings indicated that the honest reports were longer and more detailed;

honest respondents were also more likely to admit to making potential mistakes in their

testimonies. In the MN portion of the interview, honest respondents benefited from the attempts

to enhance their memory of the event as they provided more new details with each follow-up

question; lie-tellers nevertheless provided shorter, and more repetitive statements with each

follow-up question (Colwell et al., 2007).

Suckle-Nelson and colleagues (2010) studied the effectiveness of ACID at detecting truth

and lies with a population of incarcerated individuals ($N = 88$). Participants witnessed a staged

theft, and were asked to either tell a truth or lie to an interviewer. The number of details in the

free-recall (FR) and mnemonics (MN) phases of the interview, and the coherence and TTR of

each statement were examined. Honest statements had more unique words and details added after

each FR question. In addition, the honest statements were rated as more coherent, but had a

lower TTR compared to the dishonest statements. Furthermore, discriminant function analyses

(DFAs) were used to assess whether ACID could correctly classify statements as honest or

deceptive. Overall, ACID correctly classified 89% of the statements (Suckle-Nelson, 2010),

which was noticeably higher than the classification accuracy of laypersons and "experts" in

previous research that did not utilize ACID (Aamodt & Mitchell, 2006; Akehurst et al., 2004;

Bond & DePaulo, 2006; Vrij, 2008).

Ansarra and colleagues (2011) assessed the general validity of ACID at detecting

deception in 67 undergraduate students; the procedures and measurements for the study

resembled that of Suckle-Nelson and colleagues (2010). Honest responders provided more

details throughout the interview, with their statements being more spontaneous in structure. Also,

the ACID system was able to correctly classify the majority of the honest (87%) and deceptive

(73%) statements (Ansarra et al., 2011).

       Gaps in Literature. Previous research suggests that ACID is a promising lie-detection

tool (Ansarra et al., 2011; Colwell et al., 2007; Suckle-Nelson et al., 2010); nevertheless, little is

known whether it can also be effective with children. Although some research suggests that the

ability to deceive may not vary based on age (Edelstein, Luten, Ekman, & Goodman, 2006; Vrij,

Akehurst, Brown, & Mann, 2006); other findings indicate that the frequency of lie-telling

behaviour (Talwar & Lee, 2002b; Wilson, Smith & Ross, 2003; Xu et al., 2010) and the ability to

successfully maintain those lies is influenced by the age (Evans et al., 2011; Talwar & Lee,

2002ab; Talwar & Lee, 2008). Also, cognitive factors that develop as children get older, such as

working memory (Talwar & Lee, 2008), inhibitory control (Evans et al., 2011; Talwar & Lee,

2008) and theory-of-mind (Polak & Harris, 1999; Talwar & Crossman, 2011; Talwar, Gordon et

al., 2007; Talwar & Lee, 2008), have been shown to be related to the quality of a child's lie. In

addition, positive relationships have been found between high levels of word knowledge and

verbal intelligence and the ability to effectively perform a verbal task (Nagels et al., 2012; Ruff,

Light, Parker & Levin, 1997); thus, a child's developing verbal skills may influence the amount

of information they are able to disclose in their testimony.

       Under free-recall conditions, age has been shown to be related to the amount of

information disclosed about an event (Chapman & Perry, 1995; Eisen et al., 2007; Tustin &

Hayem, 2010). Jack, Leov and Zajac (2014) examined the age-related differences in the free-

recall accounts of child, adolescent and adult witnesses. Overall, the amount of information

participants disclosed was significantly related to age, as adults provided more information about an event than adolescents and children. Nevertheless, the accuracy of the reports were not influenced by age (Jack, Leov & Zajac, 2014). For these reasons, a child's age and developmental level may influence some of the variables used by ACID to detect deception, such as total response length, number of unique words, TTR, number of details and the coherence of their testimony.

Past research with ACID has generally focused on evaluating the statements of adults after they were asked to falsely deny a transgression (Ansarra et al., 2011; Colwell et al., 2007; Suckle-Nelson et al., 2010). However, in cases of child maltreatment, a child may be asked to falsely accuse another of committing the abuse (Black & Schwitzer, 2012; Engle & O'Donohue, 2012; Ney, 1995). Thus, ACID needs to be studied in contexts where children are asked to make false accusations to fully understand its effectiveness at detecting truths and lies.

Limited research has considered whether the gender of the individual providing the testimony influences the effectiveness of ACID. Past research has found that women often have stronger verbal skills than men (Shibley-Hyde & Linn, 1988; Weis et al., 2003). Women have also scored higher on tasks requiring attention to detail, and recall from episodic memory (Duff & Hampson, 2001; Herlitz, Nilsson & Backman, 1997; Postma et al., 2004). Suckle-Nelson and colleagues (2010) found that women provided more coherent testimonies, and had a lower TTR score compared to men. It was also found that the deceptive women gave less detail than deceptive males; however, honest women gave more detailed disclosures compared to honest men (Suckle-Nelson et al., 2010). Further research is still needed to evaluate the relationship between gender and the classification accuracy of ACID, especially with a sample that includes children.

Present Study

The current study analyzes the effectiveness of ACID in detecting truths and lies in children's testimonies. In this study, children (ages 6-11) will witness an investigator (E1) discover a stranger's wallet. E1 will find twenty dollars, and either steal the money or leave it in the wallet. Children will then be asked by E1 to lie to an interviewer (E2) by either falsely denying a theft that occurred (False Denial condition), or by falsely accusing E1 of a theft that did not take place (False Accusation condition). E1 will also ask some children to tell the truth to E2 about whether they took the money (True Assertion condition) or left it in the wallet (True Denial condition). Children will then be interviewed by E2 about the events that took place with E1; the interview script will be based on the Reality Interview (RI). The interview will be videotaped, and later transcribed into written transcripts, and coded by three researchers using the ACID coding criteria. The number and type of details in the FR and MN portions of the interview will be evaluated, as well as the coherence, TTR, and whether the participants provide an admission of error.

The first set of hypotheses revolve around children's lie-telling behaviour according to condition, age and gender. First, it is expected that there will be no differences in the rate of lie-telling behaviour between the children in the False Denial (FD) and False Accusation (FA) conditions. In the present study, the participants will have had prior interaction with E1 before the interview, and no interaction with E2; thus, the hypothesis is based on previous research involving children having significant prior interaction with the instigator. Tye and colleagues (1999) found that more than half of children (56%) were willing to falsely accuse an innocent researcher of a theft instead of incriminating a significant other. Similarly, in the Talwar and colleagues (2004) study, slightly over half (51%) of children falsely denied that their parent

broke a puppet when the parent was absent during their first confession. Second, past research on lie-telling in children showed that children's willingness to tell anti-social and pro-social lies increased with age (Bottoms et al., 2002; Talwar & Lee, 2002b; Wilson, Smith & Ross, 2003). For this reason, it is expected that the rate of lie-telling behaviour in both lie-telling conditions will also increase with age. Third, it is expected that boys will lie more often than girls in both lie-telling conditions. Lying has been associated with disruptive behaviour disorders (Gervais et al., 2000; Ostrov, 2006; Stouthamer-Loeber, 1986), with boys having higher rates of disruptive behaviour and recurrent lying problems compared to girls (Gervais et al., 2000; Molfit & Caspi, 2001). Boys are also more willing to evaluate immoral acts as more acceptable than girls (Keltikangas-Jarvinen & Lindeman, 1997); therefore, they may be more willing to falsely deny that the theft occurred.

The second set of hypotheses place emphasis on the effectiveness of ACID in detecting truth and lies in the testimonies of children. Since no research on ACID has included children, the following hypotheses are based on the recent results with adult participants (Ansarra et al., 2011; Colwell et al., 2007; Suckle-Nelson et al., 2010). First, it is expected that the honest respondents will provide statements that are more vivid (statements that are longer and more detailed) and spontaneous (statements that get longer with each follow-up question) than the lie-tellers. Thus, honest respondents will provide testimonies with higher word lengths and number of details (internal, external and contextual), as well as greater coherence. Honest responders will also provide a greater number of significant details (details about the theft), but fewer contradictions. Nevertheless, lie-tellers will have testimonies with a higher number of unique words, and thus have a higher TTR. Finally, truth-tellers will be more likely to provide an admission of error compared to lie-tellers. Second, no research has been discovered that has

taken a developmental approach to evaluating the efficacy of ACID; therefore, it is unclear whether results will be consistent across the three age groups of the participants (6-7, 8-9 and 10-11). Third, in correspondence with the findings of Suckle-Nelson and colleagues (2010), female lie-tellers will provide less details and words than deceptive males; yet, honest females will give testimonies with more detail and words, and have a lower TTR compared to honest males. Among both the truth-tellers and lie-tellers, females will provide more coherent testimonies (Suckle-Nelson et al., 2010). Furthermore, due to the lack of previous research on false accusations, it is unclear whether ACID will also be able to detect this type of lie.

Method

Participants

A sample of 89 children (n $_{males}$ = 43; n $_{females}$ = 46) between the ages of 6 to 11 and from predominately middle-income families in a large metropolitan area (i.e., population approximately 3,000,000) participated in the study. Participants were primarily recruited from the McGill Infant Research Group (MIRG) database, and advertisements in a local family-based magazine. However, non-English speaking children (n = 1) were not included in the study because the measures were only available in English. Also, children (n = 2) who had previous experiences participating in any lie-telling studies were also excluded from the study. Thus, the final sample included 86 children (n $males$ = 42; n $females$ = 44). Children were divided into three separate age groups: 6 to 7-years (*Mage in months* = 82.9, *SE* = 1.28, n = 27), 8 to 9 years (*Mage in months* = 105.7, *SE* = 1.04, n = 42) and 10 to 11 years (*Mage in months* = 128.4, *SE* = 1.61, n = 17).

Materials

      Demographics Questionnaire. The parents of the participants completed a

demographics questionnaire that was attached to each consent form. The questionnaire provided

information regarding the age, gender, family structure, ethnicity, socioeconomic status and

religious backgrounds of each participant.

      Interview Script. The script and coding of the interview with E2 were based on the

ACID theory and Reality Interview (RI) method (Ansarra et al., 2011; Colwell, 2007). The script

(see Appendix A) contained 24 questions, which were separated into four different categories;

refer to Table 1 for how the interviewed was organized. *Baseline and Rapport* questions (4) were

used to develop a bond between the children and E2. Moreover, they provided baseline data

regarding each child's verbal ability and/or willingness to disclose information. A *Free Recall*

question (1) was used to allow each child to describe in as much detail as possible everything

they remembered from their time spent with E1. *Mnemonic* questions (4) were used to enhance

the memory of the interviewees. The mnemonic questions were separated into four categories.

First, children were asked to recall their senses (sights, smells, auditory memories, taste and

things they touched) they experienced upstairs with E1. Second, children were asked to recall

their experiences with E1 from the perspective of their parent. Third, children were asked to

describe everything they could remember about their time upstairs with E1, but in reverse-order.

Fourth, children were asked to retell in as much detail as possible everything they could

remember about their time upstairs with E1. *Forced-Choice* questions (16) were closed-ended,

and required children to either provide short-answers (e.g., "Was there money in the wallet?") or

choose a response based on a set of possible answers (e.g., "Was the money in the wallet green

or blue?"). Only the final forced-choice question was scored ("Did E1 take the money from the

wallet?"). This question was used to determine if a child told a truth (scored as 0) or a lie (scored

as 1) about the potential theft. The remaining forced-choice questions were not scored; they were

used to encourage the children to discuss the situation with the wallet in the free-recall questions

(Ansarra et al., 2011; Colwell, 2007). Furthermore, children were asked to evaluate whether they

thought they could have been mistaken about any information they provided during the interview

(Yes = 1; No = 0).

Rater Training

Each interview was video-recorded. Written manuscripts of each child's verbal responses

and non-verbal behaviour were produced based on the video-recordings. The written

transcriptions of each interview were coded by three different researchers. The coders were blind

to the condition that each participant was placed in, and coded each script independently to avoid

any potential biases. The five free-recall questions were primarily used to determine whether the

ACID coding criteria predicted truth and lie-telling behaviour. The final closed-ended question

was used to determine whether a participant told a truth or lie at the end of the interview.

The project coordinator was trained by the author of the ACID training procedure, Kevin

Colwell; the coder training session was 6-hours in length. The training was based on the

procedures reported in Colwell and others (2007). The training session covered the history of the

ACID theory, and provided training on how to code the manuscripts. Standard scoring sheets

were also provided to ensure consistent operational definitions of the variables. Colwell also

described the procedure for tallying the amount and type of details presented in the transcripts.

Prior to completing the training, the project coordinator completed 3 manuscripts and reached an

inter-rater agreement of at least 80% with Colwell.

After the training, the project coordinator trained two raters on the ACID coding system. The training session consisted of three, two-hour training sessions, which took place over a two-week period. The first training session focused on the history of the ACID coding system. The second session taught the coders the procedures for tallying the amount of details present in each script. The third session involved the coders completing three practice scripts using the ACID coding system. The raters also completed three additional practice scripts. Disagreements in coding the transcripts between the raters were primarily based on determining which type of information was relevant to the free-recall questions, and which information was considered to be a new or unique detail.

Coding

The coding of the interview scripts was based on the updated ACID criteria from Colwell and others (2007) and Suckle-Nelson and others (2010). Coherence (Coh) refers to a disclosure that does not contradict itself regarding major details, or one that was possible given the limits of time and space (Suckle-Nelson, 2010). Coh was scored by hand by the three raters, with each rater providing one score for the entire script. A transcript rated as coherent, and did not contradict itself regarding major details, was given a score of 0. In contrast, a transcript that contained an implausible story and/or contradictions regarding major details was rated as incoherent, and received a score of 1. The potential scores for Coh were 0 (all coders rated script as coherent), .33 (two rated coherent, one incoherent), .67 (one rated coherent and two rated incoherent), and 1 (all coders rated script incoherent). An inter-rater reliability analysis using the Kappa statistic was performed to determine consistency among three raters for the Coh variable. Substantial agreement in the ratings for Coh was found between raters 1 and 2 (Kappa = .705, *p*

= <.001), and raters 1 and 3 (Kappa = .707, p = <.001); while, a moderate agreement was

discovered between the ratings of raters 2 and 3 (Kappa = .562, p = <.001).

The total number of free recall details (Det_{FR}) and the total amount of new details added

during the mnemonics questions (Det_{MN}) were also analyzed. Free recall details refer to the total

number of details (internal, external, and contextual) in a transcript. Internal (or idiosyncratic

details) incorporates any detail relating to a meta-cognitive processes (e.g., "I don't remember")

or self-referential information (e.g., "That happened to me once"). External details answer the

"who", "how", and "what" questions, as well as details that describe inter-relationships.

Adjectives (e.g., numbers and heights of things), information derived from the senses, and any

descriptions of actions or interactions are also examples of external details. Contextual details

include spatial relationships and contexts, timing and location. Contextual details answer the

"when" (e.g., time and chronological order) and "where" (spatial relationships) questions.

Although not included in the Det_{FR} and Det_{MN} analyses, the total number of sensitive details and

contradictions were also counted. Sensitive details refers to any piece of information that pertains

to the situation with the wallet. Contradictions included statements that could not realistically

have occurred. Contradictions were also scored when the child provided a piece of information

that contradicted an earlier statement; however, self-corrections were not scored as a

contradiction.

A free recall total score (Det_{FR}) was obtained by adding the total number of details on the

free recall question (Det_{FR} = External FR + Contextual FR + Internal FR). The mnemonics total

(Det_{MN} = External MN + Contextual MN + Internal MN) refers to the total amount of new

details added during the four mnemonics recall questions. Therefore, on the second through fifth

free-recall questions, only new details (internal, external and contextual) that were not mentioned

in the first free-recall question were counted. A Pearson product-moment correlation was run to determine the relationship between the three raters' total number of details found in each script. Significant, strong and positive correlations were found between raters 1 and 2 ($r = .985$, $p = <.001$), 1 and 3 ($r = .993$, $p = <.001$), and 2 and 3 ($r = .990$, $p = <.001$) in terms of the total number of details found in each script.

Free recall response length (Res$_{FR}$), free recall type-token ratio (TTR$_{FR}$), mnemonics response length (Res$_{MN}$), and the mnemonics type-token ratio (TTR$_{MN}$) of each script were also evaluated. Res$_{FR}$, Res$_{MN}$, TTR$_{FR}$, and TTR$_{MN}$ were automated and scored by software. Free recall response length (Res$_{FR}$) is the number of words disclosed in the FR question; mnemonics response length (Res$_{MN}$) is the number of words disclosed across the mnemonics portion of the interview. The free recall type-token ratio (TTR$_{FR}$) refers to the ratio of unique words in the FR statement to the Res$_{FR}$. The mnemonic TTR (TTR$_{MN}$) is the ratio of unique words in a mnemonics statement to the Res$_{MN}$. To evaluate Res$_{FR}$, TTR$_{FR}$, Res$_{MN}$ and TTR$_{MN}$, each transcript was saved in a Plain Text Format, with a separate file for each FR and MN questions. Each file was evaluated using a Wordscan program, which recorded the total number of words, and total number of unique words (Colwell, 2007; Suckle-Nelson et al., 2010). Type-token ratio (TTR) was evaluated by dividing the unique words by the total amount of words (Unique/Total). The TTR$_{MN}$ was determined by averaging the TTR across the four mnemonic questions (TTR$_{MN}$ = TTR reinstatement + TTR another perspective + TTR reverse order + TTR retell/ 4).

Setting

The present study took place at the Talwar Child Development Research Laboratory. The laboratory consists of a common room, an interview room and a testing room. The interview room (located on the main floor) was the location of the interview with E2; the room contained

three hidden cameras that recorded the interview. The primary interaction with E1 and the

situation with the wallet took place in the testing room.

Procedures

      E1 and E2 greeted the children and parents when they arrived. E1 was responsible for

interacting and playing with the children before the study. E2 provided the parents(s) with the

consent and demographics forms, and answered any questions about the study. E2 had very

limited interaction with the children prior to the interview. After the consent form was signed by

the parent(s), E1 brought the children upstairs to the testing room to do filler tasks. Parents

remained in the common-room throughout the duration of the study.

      Upstairs, E1 acquired the verbal assent of the children to participate in the study, and

asked them to try and remember everything they could regarding their experiences with E1. E1

and the children then engaged in five filler activities (e.g., memory games). The purpose of the

activities was to further develop the bond between E1 and each child; the total time spent with

each child playing the activities ranged from 35 to 45 minutes. After completing the activities,

E1 notified the children that they had to grab his or her jacket, which was located near the testing

table. E1 would then find a wallet that was placed near the jacket. E1 opened the wallet, and

notified the children that the wallet belonged to another researcher. E1 then removed twenty-

dollars from the wallet. Depending on the condition the children were placed in, E1 either stole

the money, or placed it back in the wallet.

      E1 then proceeded to bring the children downstairs to be interviewed by E2. Immediately

prior to the interview, the children and E1 met with E2 outside the interview room. E1 praised

each child for their performance upstairs, and then told E2 that he or she had to go upstairs

because E1 had forgotten his or her jacket. E2 then stated that he or she also needed to go

upstairs with E1 to get his or her clipboard with the questions for the children. The children were

then brought into the interview room by E2. E2 provided each child with a puzzle to be

completed while E2 went upstairs with E1 to get the jacket and clipboard. Later, the children

learned that E2 thought that E1 stole money from the wallet; thus, the purpose of the interaction

between E1 and E2 was to help the children acknowledge how E2 became aware of the situation

with the wallet upstairs

Participants were then organized into four conditions (see Appendix B); each age group

was equally distributed across the four conditions. One-minute after E2 left the interview room,

E1 returned and either asked the children to tell a truth or a lie about the situation with the wallet.

Children were randomly placed into either a lie (2) or truth (2) conditions. Children ($n = 23$) in

the False Accusation condition (FA) witnessed E1 leave the money in the wallet; however, they

were asked by E1 to tell a lie to the interviewer (E2) by falsely accusing E1 of taking the money.

In the False Denial (FD) condition, E1 took the money from the wallet, but they asked the

children ($n = 22$) to lie to E2 and say that E1 did not take the money. Children ($n = 19$) in the

True Assertion condition (TA) witnessed E1 take the money from the wallet, yet they were asked

by E1 to tell the truth to E2 about the event. Finally, in the True Denial condition (TD), E1 did

not take the money from the wallet; children ($n = 22$) were then asked by E1 to tell the truth to

E2 about the event. E1 then proceeded to leave the room. One-minute after E1 left the room, E2

returned to interview the children about the events with E1 (see Appendix A). After completing

the interview, the children were brought into the common-room to be debriefed by E1 and E2.

Ethical Concerns

Informed Consent. The guardians of the participants completed a consent form that

explained the procedures, purpose and deceptive nature of the study. The parents were also

assured that their child's personal information would remain confidential. In addition, the methods of conducting the study were not designed to cause any physical or emotional harm to the children. Finally, E1 acquired the verbal assent of each child to participate in the study prior to beginning the activities upstairs.

Confidentiality. The guardians were informed that their child's names would only be known by the primary investigator, the confederate and interviewer. Each child received an identification number (ranging from 700- 786) that was designed to conceal their identity and family information. Finally, participant information was stored in a locked file cabinet in a secured laboratory facility that could only be accessed by members of the lab.

No Coercion. The participants were not forced to proceed with the study if they desired to discontinue their involvement. Prior to the study, children and their guardians were notified that they were free to withdraw their involvement at any time during the study. No participants withdrew their involvement from the study.

Debriefing. After completing the interview, E1 and E2 explained to the children and their guardians the true purpose of the study. They were notified about the deceptive nature of the study, and told that the theft was pretend and did not actually occur. In addition, children were told that their involvement in the study would help many children, and that they should tell their guardians if they are ever asked to lie by another adult.

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Results

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Children's Lie-telling Behaviour

The present sample contained ($N = 86$) a higher number of 6-7 ($n = 27$) and 8-9 year olds ($n = 42$) compared to 10-11 year olds ($n = 17$); there was also slightly more females ($n = 44$) compared to males ($n = 42$). Four separate Chi square analyses were used to assess children's lie-

telling behaviours according to age, gender and condition. Significant differences were found in

children's lie-telling behaviour between the conditions, χ^2 (3, $N = 86$) = 27.55, $p < .001$.

However, when excluding the two truth conditions, no significant differences were found in the

rate of children's lie-telling behaviours between the FD and FA conditions, χ^2 (1, $n = 45$) = .184,

$p = .668$. Overall, one-third (33%) of the total sample told a lie (see Table 2). In the FD

condition, 55% of the children told a lie to protect E1; while, over half of the children (61%) lied

to falsely accused E1 of the theft in the FA condition. Nearly all the children told the truth in the

TD (96%) and TA (95%) conditions.

There were no significant differences in the rate of children's truth and lie-telling

behaviours between age groups, χ^2 (2, $N = 86$) = 1.96, $p = .376$. Nevertheless, when the truth-

tellers were excluded from the analysis, a significant effect of age-group on the rate of children's

lie-telling behaviour was discovered χ^2 (2, $n = 45$) = 6.13, $p = .047$. Although not significant, the

8-9 years lied more (78%) than the 10-11 (40%) and 6-7 year olds (38%) in the FD condition, χ^2

(1, $n = 22$) = 3.323, $p = .190$. In the FA condition, the 10-11 (80%) and 8-9 year olds (73%) lied

more compared to the 6-7 year olds (29%), even though this difference was not significant, χ^2 (1,

$n = 23$) = 4.483, $p = .106$. One child in the 6-7 year old age group told a lie in the TA condition

(25%), while, one 8-9 year old told a lie in the TD condition (9%). Furthermore, there were no

significant associations between gender and children's lie-telling behaviour according to

condition, χ^2 (1, $N = 86$) = 1.146, $p = .284$. Figure 1 shows the differences in children's lie-

telling behaviour according to condition and gender. Although not significant, males (38%) were

more likely to lie compared to females (27%). After only including lie-tellers in the analysis, no

significant differences were discovered in the rate of lie-telling behaviour between males and

females, χ^2 (2, $n = 45$) = 1.910, $p = .167$. In the FD condition, males were far more likely to lie

(73%) to protect E1 compared to the females (36%), with the difference in the rate of lie-telling

behaviour approaching significance, χ^2 (1, $n = 22$) = 2.933, $p = .087$. No significant differences

were found in the rate of lie-telling behaviour between males (64%) and females (58%) in the FA

condition, χ^2 (1, $n = 23$) = .068, $p = .795$. In the TD condition, all the males told the truth, while

one female told a lie (9%); in the TA condition, all the females told the truth, and one male told a

lie (11%).

Manipulation Checks and Experimenter Bias

The participant transcripts were read and coded by three researchers (1 male; 2 females).

The transcripts of 67 participants were included in the examination of the efficacy of ACID. One

participant was excluded because they did not appear to understand the questions in the

interview. A malfunction with a computer hard-drive resulted in the loss of an additional 18

transcripts. In all, 19 cases were not included in the analysis (13 female; 6 male). The remaining

transcripts contained a higher number of 8-9 year olds ($n = 36$) than 6-7 ($n = 17$) and 10-11 year

olds ($n = 14$); there was a near equal number of transcripts from male ($n = 36$) and female ($n = 31$) participants. In addition, there was a higher number of truth-tellers ($n = 41$) than lie-tellers ($n = 26$). Finally, the lie conditions (FA = 20; FD = 17) had a higher number of participants

compared to the truth conditions (TA = 17; TD = 13).

Both the interviewer (E2) and the coders were blind to the condition of the participants.

To avoid the influence of personal characteristics, such as age, personality and likeability of E1

or E2 on children's lie-telling behaviour, eight different E1's (2 male; 6 female), and 18 different

E2s (3 male; 15 female) were used. A Pearson chi-square was run to assess for experimenter bias

in the classification accuracy of the conditions of the participants among the three coders. The

findings indicate that raters 1 (38% accurate; χ^2 (3, $n = 67$) = 13.575, $p = .004$), 2 (42% accurate;

χ^2 (3, n = 67) = 10.984, p = .012) and 3 (38% accurate; χ^2 (3, n = 67) = 16.189, p = .001) were significantly more likely to be inaccurate in their identification of the condition for each participant. Thus, the condition of each child was unlikely to influence the raters' coding for each transcript.

Mean Comparisons

Honesty of Report. Factorial MANOVAs were conducted to examine the main effects of the ACID variables (Coh, Det$_{FR}$, Res$_{FR}$, TTR$_{FR}$, Det$_{MN}$, Res$_{MN}$, and TTR$_{MN}$) on honesty of the report (truth-tellers vs. lie-tellers). First, there were no significant differences in the coherence (Coh) of the children's testimonies between the truth and lie-tellers, $F(1,65)$ = .598, p = .442. Second, truth-tellers and lie-tellers did not differ significantly regarding the total number of details they provided on the free-recall question (Det$_{FR}$; $F(1,65)$ = .127, p = .723) and on the four mnemonic (Det$_{MN}$; $F(1,65)$ = .263, p = .610) questions. Third, no significant differences were found between truth and lie-tellers in the number of unique words disclosed on the free recall ($F(1,65)$ = 1.18 , p = .281) and mnemonics questions ($F(1,65)$ = .076, p = .783); moreover, no significant differences were discovered regarding the free recall (Res$_{FR}$; $F(1,65)$ = .853, p = .359) and mnemonics response lengths (Res$_{MN}$; $F(1,65)$ = .271, p = .605). Furthermore, truth-tellers and lie-tellers did not have significantly different TTR scores on the free-recall (TTR$_{FR}$; $F(1,65)$ = 1.109, p = .296) and mnemonics questions (TTR$_{FR}$; $F(1,65)$ = .041, p = .841). Table 3 shows the mean and standard deviation for each ACID variable across honesty of report.

A 2 (honesty) X 7 (total number of details, type of detail and response length) mixed factorial ANOVA was conducted to evaluate the observed effect of honesty on the total number and type of details (internal, external, contextual, and sensitive), contradictions, and the total length of the children's testimonies across the five free-recall questions. No significant

differences were found regarding the total number of details children provided across the five

free-recall questions, $F(1,65) = .055$, $p = .815$. The type of details were not significantly affected

by the honesty of reporting: External, $F(1,65) = .033$, $p = .857$; Contextual, $F(1,65) = .001$, $p =$

.975; Contradictions, $F(1,65) = .016$, $p = .900$. However, truth-tellers provided more sensitive

details ($M = 4.89$) about the event compared to the lie-tellers ($M = 2.77$); although this difference

was not significant, $F(1,65) = 2.126$, $p = .150$. In contrast, lie-tellers ($M = 3.01$) provided more

internal details than truth-tellers ($M = 1.98$), with the difference approaching significance,

$F(1,65) = 2.782$, $p = .100$. There were also no significant differences in the total length of

response throughout the interview between the truth-tellers and lie-tellers. Furthermore, truth-

tellers were more likely to admit that they could have been mistaken about some of the

information they provided during the interview (49%) compared to lie-tellers (31%), but this

difference was not significant χ^2 (2, $n = 67$) = 2.135, $p = .344$). Refer to Table 4 for the mean

total number of details, type of details and response lengths of the truth-tellers and lie-tellers.

Condition. A 2 (honesty) X 4 (condition) X 5 (Free-recall questions) mixed factorial

ANOVA was used to assess the role of each free-recall question on the total amount of unique

details children disclosed. Table 5 shows children's mean number of unique details on the five

free-recall questions according to condition. There were no significant differences in the total

number of unique details children provided across the five free-recall questions between the truth

($M = 59.2$) and lie-tellers ($M = 61.9$), $F(1,56) = .145$, $p = .705$. In the FD condition, truth-tellers

and lie-tellers did not differ significantly in the number of details they disclosed on the FR (22.50

vs. 19.34), CR (17.67 vs 14.30), MP (2.67 vs 3.66) and RO (11.84 vs 12.27) questions.

However, on the RT question, truth-tellers ($M = 12.23$) provided significantly more unique

details compared to the lie-tellers ($M = 4.03$), $F(1,16) = 5.36$, $p = .035$. In the FA condition, lie-

tellers gave more unique details on the FR (37.80 vs. 17.24; $F(1,19) = 3.197$, $p = .091$) and CR

(12.59 vs. 8.81; $F(1,19) = 2.458$, $p = .134$) questions than the truth-tellers, with the differences

approaching significance. No significant differences were found on the MP (3.14 vs. 3.36), RO

(9.24 vs 10.18), and RT (2.81 vs .4.16) questions between the truth and lie-tellers. Since only one

child lied in the TD and TA conditions, they were excluded from this analysis. Children in the

TA condition provided more unique details on the FR (34.98 vs. 21.31) and RT (9.83 vs. 7.50)

questions than children in the TD condition, but the differences were not significant.

A MANOVA was conducted to examine the observed effect of condition on the ACID

variables (Coh, Det_{FR}, Det_{MN}, Res_{FR}, Res_{MN}, TTR_{FR} and TTR_{MN}). In the FD condition, no

significant differences were found between the truth-tellers and lie-tellers on any of the ACID

variables, except for the Res_{MN} variable (refer to Table 6). On the Res_{MN} variable, truth-tellers

provided significantly more words in their disclosure ($M = 200.83$) compared to lie-tellers ($M =$

140.82), $F(1, 17) = 3.612$, $p = .007$. Although not significant, truth-tellers also provided more

unique words ($M = 123.83$) on the mnemonics questions than the lie-tellers ($M = 92.36$), $F(1, 17)$

$= 2.782$, $p = .116$. In the FA condition, lie-tellers disclosed a higher number of details (Det_{FR}),

unique words, total length of disclosure (Res_{FR}) and TTR_{FR} on the free-recall question compared

to the truth-tellers; however, the differences on Det_{FR} ($F(1, 20) = 2.699$, $p = .118$) unique words

total ($F(1,20) = 2.495$, $p = .132$), Res_{FR} ($F(1, 20) = 2.730$, $p = .116$) and TTR_{FR} ($F(1, 20) =$

2.366, $p = .141$) were not significant. No significant differences were found between the truth-

tellers or lie-tellers on the Coh, Det_{MN}, Res_{MN} and TTR_{MN} and the number of unique words

disclosed on the mnemonics questions (refer to Table 6). In the TD condition, children's scores

on the ACID variables (excluding Coh) resembled those of the lie-tellers in the FD condition

(refer to Table 6). Children in the TA condition had scores on Det_{MN}, Res_{MN}, TTR_{MN} and the

number of unique words on the MN questions variables which corresponded to the lie-tellers in the FA group (refer to Table 6).

A 2 (honesty) X 4 (Condition) X 4 (Type of Detail) mixed factorial ANOVA was used to evaluate the effect of the four conditions on the type of details children disclosed. No significant differences were found in the number of internal, external and contextual details between the groups. However, in the TA condition, children provided more sensitive details compared to the other conditions, but this difference was not significant, $F(3, 63) = 1.921$ $p = .135$. In the FD condition, truth-tellers provided significantly more sensitive details ($M = 5.56$) about the wallet situation compared to the lie-tellers ($M = .12$), $F(1, 15) = 12.592$, $p = <.001$; nonetheless, no significant differences in the number of internal, external or significant details were found between the truth-tellers and lie-tellers. In the FA condition, lie-tellers provided more internal ($F(2, 18) = 3.48$, $p = .081$) external ($F(2, 18) = 2.294$, $p = .147$) and sensitive details ($F(2, 18) = 2.648$, $p = .121$) than the truth-tellers, yet these differences were not significant. No significant differences in the number of contextual details were discovered between the truth-tellers and lie-tellers in the FA condition. Refer to Table 5 for the mean differences in the number of details between truth-tellers and lie-tellers according to condition.

A Pearson chi-square was used to evaluate whether truth and lie-tellers in each condition thought they could have been mistaken about the information they provided in the interview. In the FD condition, truth-tellers (67%) were significantly more likely to admit that they could have been mistaken compared to lie-tellers (9%), χ^2 (1, $n = 17$) $= 6.199$, $p = .013$. No significant differences were found between truth (43%) and lie-tellers (46%) in the FA condition, χ^2 (2, $n = 20$) $= .659$, $p = .719$.

Age. A MANOVA was conducted that evaluated the observed effect of age on the ACID dependent measures. Children's Coh, Det_{FR}, Det_{MN}, Res_{FR}, and Res_{MN} all increased significantly with age; thus, honesty of report according to the ACID variables was evaluated within the age groups. In the 6-7 year old and 8-9 year old age groups, no significant differences were found between the truth- tellers and lie-tellers for any of the ACID variables (refer to Table 7). For 10-11 year olds, lie-tellers were rated as more coherent, and provided more details (Det_{FR}), unique words and total words (Res_{FR}) on the free-recall question, with the differences approaching significance. However, no differences were found between the groups on the Det_{MN}, unique words, Res_{MN} and TTR_{MN} variables (refer to Table 7).

A 3 (Age) X 5 (Free-recall questions) X 3 (Type of Details) mixed factorial ANOVA was conducted to evaluate the differences in the amount of unique details children provide based on their age group. Overall, 10-11 year olds ($M = 80.17$) provided significantly more new details throughout the interview compared to the 8-9 year olds ($M = 69.40$) and 6-7 year olds ($M = 34.34$), $F(2, 64) = 5.549$, $p = <.001$. On the FR question, 10-11 year olds ($M = 36.43$) gave significantly more new details than the 8-9 year olds ($M = 30.31$) and 6-7 year olds ($M = 11.94$), $F(2, 64) = 4.452$, $p = 0.02$. Similarly, 10-11 year olds ($M = 17.52$) provided significantly more new unique details on the CR question than the 8-9 ($M = 14.87$) and 6-7 year olds ($M = 8.27$), $F(2, 64) = 5.329$, $p = <.001$. No significant differences in the amount of new details disclosed were found between the age groups on the MP ($F(2, 64) = 1.471$, $p = .237$), RO ($F(2, 64) = 2.297$, $p = .109$) and RT questions ($F(2, 64) = .834$, $p = .439$). Refer to Figure 2 for the mean number of details on each free-recall question according age.

A second MANOVA was used with the interaction of honesty of report and age group as the independent variables, and the type of details (internal, external, contextual and sensitive) as

the dependent variables. The 10-11 year olds provided significantly more external (F (2, 57) =

7.34, $p < .01$), contextual (F (2, 57) = 4.59, $p = .02$), and mnemonics total details (F (2, 57) =

8.43, $p < .01$) compared to the 8-9 and 6-7 year olds. The 10-11 year olds also provided more

sensitive details about the wallet situation, with the difference approaching significance (F (2,

57) = 2.84, $p = .07$).

Finally, a Pearson chi-square was used to compare the rate of admission of error between

truth and lie-tellers according to age group. The 10-11 years olds (71%) were more likely to

admit to making a potential error during their testimony compared to the 8-9 (31%) and 6-7 year

olds (41%), with the difference approaching significance χ^2 (4, $n = 67$) = 8.084, $p = .089$).

Among the 6-7 year olds, truth-tellers (46%) were more likely than the lie-tellers (33%) to

provide an admission of error, yet this difference was not significant, χ^2 (1, $n = 17$) = .235, $p =$

.627). Similarly, truth-tellers (38%) in the 8-9 year old age group were also more likely to

provide an admission of error compared to the lie-tellers (20%), but this difference was also not

significant, χ^2 (2, $n = 36$) = 1.354, $p = .508$). The 10-11 year-old truth-tellers (78%) were also

more likely than the lie-tellers (60%) to make an admission of error; however this difference was

also not significant, χ^2 (1, $n = 14$) = .498, $p = .480$).

Gender. A MANOVA was used to measure the effect of gender on the nine ACID

variables (Coh, Det$_{FR}$, Res$_{FR}$, TTR$_{MN}$, Det$_{MN}$, Res$_{MN}$, TTR$_{MN}$ and unique words on FR and MN

questions). There were no significant differences between male and female participants for the

Coh (F (1, 65) = .598, $p = .442$), Det$_{FR}$ (F (1, 65) = .247, $p = .621$), Res$_{FR}$ (F (1, 65) = .853 $p =$

.359), TTR$_{FR}$ (F (1, 65) = 1.109, $p = .296$), Det$_{MN}$ (F (1, 65) = 1.574, $p = .214$), Res$_{MN}$ (F (1, 65)

= .271, $p = .605$), TTR$_{MN}$ (F (1, 65) = 0.41, $p = .841$), and the total unique number of details

disclosed on the FR (F (1, 65) = 1.181, $p = .281$) and MN (F (1, 65) = .076, $p = .783$) questions.

Among males, truth-tellers and lie-tellers did not differ significantly on the Coh(F (1, 34) = .769, p = .387), Det$_{FR}$ (F (1, 34) = .349, p = .559), Res$_{FR}$ (F (1, 34) = .046, p = .831), TTR$_{FR}$ (F (1, 34) = .012, p = .912), Det$_{MN}$ (F (1, 34) = 2.076, p = .159), Res$_{MN}$ (F (1, 34) = 1.102, p = .301), TTR$_{MN}$(F (1, 34) = .279, p = .601), and the total unique number of details disclosed during the FR (F (1, 34) = .019, p = .891) and MN (F (1, 34) = .861, p = .360) questions. For females, lie-tellers provided significantly more De$_{tFR}$ (F(1, 29) = 5.868, p = .022), Res$_{FR}$ (F(1, 29) = 4.807, p = .037), and unique words on the FR question (F(1, 29) = 4.695, p = .039); lie-tellers also had a higher TTR$_{FR}$, with the difference approaching significance (F(1, 29) = 3.789 p = .062). No significant differences were found between truth-tellers and lie-tellers on the Det$_{MN}$ (F (1, 29) = .1.947, p = .174), Res$_{MN}$ (F(1, 29) = .623, p = .436), TTR$_{MN}$ (F(1, 29) = 1,297, p = .264), and the number of unique words on the MN questions (F(1, 29) = .666, p = .421). Refer to Table 8 for the mean totals across the nine ACID variables for male and female participants and the truth and lie-tellers.

A Pearson chi-square was used to evaluate the rate of admission of error between truth and lie-tellers according to gender. Females (48%) were more likely to admit to making a mistake compared to males (36%), though this difference was not significant, χ^2 (2, n = 67) = 3.981, p = .137). Among the female participants, no significant differences were found between the truth-tellers (52%) and lie-tellers (40%), χ^2 (1, n = 31) = .579, p = .749). In contrast, male truth-tellers (45%) were more likely to admit to making an error compared to the male lie-tellers (25%), but this difference was not significant, χ^2 (1, n = 36) = 1.541, p = .241).

Discussion

Children's Lie-telling Behaviours

The present study evaluated children's (ages 6 to 11) lie-telling behaviours in situations where they are asked to falsely deny a crime to protect an offender or falsely accuse another of a crime that did not happen. The first set of hypotheses focused on the differences in the rate of children's lie-telling behaviour according to condition, age and gender. It was first hypothesized that there would be no differences in the rate of lie-telling behaviours between the FD and FA conditions; as hypothesized, no significant differences were found between conditions.

The second hypothesis was that the rate of children's lie-telling behaviour would increase with age. Although there were no differences in the mean age of truth-tellers ($M = 101.7$) and lie-tellers ($M = 104.96$), the rate of lie-telling behaviour did increase significantly with age. Particularly in the FA condition, both the 8-9 (73%) and 10-11 year olds (80%) lied far more than the 6-7 year olds (29%). In this condition, children were asked to tell a more sophisticated lie compared to the FD condition. In the FD condition, children simply had to deny that the theft occurred. False accusations may require higher cognitive processing as the lie-teller has to convince the recipient that an event occurred even though it did not. Previous research suggests that children's abilities to give plausible details to maintain a lie is related to age, word knowledge and their increasing cognitive sophistication (Nagels et a., 2012; Ruff, Light, Parker & Levin, 1997; Talwar et al., 2007; Talwar & Lee, 2008). Moreover, many of the 6-7 year olds had problems understanding the FA condition, with some requiring E1 to repeat the condition a few times. Children under the age of 8 in the current study were less willing or capable of falsely accusing another in a high cost situation; thus, future research on false accusations with young children is required to better understand this type of lie.

The third hypothesis was that males would lie more often than females in both lie-telling

conditions. In the FD condition, males (67%) were far more willing to lie compared to females

(36%), with the difference approaching significance. In the FD condition, the children were

under the impression that E1 had stolen the money. Boys evaluate immoral acts, such as stealing,

as more acceptable compared to girls (Keltikangas-Jarvinen & Lindeman, 1997); thus, they may

have evaluated the behaviour of E1 less severely than girls, and therefore been more willing to

lie for them. In the FA condition, the hypothesis was not supported as there were no significant

differences in the rate of lie-telling behaviour between males and females. In this condition,

children were under the impression that they were keeping "a secret" for fun as E1 had

committed no transgressions prior to asking the children to lie. In the debriefing, many children

claimed that they did not feel E1 would get in trouble if they falsely accused them of the theft,

since E1 had asked them to tell the lie. Children may have felt there were less consequences

associated with telling a lie in this condition; thus, they were telling a lie to please E1, rather than

to cover-up a transgression. This supports the findings of Talwar, Murphy and Lee (2007) who

found no significant differences in the rate of lie-telling behaviour between genders when

children were asked to tell a pro-social lie.

Assessment Criteria Indicative of Deception (ACID)

The second set of hypotheses revolved around the effectiveness of ACID at detecting lies

according to honesty of report, age, condition and gender of participants. It was hypothesized

that truth-tellers would score higher than lie-tellers on the Coh, Det_{FR}, Res_{FR}, Det_{MN} and Res_{MN}

variables, and be more willing to make an admission of error; however, truth-tellers would

provide less unique words on the FR and MN questions, and have lower TTR_{FR} and TTR_{MN}

scores. The first hypothesis was based on the findings from the previous research on ACID with

adults (Ansarra, 2011; Colwell et al., 2002, 2007; Suckle-Nelson et al., 2010). In the present

study, no significant differences were found between truth-tellers and lie-tellers on any of the

ACID variables. Nevertheless, truth-tellers (49%) were more likely to admit to making a possible

error during their disclosure compared to lie-tellers (31%), but this difference was not

significant. In addition, truth-tellers were also more likely to provide sensitive information about

the wallet, but lie-tellers provided more internal details. Since the present study included children

between the ages of 6-11, the age and developmental levels of the children could have influenced

the results. Previous research on ACID only included non-clinical adult samples (Ansarra, 2011;

Colwell et al., 2002, 2007; Suckle-Nelson et al., 2010). It was unlikely that there were

differences in the participants' verbal ability, TOM, working memory and inhibitory control,

which are related to quality of lie-telling and the length of disclosure; however, many of these

cognitive abilities develop primarily during childhood and adolescence (Evans & Lee, 2011;

Polak & Harris, 1999; Talwar & Lee, 2008; Weis et al., 2011). In the present sample, children's

scores on all the ACID variables, except for TTR_{FR} and TTR_{MN}, increased significantly with age.

For this reason, the effectiveness of ACID at detecting truths and lies was evaluated within each

age group. In the 6-7 and 8-9 year old age groups, no significant differences were found between

truth and lie-tellers on any of the ACID variables. Among the 10-11 year olds, lie-tellers were

surprisingly more coherent in their testimonies. Lie-tellers also and provided more details

(Det_{FR}), unique words and total words (Res_{FR}) on the free-recall questions, with the differences

approaching significance. No differences were found on any of the ACID variables for the MN

questions.

A possible reason for the lack of discrepancy between truth and lie-tellers on the ACID

variables is that both groups felt uncomfortable talking about the situation with the wallet during

the free-recall questions. Only 28 out of the 67 participants (42%) discussed the wallet situation

at all during any of the free recall questions. Among those who did bring up the topic, most

provided very little sensitive details ($M = 4.07$). Although truth-tellers were more willing to

provide sensitive details (49%; $M = 4.89$) compared to the lie-tellers (31%; $M = 2.77$), they still

did not provide many details about the potential theft; rather, most children preferred to simply

discuss the games they had played with E1. In addition, most truth-tellers (93%) told the truth

during the closed-ended questions, especially on questions that directly inquired about the wallet

and/or missing money. Previous research suggests that children provide more sensitive

information in their free-recall disclosures after multiple interviews (Hershkowitz & Terner,

2007; Malloy, Lyon & Quas, 2007; Sorenson & Snow, 1991). For example, Sorenson and Snow

(1991) evaluated the number of disclosures in 116 high certainty allegations of sexual abuse

involving children between the ages of 3 and 17. Only 11% of children provided active

disclosures during the first interview. However, after six interviews, 96% of children disclosed

the abuse (Sorenson & Snow, 1991). Since the present study contained a higher-cost scenario

(i.e. potential theft) compared to previous lie-telling studies with children (Bottoms et al., 2002;

Ceci & Leichtman, 1992; Pipe &Wilson, 1994; Talwar, Lee, Bala, & Lindsay, 2004; Wilson &

Pipe, 1989), it may be that a second interview sometime after the event could increase the

amount information children would have been willing to disclose on the free-recall questions.

  The type of lie (condition) children were asked to tell could have influenced the efficacy

of ACID at detecting truth and lies. Research on ACID has only included a condition where

participants were asked to falsely deny an event (Ansarra, 2011; Colwell et al., 2007; Suckle-

Nelson et al., 2010). In the FD condition, the findings supported previous research as truth-tellers

provided significantly more words in their disclosures on the mnemonics questions ($Res_{MN} =$

200.83) than the lie-tellers (Res_{MN} = 140.82). Truth-tellers also provided more details on the RT question, had a slightly lower TTR_{MN}, and were more likely to make an omission of error. Furthermore, truth-tellers ($M = 5.56$) in the FD condition provided more sensitive details about the theft as the interview progressed compared to the lie-tellers ($M = 0.12$). These findings support past research on ACID as lie-tellers were less comfortable adding information about the theft, potentially out of fear of making contradictions.

In contrast, lie-tellers in the FA condition had higher scores on the Res_{FR} and Res_{MN} variables. Also, lie-tellers provided more details on the FR, CR and RT questions compared to the truth-tellers. Finally, lie-tellers had lower TTR_{FR} and TTR_{MN} scores, and made an admission of error at a similar rate to the truth-tellers. Children in the FA condition were asked to tell a more complex lie compared to those in the FD condition. This was exemplified by the fact that 86% of lie-tellers in this condition were above the age of 8 compared to 70% in the FD condition. Lie-tellers in the FA condition also had longer responses with more unique words on the FR and MN portions of the interview than the lie-tellers in the FD condition. Moreover, no differences were found between the truth-tellers and lie-tellers regarding the number of sensitive details about the wallet situation they were willing to provide. Thus, lie-tellers in the FA condition were actively attempting to deceive the interviewer as they were purposefully providing false information about the theft. On the other hand, lie-tellers in the FD condition were more likely to lie by omission, which supports the findings from previous research on ACID (Ansarra, 2011; Colwell et al., 2002, 2007; Suckle-Nelson et al., 2010). For these reasons, more research is needed to evaluate the effectiveness of ACID in situations where children are asked to falsely accuse another.

The effect of gender on the effectiveness of ACID was also evaluated. In correspondence to the findings from Suckle-Nelson and colleagues (2010), females provided more coherent testimonies that contained a higher number of words and unique words on the FR portion of the interview; yet, no differences were found in the total number of details children provided. Within each gender, the results did not support the findings from Suckle-Nelson and colleagues (2010). Male truth-tellers and lie-tellers did not differ significantly on any of the ACID variables used for detecting truths and lies. While, female lie-tellers had significantly higher scores on the Det_{FR}, Res_{FR}, and unique words on the FR question; no differences were found for any of the ACID variables on the MN portion of the interview.

Implications

Much research on lie-telling behaviour has focused on the age at which truth and lies emerge (Evans & Lee, 2013; Talwar & Crossman, 2011; Talwar & Lee, 2002ab; Talwar & Lee, 2008), but less is known about the lie-telling behaviours of school-aged children (Bussey, 1999; Lee, Xu, Cameron & Chen, 2001; Talwar, Murphy & Lee, 2007), especially in cases where children are asked to falsely accuse another of a crime (Tye et al., 1999). The present study therefore adds to the existing literature on lie-telling behaviour in school-aged children.

There is also limited existing literature regarding children's lie-telling behaviours after they witness a high-cost event (Tye et al., 1999). In previous research, participants recalled events after experiencing a non-threatening situation (Goodman, Aman & Hirshman, 1987; Huffman, Warren & Larson, 1999; Talwar, Gordon & Lee, 2007; Talwar, Murphy & Lee, 2007; Williams et al., 2013). Being asked to recall information about a non-threatening event may not promote deceitful behaviours in the same manner as when children actually witness a serious transgression or crime. Also, in situations when children actually experience or witness a crime,

such as in cases of child maltreatment, the crime is often performed by someone they know (U.S. Department of Health & Human Services, 2012); yet, they are asked to disclose sensitive information about the event to professional (e.g., police officer or forensic interview) who they may not know well. The present study attempted to provide children with an experience that resembled a real-life situation where children have to provide a testimony. In addition to the children being asked to lie about a high-cost event (i.e., theft), the amount of interaction between the children and E1 and E2 was also controlled so that they would spend a significant amount of time with the instigator prior to the transgression, while having limited interaction with the interviewer.

To date, little research has evaluated the efficacy of ACID in detecting truth and lies in children. The present study therefore provides some information regarding the benefits and limitations of ACID with children. A developmental approach was taken to studying the effects of ACID; participants ranged not only in age, but also in their level of cognitive development. ACID has yet to be evaluated in contexts where children are asked to falsely accuse another. For this reason, more is now known about limitations of ACID at detecting truths and lies in cases where children are asked to falsely accuse another of crime, compared to situations where they are asked to falsely deny a crime.

Presently, it is inconclusive whether ACID can be used to successfully detect lies in children's testimonies. No differences were found between truth-tellers or lie-tellers on most of the ACID variables, even when the age and gender of the participants were considered. In the FD condition, the findings supported previous research with adults as truth-tellers provided more words, and unique and sensitive details during the mnemonics questions (Ansarra et al., 2011; Colwell et al., 2007; Suckle-Nelson et al., 2010). Yet, findings from the FA condition contradicts

past results on ACID, as lie-tellers had provide more words and unique details during the free-recall and mnemonics questions. Nevertheless, most of the findings were non-significant, with limitations with the sample size having a potential influence on the results. Thus, future research is warranted before drawing conclusions about the effectiveness of ACID at detecting children's truth and lies.

The present study provided more information about children's testimonies after they are asked to tell two different types of lies. Although presently it is inconclusive whether ACID can be an effective method of lie-detection with children, much was learned about the value of mnemonic questions on increasing the amount of information children disclosed about an event. The present findings also correspond to previous research with adults using the RI (Ansarra et al., 2011' Colwell et al., 2002; Colwell et al., 2007; Colwell et al., 2008; Suckle-Nelson., 2010). During the mnemonics questions, children provided more internal, contextual, external and sensitive details that were not said previously in the interview. For instance, truth-tellers in the FD condition supplied significantly more sensitive details about the wallet situation as the interview progressed compared to the lie-tellers. Therefore, these mnemonics questions can be used to help improve children's memories of an event, as well as increase the vividness of their testimonies.

The results from the present study could benefit professionals in the criminal justice system who interview children, such as law enforcement and forensic interviewers. Even though there were very few differences between the truth-tellers and lie-tellers on many of the variables associated with ACID, the present study provided an increased understanding regarding the qualitative nature of children's disclosures. An increased understanding was obtained regarding the amount and types of details (external, internal, contextual and sensitive) children commonly

provide in their testimonies. In addition, more was learned about the types of follow-up questions that may encourage children to provide new information about an event. For example, children provided more unique details on the CR and RO mnemonics questions compared to the MP and RT questions; thus, these questions may be more effective at enhancing children's memories about an event. Finally, the present study adds to the limited existing research on the coherence of children's free-recall testimonies in situations where they witness a transgression. Previous research has primarily focused on the amount and accuracy of information children provide in their testimonies (Chapman & Perry, 1995; Eisen et al., 2007; Jack, Leov & Zajac, 2014; Tustin & Hayem, 2010). Nonetheless, the present study also evaluated the number of contradictions and whether the testimony could be understood by independent raters. Information about the effects of age and gender was also added to the limited existing research regarding children's abilities to provided coherent testimonies.

Limitations and Directions for Future Research

A larger sample of children is required before developing any conclusions regarding the efficacy of ACID as a lie-detection tool with children. In the present study, the samples size for each age group were very different. For example, the samples for the 6-7 year olds ($n = 17$) and 10-11 year olds ($n = 14$) were noticeably smaller than the 8-9 year olds ($n = 36$). Also, a non-clinical sample was used, which consisted of children from predominately middle-class and Caucasian families. Future research should include participants from different cultural and SES backgrounds to increase the generalizability of the findings. ACID should also be studied with various clinical populations to better understand its overall value as a lie-detection tool. For instance, children who witness or experience crimes may also experience post-traumatic stress (Famularo, 1996; Gabbay, Oatis, Silva & Hirsch, 2004). Individuals who experience symptoms

of PTSD may avoid discussing their traumatic experience (Ullman, 2007; Ullman & Filipas,

2005); thus, they may provide less vivid testimonies about their experiences. Also, children and

adolescents diagnosed with a disruptive behaviour disorder are more likely to have problems

with recurrent lying (Gervais et al., 2000; Loeber & Schmiling, 1985). For these reasons, the

findings regarding the effectiveness of ACID may be different for clinical populations. Finally,

children as young as two and half years of age have shown the ability to tell lies (Evans & Lee,

2013); therefore, future research with a younger population could provide additional information

regarding the overall value of ACID.

        In the present study, participants had 30-45 minutes of social interaction with the

instigator before the transgression, and little prior social interaction with the interviewer. There

has been very little research that has investigated the influence of children's perceived likeability

of the instigator and interviewer on lie-telling behaviour (Lamb & Garretson, 2003; Tye et al.,

1999). Children are more inclined to lie to an unfamiliar adult compared to someone they know

(Williams, Kirmayer, Simon & Talwar, 2013), and be more willing to lie to conceal the

transgression of someone they know (Tye et al., 1999). Future research should evaluate whether

the likability of the instigator and/or interviewer influences the veracity of children's testimonies.

Moreover, whether the likeability of the instigator and/or interviewer affects the number and type

of details children are willing to disclose in the RI, and the effectiveness of ACID at detecting

truths and lies.

        Many false accusations involve children being asked by the offender or someone

affiliated with the offender (e.g., spouse) to accuse an innocent individual of committing the

transgression (Black, Schweitzer & Varghese, 2012). In the present study, E1 asked the children

to falsely accuse E1 of the theft; therefore, the children may not have felt the same discomfort

associated with falsely accusing an innocent third-party. Future research should be directed at evaluating children's lie-telling behaviours when they are asked to falsely accuse an innocent third-party, as well as whether ACID can be effective at detecting this specific type of lie in children.

In cases involving child-maltreatment, it is unlikely that the victim will be asked to provide a testimony immediately after the abuse or neglect (Elliott & Briere, 1994; Goodman et al., 1992; Henry, 1997; London et al., 2007; Smith et al., 2000). For example, Goodman and colleagues (1992) found that many children took 6 to 12 months to disclose the sexual abuse they experienced. Moreover, Smith and colleagues (2000) found that 47% of child-rape victims (out of a sample 3,220) did not disclose for over 5 years. Thus, children's memory of the event(s) may be diminished by factors such as interference, suggestibility and parental attachment (Goodman et al., 1994; Goodman et al., 1997; Pillemer, Picariello & Pruett, 1994; Quas et al., 1999). Quas and colleagues (1999) found that children's (ages 3-13) ability to accurately describe a medical procedure they had experienced was significantly related to the delay of time since the procedure. For instance, children who had received the medical procedure several years before being interview provided significantly fewer correct details about the procedure compared to those who experienced it recently (Quas et al., 1999). Moreover, in cases where a child has had multiple experiences with abuse or neglect, they might combine or misconstrue certain details about each individual experience. In the present study, children were asked to provide a testimony five minutes after the wallet situation; therefore, it was unlikely that factors such as time and interference could diminish their memory of the event. To increase the generalizability of the findings, future research on ACID and RI should have children provide testimonies after a considerable amount of time has elapsed since the event.

Future research on ACID should also include a script that contains free-recall questions that directly inquires about the wallet situation. In the current study, more than half of the children (58%) were not willing to discuss the wallet situation at all in their free-recall responses, rather they preferred to only discuss the games that they played with E1. Previous research suggests that children may lie by omission as a tactic for deceiving others (Lyon, Malloy, Quas, & Talwar, 2008); nevertheless, in the present study many truth-tellers were also unwilling to discuss the wallet situation. A possible explanation for this is that children may have thought that they only needed to discuss the activities they did with E1, instead of also including information about the wallet. Past research on ACID included more direct free recall questions about the transgression, which may have encouraged truth-tellers to discuss the transgression (Colwell et al., 2002, 2007; Suckle-Nelson et al., 2010). Therefore, future research on ACID should include free-recall questions that encourages children to discuss the transgression.

Future research should also verify that the children understand what actually happened with the instigator and the transgression. Especially with younger children, coaching a child to tell a false story about an event they witnessed can change their memory of the event (see Bruck & Ceci, 1999 for a review). In the present study, children were asked to "keep a secret" about the potential theft. Some children may have thought that everything that happened with the wallet was a "game" or "pretend"; thus, children may not have been intentionally telling a lie to protect or pleas E1. Future research should have the children describe the actual events they witnessed after the debrief to ensure that they were intentionally trying to deceive the interviewer. Finally, a follow-up questionnaire that assesses children's reasons for telling a truth or lie could ensure that they were intentionally trying to deceive the interviewer, and provide more information regarding their motivations for telling the truth or a lie.

Conclusions

The present study evaluated children's (ages 6-11) abilities to falsely deny a transgression committed by an instigator who they had become familiar with, or falsely accuse the instigator of the transgression. In addition, whether ACID can be used to successfully detect both types of lies in the children's testimonies about the event. The findings suggest that children as young as 6 years of age are able to falsely deny a transgression to protect someone, and falsely accuse someone of a theft that did not take place; nevertheless, children above the age of 8 may be more willing or capable of falsely accusing another. The results also suggest that gender may be a factor that influences children's willingness to tell a lie, as males were more willing to falsely deny the theft compared to females.

It is inconclusive whether ACID can be an effective tool for detecting lies in children, especially in cases when they are asked to falsely accuse another of a transgression. No significant differences were found between truth-tellers and lie-tellers on the majority of the variables used by ACID to detect truths and lies, even when the age and gender of the participants were considered. In addition, the type of lie the children were asked to tell influenced the results for truth-tellers and lie-tellers on many of the variables used by ACID. Due to limitations with the sample and design of the study, it is unclear whether ACID would be effective with school aged children, clinical populations and in situations where children are asked to falsely accuse an innocent third-party of a transgression. Future research on the effectiveness of ACID should also evaluate the vividness and spontaneity of children testimonies after a considerable amount time has elapsed since the original event.

Even though it remains unclear whether ACID can be effective with children, the findings from the present study provide information on the veracity and coherence of children's

testimonies after they were asked to tell two types of lies; as well as the types of details about the

transgression truth-tellers and lie-tellers were willing to disclose. Therefore, the findings add to

the limited existing research on children's testimonies, which can have positive implications for

legal professionals, law-enforcement, and forensic psychologists and interviewers.

References

Aamodt, M. G., & Mitchell, H. (2006). Who can best catch a liar? A meta-analysis of individual

    differences in detecting deception. *Forensic Examiner*, *15*(1), 6–11. Retrieved from

    https://www.ncjrs.gov/App/Publications/abstract.aspx?ID=236906

Akehurst, L., Bull, R., Vrij, A., & Köhnken, G. (2004). The effects of training professional

    groups and lay persons to use criteria-based content analysis to detect deception. *Applied*

    Cognitive Psychology, *18*(7), 877–891. doi:10.1002/acp.1057

Ansarra, R., Colwell, K., Hiscock-Anisman, C., Hines, A., Fleck, R., Cole, L. D., & Belarde, D.

    (2011). Augmenting acid with affective details to assess credibility. *The European*

    Journal of Psychology Applied to Legal Context, *3*(2), 141-158.

Black, F., Schweitzer, R., & Varghese, F. (2012). Allegations of child sexual abuse in family

    court cases: A qualitative analysis of psychiatric evidence. *Psychiatry, Psychology and*

    Law, 19(4), 482-496. doi:10.1080/13218719.2011.613905

Bond, C. F., Jr., & DePaulo, B. M. (2006). Accuracy of deception judgments. *Personality and*

    Social Psychology Review, *10*(3), 214–234. doi:10.1207/s15327957pspr1003_2

Bottoms, B. L., Goodman, G. S., Schwartz-Kenney, B. M., & Thomas, S. N. (2002).

    Understanding children's use of secrecy in the context of eyewitness reports. *Law &*

    Human Behavior, *26*(3), 285–313. doi:10.1023/A:1015324304975

Brennan M. (1994). The battle for credibility: Themes in the cross-examination of child victim

    witnesses. *International Journal for the Semiotics of Law, 7*(1), 51–73.

    doi:10.1007/BF01099010

Bruck, M., & Ceci, S. (1999). The suggestibility of children's memory. *Annual review of*

    psychology, *50*(1), 419-439. doi:10.1146/annurev.psych.50.1.419

Bussey, K. (1992). Lying and truthfulness: Children's definitions, standards, and evaluative

    reactions. *Child Development, 63*(1), 129-137. doi:10.2307/113090710.2307/1130907

Bussey, K., Lee, K., & Grimbeek, EJ. (1993). Lies and secrets: Implications for children's

    reporting of sexual abuse. In G.S. Goodman & B.L. Bottoms, BL (Eds), *Child Victims,*

    Child witnesses: Understanding and Improving Testimony (pp. 147-168). New York,

    NY: Guilford.

Ceci, S.J., & Leichtman, M. (1992). "I know that you know that I know that you broke the toy":

    A brief report of recursive awareness among 3-year-olds. In: S.J. Ceci, M. Leichtman, M,

    & M. Putnick (Eds.), *Cognitive and social factors in early deception* (pp. 1-9). Hillsdale,

    NJ: Lawrence Erlbaum.

Center on Child Abuse and Neglect. (2000). *The differences between forensic interviews &*

    clinical interviews. Norman, OK: Author.

Chapman, A. J., & Perry, D. J. (1995). Applying the cognitive interview procedure to child and

    adult eyewitnesses of road accidents. .*Applied Psychology: An International*

    Review, *44*(4), 283–294. doi:0.1111/j.1464-0597.1995.tb01081.x

Colwell, L. H., Colwell, K., Hiscock-Anisman, C. K., Hartwig, M., Cole, L., Werdin, K., &

    Youschak, K. (2012). Teaching professionals to detect deception: The efficacy of a brief

    training workshop. *Journal of Forensic Psychology Practice*, *12*(1), 68-80.

    doi:10.1080/15228932.2012.629592

Colwell, K., Hiscock, C. K, & Memon, A. (2002). Interviewing techniques and the assessment of

    statement credibility. *Applied Cognitive Psychology, 16*(3)*,* 287-300.

    doi:10.1002/acp.788

Colwell, K., Hiscock-Anisman, C., Memon, A., Colwell, L. H., Taylor, L., & Woods, D. (2009).

    Training in assessment criteria indicative of deception to improve credibility

    judgments. *Journal of Forensic Psychology Practice*, *9*(3), 199-207. doi:

    10.1080/15228930902810078

Colwell, K., Hiscock-Anisman, C., Memon, A., Rachel, A., & Colwell, L. (2007). Vividness and

    spontaneity of statement detail characteristics as predictors of witness credibility.

    American Journal of Forensic Psychology, 25(1), 5-30. doi:10.07331290

Colwell, K., Hiscock-Anisman, C. K., Memon, A., Taylor, L., & Prewett, J. (2008). Assessment

    Criteria Indicative of Deception (ACID): An integrated system of investigative

    interviewing and detecting deception. *Journal of Investigative Psychology and Offender

    Profiling*, *4*(3), 167-180. doi:10.1002/jip.73

Colwell, K., Hiscock-Anisman, C., Memon, A., Yaeger, H., & Michlik, P. M. (2006). Strategies

    of impression management among deceivers and truth-tellers: How liars attempt to

    convince. *American Journal of Forensic Psychology, 24*(2)*, 31-38. Retrieved from

    http://www.scimagojr.com/journalsearch.php?q=29469&tip=sid&clean=0

Colwell, K., & Sjerven, E. R. (2005). The 'Coin-in-Hand' stratagem for forensic assessment of

    malingering. *American Journal of Forensic Psychology, 23*(1)*, 83-89. Retrieved from

    http://www.scimagojr.com/journalsearch.php?q=29469&tip=sid&clean=0

Cronch, L., Viljoen, J., & Hansen, D. (2006). Forensic interviewing in child sexual abuse cases:

    Current techniques and future directions. *Aggression and Violent Behavior, 11*(3), 195-

    207. doi:10.1016/j.avb.2005.07.009

Cross, T., Jones, L., Walsh, W., Simone, M., & Kolko, D. (2007). Child forensic interviewing in

children's advocacy centers: Empirical data on a practice model. *Child Abuse & Neglect,*

31(10), 1031-1052. doi: 10.1016/j.chiabu.2007.04.007

Davies, G., & Wescott, H. (1999). Interviewing child witnesses under the memorandum of good

practice: A research review. *Police Research Series, 115,* 1-57. doi:10.1037/0033-

2909.129.1.74

DePaulo, B. M., Lindsay, J. J., Malone, B. E., Muhlenbruck, L., Charlton, K., & Cooper, H.

(2003). Cues to deception. *Psychological Bulletin*, *129*(1), 74–118. doi: 10.1037/0033-

2909.129.1.74

Duff, S. J., & Hampson, E. (2001). A sex difference on a novel spatial working memory task in

humans. *Brain and Cognition, 47*(3), 470-493. doi:10.1006/brcg.2001.1326

Edelstein, R. S., Luten, T. L., Ekman, P., & Goodman, G. S. (2006). Detecting lies in children

and adults. *Law and Human Behavior, 30*(1), 1–10. doi:10.1007/s10979-006-9031-2.

Eisen, M. L., Goodman, G. S., Qin, J., Davis, S., & Crayton, J. (2007). Maltreated children's

memory: Accuracy, suggestibility, and psychopathology. *Developmental*

Psychology, *43*(6), 1275–1294. doi:10.1037/0012-1649.43.6.1275

Elliott, D. M., & Briere, J. (1994). Forensic sexual abuse evaluations of older children:

Disclosures and symptomatology. *Behavioral Sciences & the Law*, *12*(3), 261-277.

doi:10.1002/bsl.2370120306

Engle, J., & O'Donohue, W. (2012). Pathways to false allegations of sexual assault. *Journal of*

Forensic Psychology Practice, 12(2), 97-123. doi:10.1080/15228932.2012.650071

Evans, A. D., & Lee, K. (2010). Promising to tell the truth makes 8-to 16-year-olds more

honest. *Behavioral Sciences & the Law*, *28*(6), 801-811. doi:10.1002/bsl.960.

Evans, A. D., & Lee, K. (2013). Emergence of lying in very young children. *Developmental Psychology, 49*(10), 1958. Retrieved from http://psycnet.apa.org/index.cfm?fa=buy.optionToBuy&id=2013-00030-001.

Evans, A. D., Xu, F., & Lee, K. (2011). When all signs point to you: Lies told in the face of evidence. *Developmental Psychology*, 47(1), 39-49. doi:10.1037/a0020787

Everson, M. D., & Boat, B. W. (1989). False allegations of sexual abuse by children and adolescents. *Journal of the American Academy of Child & Adolescent Psychiatry*, *28*(2), 230-235. doi:10.1097/00004583-198903000-00014

Famularo, R. (1996). Psychiatric comorbidity in childhood post-traumatic stress disorder. *Child Abuse & Neglect, 20*(10), 953-961. doi:10.1016/0145-2134(96)00084-1

Feldman, R. S., Jerkins, L, & Popoola, O. (1979). Detection of deception in adults and children via facial expressions. *Child Development*, 50, 350–355. doi:10.2307/1129409

Feldman, R. S., & White, J. B. (1980). Detecting deception in children. *Journal of Communication*, *30*(2), 121–128. doi:10.1111/j.1460-2466.1980.tb01974.x

Gabbay, V., Oatis, M., Silva, R., & Hirsch, G. (2004). *Post- traumatic stress disorders in children and adolescents.* New York: NY, Nortan & Company Inc.

Gardner, R. A. (1992). *True and false accusations of child sex abuse*. Cresskill, NJ: Creative Therapeutics.

Garven, S., Wood, J. M., Malpass, R. S., & Shaw III, J. S. (1998). More than suggestion: The effect of interviewing techniques from the McMartin Preschool case. *Journal of Applied Psychology*, *83*(3), 347. doi:10.1037/0021-9010.83.3.347

Gilbert, D. T., Tafarodi, R. W., & Malone, P. S. (1993). You can't not believe everything you

read. *Journal of Personality and Social Psychology*, *65*(2), 221–233. doi:10.1037/0022-

3514.65.2.221

Goodman, G., Aman, C., & Hirschman, J. (1987). Child sexual and physical abuse: Children's

testimony. *Children's Eyewitness Memory,* 1-23. Retrieved from

http://download.springer.com/static/pdf/863/chp%253A10.1007%252F978-1-4684-6338

Goodman, G. S., Quas, J. A., Batterman-Faunce, J. M., Riddlesberger, M. M., & Kuhn, J. (1994).

Predictors of accurate and inaccurate memories of traumatic events experienced in

childhood. *Consciousness and Cognition*, *3*(3), 269-294. doi:10.1006/ccog.1994.1016

Goodman, G. S., Quas, J. A., Batterman-Faunce, J. M., Riddlesberger, M. M., & Kuhn, J. (1997).

Children's reactions to and memory for a stressful event: Influences of age, anatomical

dolls, knowledge, and parental attachment. *Applied Developmental Science*, *1*(2), 54-75.

doi:10.1207/s1532480xads0102_1

Goodman, G. S., Taub, E. P., Jones, D. P., England, P., Port, L. K., Rudy, L., ... & Melton, G. B.

(1992). Testifying in criminal court: Emotional effects on child sexual assault

victims. *Monographs of the Society for Research in Child Development*, i-159. doi:

10.2307/1166127

Granhag, P. A., Andersson, L. O., Stromwall, L. A., & Hartwig, M. (2004). Imprisoned

knowledge: Criminals' beliefs about deception. *Legal and Criminological Psychology,*

9(1)*,* 103-119. doi:10.1348/135532504322776889

Gries, L. T., Goh, D. S., Andrews, M. B., Gilbert, J., Praver, F., & Stelzer, D. N. (2000). Positive

reaction to disclosure and recovery from child sexual abuse. *Journal of Child Sexual

Abuse*, *9*(1), 29-51. doi:0.1300/J070v09n01_03

Henry, J. (1997). System intervention trauma to child sexual abuse victims following

    disclosure. *Journal of Interpersonal Violence*, *12*(4), 499-512.

    doi:10.1177/088626097012004002

Herlitz, A., Nilsson, L. G., & Backman, L. (1997). Gender differences in episodic memory.

    Memory & Cognition. 25(6), 801-811. doi:10.1111/j.1467-8721.2008.00547.x

Heussen, Y., Binkofski, F., & Jolij, J. (2010). The semantics of the lying face- An EEG

    study. *International Journal of Psychophysiology*, *77*(3), 206.

    doi:10.1016/j.ijpsycho.2010.06.006

Hines, A., Colwell, K., Anisman, C.H., Garrett, E., Ansarra, R., & Montalvo, L. (2010).

    Impression management strategies of deceivers and honest reporters in an investigative

    interview. *The European Journal of Psychology Applied to Legal Context*, *2*(1), 73-90.

    Retrieved from http://www.journals.elsevier.com/the-european-journal-of-psychology-

    applied-to-legal-context/

Hiscock, M., & Hiscock, C. K. (1989) Refining the forced-choice method for the detection of

    malingering. *Journal of Clinical and Experimental Neuropsychology, 11*(6), 967-974.

    doi:10.1080/0168863890840094

Hogrefe, G. J., Wimmer, H., & Perner, J. (1986). Ignorance versus false belief. A developmental

    lag in attribution of epistemic states. *Child Development, 53*, 567-582.

    doi:10.2307/1130337

Huffman, M., Warren, A., & Larson, S. (1999). Discussing truth and lies in interviews with

    children: Whether, why, and how? *Applied Developmental Science, 3*(1), 6-15. doi:

    10.1207/s1532480xads0301_2

Jack, F., Leov, J., & Zajac, R. (2014). Age-related differences in the free-recall accounts of child,

adolescent, and adult witnesses. *Applied Cognitive Psychology*, *28*(1), 30-38. doi:

10.1002/acp.2951

Johnson, M. K. (1988). Reality monitoring: An experimental phenomenological approach.

Journal of Experimental Psychology: General, 117(4), 390-394. doi:10.1037/0096-

3445.117.4.390

Johnson, M. K. (1988). Reality monitoring: An experimental phenomenological approach.

Journal of Experimental Psychology: General, 117(4), 390-394. doi:10.1037/0096-

3445.117.4.390

Johnson, M. K., & Raye, C. L. (1981). Reality monitoring. *Psychological Review*, *88*(1), 67-85.

doi:10.1037/0096-3445.117.4.390

Jones, D. P., & McGraw, J. M. (1987). Reliable and fictitious accounts of sexual abuse to

children. *Journal of Interpersonal Violence*, *2*(1), 27-45.

doi:10.1177/088626087002001002

Kaasa, S., Cauffman, E., Stewart, A.C., & Loftus, E. (2013). False accusations in an

investigative context: Differences between suggestible and non-suggestible witnesses.

Behavioral Sciences and the Law, 31(5), 574-592. doi:10.1002/bsl.2075.

Kassin, S. M., Leo, R. A., Meissner, C. A., Richman, K. D., Colwell, L. H., Leach, A.-M., &

LaFon, D. (2007). Police interviewing and interrogation: A self-report survey of police

practices and beliefs. *Law and Human Behavior*, *31*(4), 381–400. doi:10.1007/s10979-

006-9073-5.

Kelley, S. J. (1996). Ritualistic abuse of children. In J. Briere, L. Berliner, J. A. Bulkley, Carole

Jenny, & T. Reid (Eds.), *The APSAC Handbook on Child Maltreatment* (pp. 90-99).

Thousand Oaks, CA: Sage.

Kopetski, L. M., Rand, D. C., & Rand, R. (2006). Incidence, gender, and false allegations of

child abuse: Data on 84 parental alienation syndrome cases. In R. A. Gardner, S. R.

Sauber, & D. Lorandos (Eds.), The International Handbook of Parental Alienation

Syndrome (pp. 65-70). Springfield, IL: Charles C. Thomas Publisher Limited.

Lamb, M. E., & Garretson, M. E. (2003). The effects of interviewer gender and child gender on

the informativeness of alleged child sexual abuse victims in forensic interviews. *Law and

Human Behavior, 27*(2), 157-171. doi:10.1023/A:1022595129689

Leach, A. M., 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*(1), 96.

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 and

Human Behavior*, *28*(6), 661−685. doi:10.1007/s10979-004-0793-0

Lee, K., Xu, F., Fu, G., Cameron, C.A., & Chen, S. (2001). Taiwan and Mainland Chinese and

Canadian children's categorization and evaluation of lie-and truth-telling: A modesty

effect. *British Journal of Developmental Psychology*, *19*(4), 525-542.

doi:10.1348/026151001166236

Levine, T. R., Park, H. S., & McCornack, S. A. (1999). Accuracy in detecting truths and lies:

Documenting the "veracity effect." *Communication Monographs*, *66*(2), 125-144. doi:

10.1080/03637759909376468

Lewis, M., Stanger, C., & Sullivan, M. W. (1989). Deception in 3- year-olds. *Developmental Psychology*, *25*(3), 439–443. doi:10.1080/03637759909376468

Loeber, R., & Schmaling, K.B. (1985). Empirical evidence for overt and covert patterns of antisocial conduct problems: A meta-analysis. *Journal of Abnormal Child Psychology, 13*(2), 337-352. doi:10.1007/BF00910652

Loftus, E. F. (1997). Creating false memories. *Scientific American*, *277*(3), 70-75. Retrieved from: https://webfiles.uci.edu

London, K., Bruck, M., Ceci, S. J., & Shuman, D. W. (2007). Disclosure of child sexual abuse: A review of the contemporary empirical literature. *Child sexual abuse: Disclosure, delay and denial*, 11-39. doi:10.1080/09658210701725732

Lyon, T. D. (2007). False denials: Overcoming methodological biases in abuse disclosure research. In M.W. Pipe, M.E. Lamb, Y. Orbach, & A.C. Cederborg (Eds.), *Disclosing Abuse: Delays, Denials, Retractions and Incomplete Accounts*, 41-62. Mahwah, NJ: Lawrence Erlbaum Associates Publishers.

Lyon, T. D., & Dorado, J. S. (2008). Truth induction in young maltreated children: The effects of oath-taking and reassurance on true and false disclosures. *Child Abuse & Neglect*, *32*(7), 738-748. doi:10.1016/j.chiabu.2007.08.008.

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*(4), 914-929. doi:10.1111/j.1467-8624.2008.01167.x

Lyon, T., & Saywitz, K. (1999). Young maltreated children's competence to take the oath. *Applied Developmental Science, 3*(1), 16-27. doi:10.2139/ssrn.161190

Malloy, L. C., Lyon, T. D., & Quas, J. A. (2007). Filial dependency and recantation of child

sexual abuse allegations. *Journal of the American Academy of Child & Adolescent

Psychiatry*, *46*(2), 162-170. doi:10.1097/01.chi.0000246067.77953.f7

Manly, T., Anderson, V., Nimmo-Smith, I., Turner, A., Watson, P., & Robertson, I.H. (2001).

The differential assessment of children's attention: The Test of Everyday Attention for

Children (TEA-Ch), normative sample and ADHD performance. *Journal of

Child Psychology and Psychiatry*, *42*(8), 1065-1081. doi:10.1111/1469-7610.00806

Mays, L., & Winfree, T. (2005). *Essentials of corrections: Fourth edition*. Belmont, CA:

Wadsworth Cengage Learning.

Memon, A., Holley, A., Milne, R., Kohnken, G., & Bull, R. (1994). Towards understanding the

effects of interviewer training in evaluating the cognitive interview. *Applied Cognitive

Psychology*, *8*(7), 641-659. doi:10.1002/acp.2350080704

Miller, G. R., & Stiff, J. B. (1993). *Deceptive communication*. Newbury Park, CA: Sage

Publications.

Morgan, C. A., Colwell, K., & Hazlett, G. (2011). Efficacy of forensic statement analysis in

distinguishing truthful from deceptive eyewitness accounts of highly stressful events.

Journal of Forensic Sciences, *56*(5), 1227-1234. doi:10.1111/j.1556-4029.2011.01896.x.

Nagels, A., Kircher, T., Dietsche, B., Backes, H., Marquetand, J., & Krug, A. (2012). Neural

processing of overt word generation in healthy individuals: The effect of age and word

knowledge. *Neuroimage*, *61*(4), 832-840. doi:10.1016/j.neuroimage.2012.04.019.

Nathan, D. & Snedeker, M. (1995). *Satan's silence*. New York: Basic Books.

Ney, T. (1995). *True and False Allegations of Child Sexual Abuse: Assessment and Case

Management.* New York, NY: Brunnel/Mazel.

Oates, R. K., Jones, D. P., Denson, D., Sirotnak, A., Gary, N., & Krugman, R. D. (2000).

Erroneous concerns about child sexual abuse. *Child Abuse & Neglect*, *24*(1), 149-157.

doi:10.1016/S0145-2134(99)00108-8

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 trails. *Law and Human Behavior*, *25*(4), 339–372.

doi:10.1023/A:1010603618330

Pillemer, D. B., Picariello, M. L., & Pruett, J. C. (1994). Very long-term memories of a salient

preschool event. *Applied Cognitive Psychology*, *8*(2), 95-106.

doi:10.1002/acp.2350080202

Pipe, M. E., Lamb, M. E., Orbach, Y., & Cederborg, A. C. (Eds.). (2013). *Child sexual abuse:*

Disclosure, delay, and denial. Psychology Press.

Pipe, M., & Wilson, J.C. (1994). Cues and secrets: Influences on children's event reports.

Developmental Psychology; *30*(4), 515–525. doi:10.1037/0012-1649.30.4.515

Polak, A., & Harris, P. L. (1999). Deception by young children following non-compliance.

Developmental Psychology, 35(2), 561–568. doi:10.1037/0012-1649.35.2.561

Popliger, M., Talwar, V., & Crossman, A. (2011). Predictors of children's prosocial lie-telling:

Motivation, socialization variables, and moral understanding. *Journal of Experimental*

Child Psychology, 110(3), 373-392. doi:10.1016/j.jecp.2011.05.003.

Porter, S., & Yuille, J.C. (1996). The language of deceit: An investigation of the verbal clues to

deception in the interrogation context. *Law and Human Behavior*, *20*(4), 443-459. doi:

10.1007/BF01498980

Postma, A., Jager, G., Kessels, R. F. C., Koppeschaar, H. P. F., & Van Honk, J. (2004). Sex differences for selective forms of spatial memory. *Brain and Cognition, 54*(1), 24-34. doi:10.1016/S0278-2626(03)00238-0

Quas, J. A., Davis, E., Goodman, G. S., & Myers, J. E. B. (2007). Repeated questions, deception, and children's true and false reports of body touch. *Child Maltreatment*, *12*(1), 60–67. doi:10.1177/1077559506296141

Quas, J. A., Goodman, G. S., Bidrose, S., Pipe, M. E., Craw, S., & Ablin, D. S. (1999). Emotion and memory: Children's long-term remembering, forgetting, and suggestibility. *Journal of Experimental Child Psychology*, *72*(4), 235-270. doi:10.1006/jecp.1999.2491

Ruff, R. M., Light, R. H., Parker, S. B., & Levin, H.S., (1997). The psychological construct of word fluency. *Brain Language. 57*(3), 394–405. doi:10.1006/brln.1997.1755

Savvidou, I., Bozikas, V. P., & Karavatos, A. (2002). False allegations of child physical abuse: A case of Munchausen by proxy-like syndrome? *International Journal of Psychiatry in Medicine*, *32*(2), 201-208. doi:10.2190/5AUK-YGF7-0Q58-A7EH

Shibley Hyde, J., & Linn, M. C. (1988). Gender differences in verbal ability: A meta-analysis. *Psychological Bulletin, 104*(1), 53-69. doi:10.1037/0033-2909.104.1.53

Smith, D. W., Letourneau, E. J., Saunders, B. E., Kilpatrick, D. G., Resnick, H. S., & Best, C. L. (2000). Delay in disclosure of childhood rape: Results from a national survey. *Child Abuse & Neglect*, *24*(2), 273-287. doi:10.1016/S0145-2134(99)00130-1

Sorensen, T., & Snow, B. (1991). How children tell: the process of disclosure in child sexual abuse. *Child Welfare, 70*(1), 3-15.

Sporer, S. L., & Schwandt, B. (2006). Paraverbal indicators of deception: A metaanalytic synthesis. *Applied Cognitive Psychology*, *20*(4), 421–446. doi:10.1002/acp.1190

Sporer, S. L., & Schwandt, B. (2007). Moderators of nonverbal indicators of deception: A meta-analytic synthesis. *Psychology, Public Policy, and Law*, *13*(1), 1–34. doi:10.1037/1076-8971.13.1.1

Stahl, P. M. (1999). *Complex issues in child custody evaluations*. Sage Publications.

Strömwall, L. A., Granhag, P. A., & Hartwig, M. (2004). Practitioners' beliefs about deception. In P. A. Granhag, & L. A. Strömwall (Eds.), *The Detection of Deception in Forensic Contexts* (pp. 229–250). Cambridge, UK: Cambridge University Press. doi: 10.1017/CBO9780511490071.010

Suckle-Nelson, J. A., Colwell, K., Hiscock-Anisman, C., Florence, S., Youschak, K. E., & Duarte, A. (2010). Assessment criteria indicative of deception (ACID): Replication and gender differences. *Open Criminology*, *3*, 23-30. doi:10.2174/1874917801003010023

Sullivan, K., Zaitchik, D., & Tager-Flusberg, H. (1994). Preschoolers can attribute second-order beliefs. *Developmental Psychology, 30*(3), 395-402. doi:10.1037/0012-1649.30.3.395

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 Behavior*, *40*, 139-179. doi:10.1016/B978-0-12-386491-8.00004-9

Talwar, V., & Crossman, A. M. (2012). Children's lies and their detection: Implications for child witness testimony. *Developmental Review*, *32*(4), 337-359. doi:10.1016/j.dr.2012.06.004

Talwar, V., Gordon, H., & Lee, K. (2007). Lying in the elementary school years: Verbal deception and its relation to second-order belief understanding. *Developmental Psychology*, *43*(3), 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 behaviour during verbal deception. *International Journal of*

   Behavioral Development, *26*(5)*,* 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*(2), 160–181. doi:10.1353/mpq.2002.0009

Talwar, V., & Lee, K. (2008). Socio-cognitive correlates of children's lying behavior:

   Conceptual understanding of lying, executive functioning, and false beliefs. *Child*

   Development, *79*(5), 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 transgression: Legal implications. *Law and Human Behavior*, *28*(4), 411.

   doi:10.1023/B:LAHU.0000039333.51399.f6

Talwar, V., Lee, K., Bala, N., & Lindsay, R. C. L. (2006). Adults' judgments of children's

   coached reports. *Law & Human Behavior*, *30*(5), 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), 1-11. doi:

   10.1177/0165025406073530

Tate, C.S., Warren, A.R., & Hess, T.M. (1992). Adults' liability for children's "lie-ability": Can

   adults coach children to lie successfully? In S.J. Ceci, M.D. Leichtman, & M. Putnick,

   (Eds.). *Cognitive and Social Factors in Early Deception* (pp. 69-87). Hillsdale, NJ:

   Erlbaum; 1992. doi:10.1177/0165025406073530

Trocmé, N., & Bala, N. (2005). False allegations of abuse and neglect when parents

   separate. *Child Abuse & Neglect*, *29*(12), 1333-1345. doi:10.1016/j.chiabu.2004.06.016

Trocmé, N., Fallon, B., MacLaurin, B., & Neves, T. (2005). What is driving increasing child welfare caseloads in Canada? Analysis of the 1993 and 1998 Ontario Incidence Studies of Reported Child Abuse and Neglect. *Child Welfare*, *84*(3), 341–359. Retrieved from http://www.tandfonline.com/toc/pijp20/current#.U-ki_fldXT

Tustin, K., & Hayne, H. (2010). Defining the boundary: Age-related changes in childhood amnesia. *Developmental Psychology*, *46*(5), 1049–1061. doi:10.1037/a0020105.

Tye, M.C, Amato, S. L, Honts, C. R, Devitt, M. K, & Peters, D. (1999). The willingness of children to lie and the assessment of credibility in an ecologically relevant laboratory setting. *Applied Developmental Science*, *3*(2), 92–109. doi:10.1207/s1532480xads0302_4

Ullman, S. E. (2007). Relationship to perpetrator, disclosure, social reactions, and PTSD symptoms in child sexual abuse survivors. *Journal of Child Sexual Abuse*, *16*(1), 19-36. doi: 10.1300/J070v16n01_02

Ullman, S. E., & Filipas, H. H. (2005). Gender differences in social reactions to abuse disclosures, post-abuse coping, and PTSD of child sexual abuse survivors. *Child Abuse & Neglect*, *29*(7), 767-782. doi: 10.1016/j.chiabu.2005.01.005

Vrij, A. (2006). Detecting deception in legal contexts. In A. Heaton-Armstrong, E. Shepherd, G. Gudjonsson, & D. Wolchover (Eds.). *Witness testimony: Psychological, investigative, and evidential perspectives* (pp. 23-42). New York: Oxford University Press.

Vrij, A. (2008). *Detecting lies and deceit: Pitfalls and opportunities* (2nd ed.). New York, NY: John Wiley & Sons.

Vrij, A., Akehurst, L., Brown, L., & Mann, S. (2006). Detecting lies in young children, adolescents, and adults. *Applies Cognitive Psychology*, *20*(9), 1225–1237. doi:10.1002/acp.1278

Vrij, A., Granhag, P. A., Mann, S., & Leal, S. (2011). Outsmarting the liars: Toward a cognitive lie detection approach. *Current Directions in Psychological Science*, *20*(1), 28-32. doi:10.1177/0963721410391245

Vrij, A., Leal, S., Granhag, P. A., Fisher, R. P., Sperry, K., Hillman, J., *et al*. (2009). Outsmarting the liars: The benefit of asking unanticipated questions. *Law and Human Behavior, 33*(2)*,* 159-166. doi:10.1007/s10979-008-9143-y.

Vrij, A. & Mann, S. (2006). Criteria-Based Content Analysis: An empirical test of its underlying processes. *Psychology, Crime, and Law*, *12*(4), 337-349. doi:10.1080/10683160500129007

Weiss, E. M., Kemmler, G., Deisenhammer, E. A., Fleischhacker, W. W., & Delazer, M. (2003). Sex differences in cognitive functions. *Personality and Individual Differences, 35*(4), 863-875. doi:0.1016/S0191-8869(02)00288-X

Williams, S. M., Kirmayer, M., Simon, T., & Talwar, V. (2013). Children's antisocial and prosocial lies to familiar and unfamiliar adults. *Infant and Child Development*, *22*(4), 430-438. doi:10.1002/icd.1802

Wilson J.C, Pipe, M. (1989). The effects of cues on young children's recall of real events. *New Zealand Journal of Psychology*, *18*, 65–70. Retrieved from http://www.psychology.org.nz/publications-media/new-zealand-journal-of-psychology/?#.U-kjqvldXTo

Wilson, A., Smith, M., & Ross, H. (2003). The nature and effects of young children's lies. *Social Development, 12*(1), 21-45. doi:10.1111/1467-9507.00220

Xu, F., Bao, X., Fu, G., Talwar, V., & Lee, K. (2010). Lying and truth-telling in children: From

concept to action. *Child Development*, *81*(2), 581-596. doi:10.1111/j.1467-

8624.2009.01417.x

Table 1

Organization and Scoring of Reality Interview (RI) Script.

Recall task	Phrase from recall task	Interview portion for scoring
1. Baseline and rapport	a. Favourite subjects in school. b. Favourite sports. c. Last birthday. d. Last meal.	Not scored
2. Free Recall	' Please describe in as much detail as possible, everything you can about what happened from the time you arrived until the time you left.'	Free recall
3. Mental reinstatement of context	' When you were doing the games, what did you see, smell, hear, taste and touch?'	Mnemonics
4. Inferential block 1	a. 'Did anything happen that was unexpected?' b. 'Was a crime committed?' c. 'Were there winter boots in the room?'	Not scored
5. Recall from other perspective	' I want you to imagine your mom was in the room with you and E1. What would she remember from that time?'	Mnemonics
6. Inferential block 2	a. 'There was a wallet in the room?' b. 'Was the wallet closer to you or E1?' c. 'Were you or E1 sitting closer to the door of the room?' d. 'Did you see any money in the wallet?'	Not scored
7. Reverse order recall	'Describe everything you remember from upstairs, but backwards.'	Mnemonics
8. Inferential block 3	a. 'There was money in the wallet?' b. 'Was the money in the wallet green or blue?' c. 'If a police officer were there, would they have arrested someone?' d. ' Do you think you could have been mistaken about anything you said so far?'	Question (d.) scored as Yes or No.
9. Retell entire event	' One last time, please describe everything you remember from upstairs with E1.'	Mnemonics
10. Inferential block 4	a. 'So just one more time, did you see a wallet?' b. 'Did you see money in the wallet?' c. 'Did someone take the money from the wallet?' d. 'Did you take the money from the wallet?' e. 'Did E1 take the money from the wallet?'	Question (e.) scored as Yes or No.

Table 2

Frequency (Number and Percentage) of Children's Lie-telling Behaviour by Age and Condition.

	6-7 year olds	8-9 years	10-11 years	Total
False Denial Condition				
Told the Truth	5 (62.5%)	2 (22%)	3 (60%)	10 (45%)
Told a Lie	3 (37.5%)	7 (78%)	2 (40%)	12 (55%)
False Allegation Condition				
Told the Truth	5 (71%)	3 (27%)	1 (25%)	9 (39%)
Told a Lie	2 (29%)	8 (73%)	4 (80%)	14 (61%)
True Assertion Condition				
Told the Truth	3 (75%)	11(100%)	4 (100%)	18 (95%)
Told a Lie	1 (25%)	0 (0%)	0 (0%)	1 (5%)
True Denial Condition				
Told the Truth	8 (100%)	10 (91%)	3 (100%)	21 (96%)
Told a Lie	0 (0%)	1 (9%)	0 (0%)	1 (4%)
Total				
Told the Truth	21 (78%)	26 (62%)	11 (65%)	58 (67%)
Told a Lie	6 (22%)	16 (38%)	6 (35%)	28 (33%)

Table 3

Mean Comparisons Across Honesty of Reporting

Interview Stage Variable	Truth-tellers M (SD)	Lie-tellers M (SD)	F	p (One-tailed)
Total Interview				
Coherence	.22	.30	.598	.442
Free Recall				
Det_{FR}	24.07	26.17	.127	.723
# Unique	40.83 (26.20)	49.12 (36.14)	1.18	.281
# Words	79.10 (84.86)	99.73 (95.53)	.853	.359
TTR_{FR}	.66 (.19)	.61 (.16)	1.109	.296
Mnemonics				
Det_{MN}	34.69	32.07	.263	.610
# Unique	101.31 (56.67)	97.65 (46.38)	.076	.783
# Words	170.78 (143.21)	154.65 (83.26)	.271	.605
TTR_{MN}	.67 (.14)	.67 (.096)	.041	.841

Table 4

Mean (Standard Error) and Effect Sizes for Revised ACID Criteria in the Complete Interview.

Variable	Honest M (SE)	Dishonest M (SE)	F	p (one-tailed)	Eta^2
Interview Total	63.78 (51.35)	61.13 (32.74)	.055	.815	.001
External	47.73 (38.23)	46.23 (22.57)	.033	.857	.001
Contextual	9.05 (8.52)	8.99 (6.67)	.001	.975	.000
Internal	1.98 (1.84)	3.01 (3.26)	2.78	.100	.041
Affective	0 (.00)	0 (.00)	-	-	-
Sensitive	4.89 (6.29)	2.77 (4.88)	2.126	.150	.032
Contradictions	.14 (.35)	.13 (.30)	.016	.900	.000
# Unique	142.15 (79.17)	146. 80 (74.13)	.057	.812	.001
# Word	249.88 (221.77)	254.38 (159.28)	.008	.929	.000
TTR	.65 (.13)	.63 (.11)	.444	.508	.007

Table 5

Children's Mean Number of Unique Details on five Free-recall Questions based on Condition.

	Free Recall	Context Restated	Mother's Perspective	Reverse-Order	Re-tell
			False Denial Condition		
Truth-tellers	22.50	17.67	2.67	11.84	12.22
Lie-tellers	19.34	14.30	3.66	12.27	4.03
			False Accusation Condition		
Truth-tellers	17.24	8.81	3.14	9.24	2.81
Lie-tellers	37.80	12.59	3.36	10.18	4.16
			True Denial Condition		
Total	21.31	15.03	3.33	10.58	7.50
			True Assertion Condition		
Total	34.98	14.92	3.27	14.00	9.83
			Total		
Truth-tellers	26.12	14.31	3.18	11.87	8.30
Lie-tellers	28.35	12.87	3.35	11.42	5.14
Total	26.99	13.75	3.24	11.70	7.08

Table 6

Mean (Standard Error) and Effect Sizes across Honesty of Reporting and Condition.

	Truth-tellers *M* (*SE*)	Lie-tellers *M* (*SE*)	*F*	*p* (one-tailed)	Eta^2
False Denial Condition					
Coherence	.17 (.28)	.24 (.42)	.154	.701	.010
Free Recall					
# Details	21.78 (11.82)	19.21 (10.60)	.210	.653	.014
# Unique	39.50 (19.25)	40.27 (17.87)	.007	.935	.000
# Words	78.50 (45.26)	77.91 (54.05)	.001	.982	.000
TTR	.61 (.22)	.62	.004	.949	.000
Mnemonics					
# Details	39.56 (14.35)	34.09 (11.64)	.729	.407	.046
# Unique	123.83 (38.26)	92.36 (36.62)	2.782	.116	.156
# Words	200.83 (63.92)	140.82 (61.35)	3.612	.007	.194
TTR	.62 (.06)	.67 (.09)	1.59	.227	.096
False Accusation Condition					
Coherence	.29 (.41)	.36 (.48)	.118	.735	.007
Free Recall					
# Details	17.00 (13.20)	34.15 (25.63)	2.699	..118	.130
# Unique	31.86 (18.24)	60.69 (45.92)	2.495	.132	.122
# Words	51.86 (36.03)	129.23 (119.66)	2.730	.116	.132
TTR	.69 (.16)	.58 (.15)	2.366	.141	.116
Mnemonics					
# Details	22.95 (9.23)	29.06 (13.27)	1.162	.295	.061
# Unique	77.14 (23.23)	104.39 (53.72)	1.605	.221	.082
# Words	113.71 (48.43)	169.54 (98.47)	1.957	.179	.098
TTR	.71 (.10)	.66 (.11)	.833	.374	.044
True Denial Condition					
Coherence	.29 (.37)	-	-	-	-
Free Recall		-	-	-	-
# Details	20.75 (14.43)	-	-	-	-
# Unique	39.42 (25.56)				
# Words	73.58 (65.77)	-	-	-	-
TTR	.68 (.19)	-	-	-	-
Mnemonics		-	-	-	-
# Details	32.94 (21.30)	-	-	-	-
# Unique	93.42 (58.62)	-	-	-	-
# Words	153.25 (115.34)	-	-	-	-
TTR	.69 (.14)	-	-	-	-
True Assertion Condition					
Coherence	.17 (.37)	-	-	-	-
Free Recall	30.50 (36.40)	-	-	-	-
# Details		-	-	-	-

# Unique	46.31 (31.98)				
# Words	95.38 (119.05)	-	-	-	-
TTR	.65 (.20)	-	-	-	-
Mnemonics		-	-	-	-
# Details	39.31 (30.66)	-	-	-	-
# Unique	109.38 (68.89)				
# Words	197.63 (199.35)	-	-	-	-
TTR	.66 (.17)	-	-	-	-

Table 7

Mean (Standard Error) and Effect Sizes across Honesty of Reporting and Age Group.

	Truth-tellers *M* (*SE*)	Lie-tellers *M* (*SE*)	*F*	*p* (one-tailed)	Eta^2
		6-7 year olds			
Coherence	.33 (.37)	.50 (.55)	.568	.463	.036
Free Recall					
# Details	11.82 (8.69)	11.94 (8.57)	.001	.977	.000
# Unique	25.18 (18.30)	23.83 (11.65)	.026	.873	.002
# Words	45.09 (43.50)	36.33 (28.08)	.195	.665	.013
TTR	.75 (.23)	.76 (.15)	.013	.911	.001
Mnemonics					
# Details	21.16 (11.42)	22.00 (8.24)	.025	.876	.002
# Unique	69.09 (36.88)	61.00 (32.36)	.202	.659	.013
# Words	106.09 (69.94)	104.17 (81.93)	.003	.960	.000
TTR	.73 (.15)	.66 (.12)	1.01	.331	.063
		8-9 year olds			
Coherence	.18 (.37)	.31 (.43)	1.035	.316	.030
Free Recall					
# Details	29.75 (32.72)	26.34 (16.66)	.137	.714	.004
# Unique	47.76 (31.22)	52.00 (34.32)	.149	.702	.004
# Words	98.91 (109.90)	107.07 (89.97)	.056	.815	.002
TTR	.631 (.18)	.58 (.152)	.805	.376	.023
Mnemonics					
# Details	40.24 (28.33)	32.36 (14.96)	.963	.333	.028
# Unique	111.33 (42.12)	99.60 (40.41)	.380	.542	.011
# Words	198.24 (181.03)	153.27 (70.06)	.831	.368	.024
TTR	.65 (.16)	.68 (.10)	.422	.520	.012
		10-11 year olds			
Coherence	.19 (.30)	0 (.00)	1.906	.193	.137
Free Recall					
# Details	25.78 (8.40)	42.73 (31.68)	2.421	.146	.168
# Unique	43.78 (10.21)	70.80 (47.91)	2.812	.119	.190
# Words	74.44 (28.20)	153.80 (133.57)	3.125	.102	.207
TTR	.63 (.12)	.54 (.13)	1.432	.255	.107
Mnemonics					
# Details	38.29 (15.73)	43.27 (7.69)	.431	.524	.035
# Unique	117.33 (42.12)	135.80 (50.71)	.537	.478	.043
# Words	185.78 (80.74)	219.40 (93.17)	.502	.492	.040
TTR	.66 (.08)	.64 (.07)	.258	.621	.021

Table 8

Mean (Standard Error) and Effect Sizes across Honesty of Reporting and Gender.

|	Truth-tellers *M* (*SE*)	Lie-tellers *M* (*SE*)	*F*	*p* (one-tailed)	Eta^2
		Males			
Coherence	.23 (.35)	.35 (.48)	.769	.387	.022
Free Recall					
# Details	28.82 (33.77)	22.94 (23.52)	.349	.559	.010
# Unique	43.20 (30.72)	41.69 (35.23)	.019	.891	.001
# Words	89.80 (109,74)	82.38 (93.11)	.046	.831	.001
TTR	.65 (.20)	.66 (.18)	.012	.912	.000
Mnemonics					
# Details	41.72 (29.99)	30.09 (13.17)	2.076	.159	.058
# Unique	114.60 (68.62)	95.44 (51.24)	.861	.360	.025
# Words	204.80 (186.69)	151.00 (93.61)	1.102	.301	.031
TTR	.65 (.16)	.68 (.11)	.279	.601	.008
		Females			
Coherence	.21 (.37)	.20 (.36)	.002	.965	.000
Free Recall					
# Details	19.54 (11.26)	31.33 (15.35)	5.868	.022	.168
# Unique	38.57 (21.57)	61.00 (36.14)	4.695	.039	.139
# Words	68.91 (52.31)	127.50 (97.52)	4.807	.037	.132
TTR	.67 (.18)	.55 (.13)	3.789	.062	.115
Mnemonics					
# Details	28.00 (12.45)	35.24 (15.57)	1.947	.174	.063
# Unique	88.67 (40.08)	101.20 (29.72)	.666	.421	.002
# Words	138.38 (75.17)	160.50 (67.73)	.623	.436	.021
TTR	.69 (.12)	.64 (.06)	1.297	.264	.043
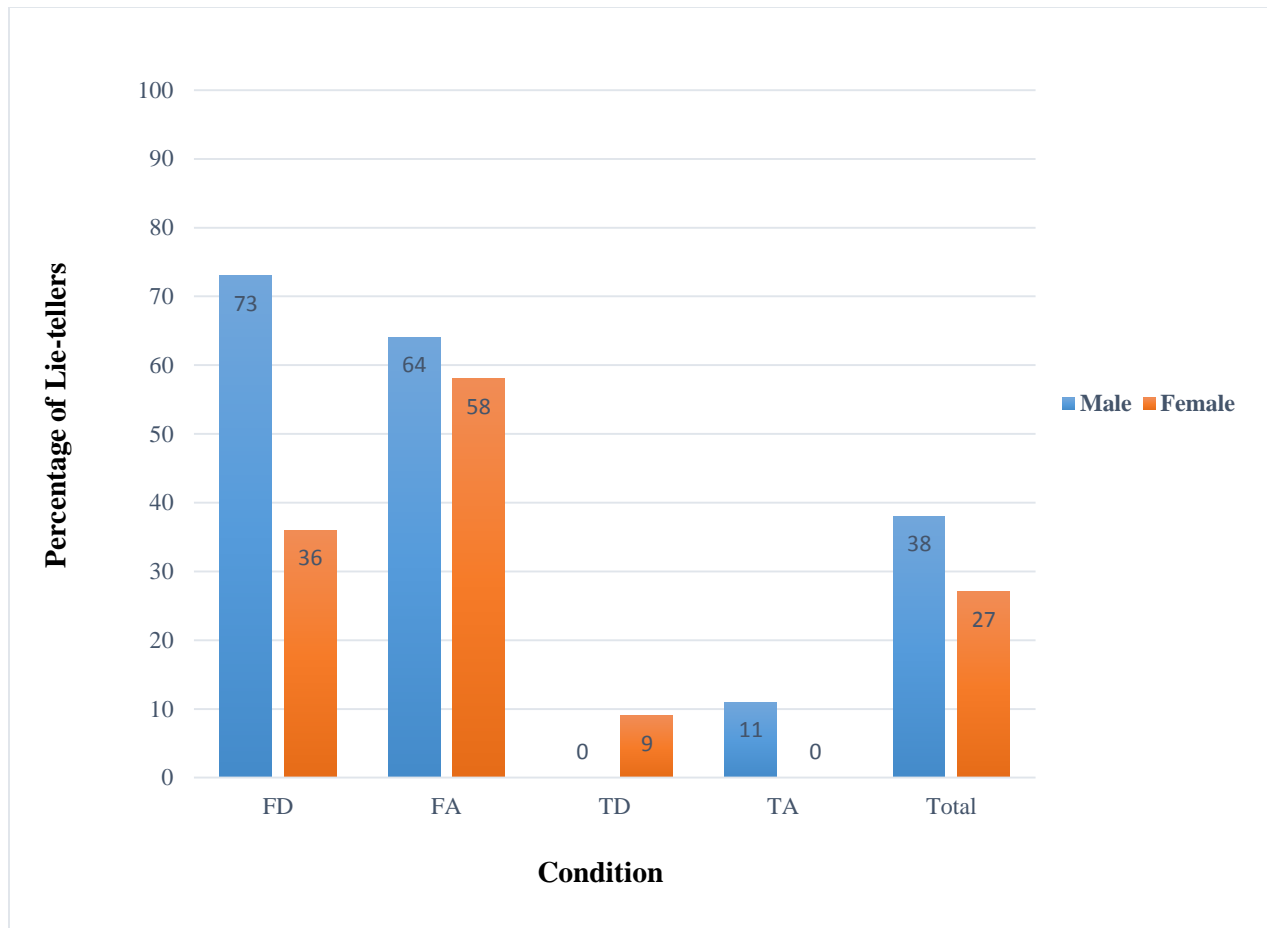
Figure 1. Children's Lie-telling Behaviour by Gender and Condition
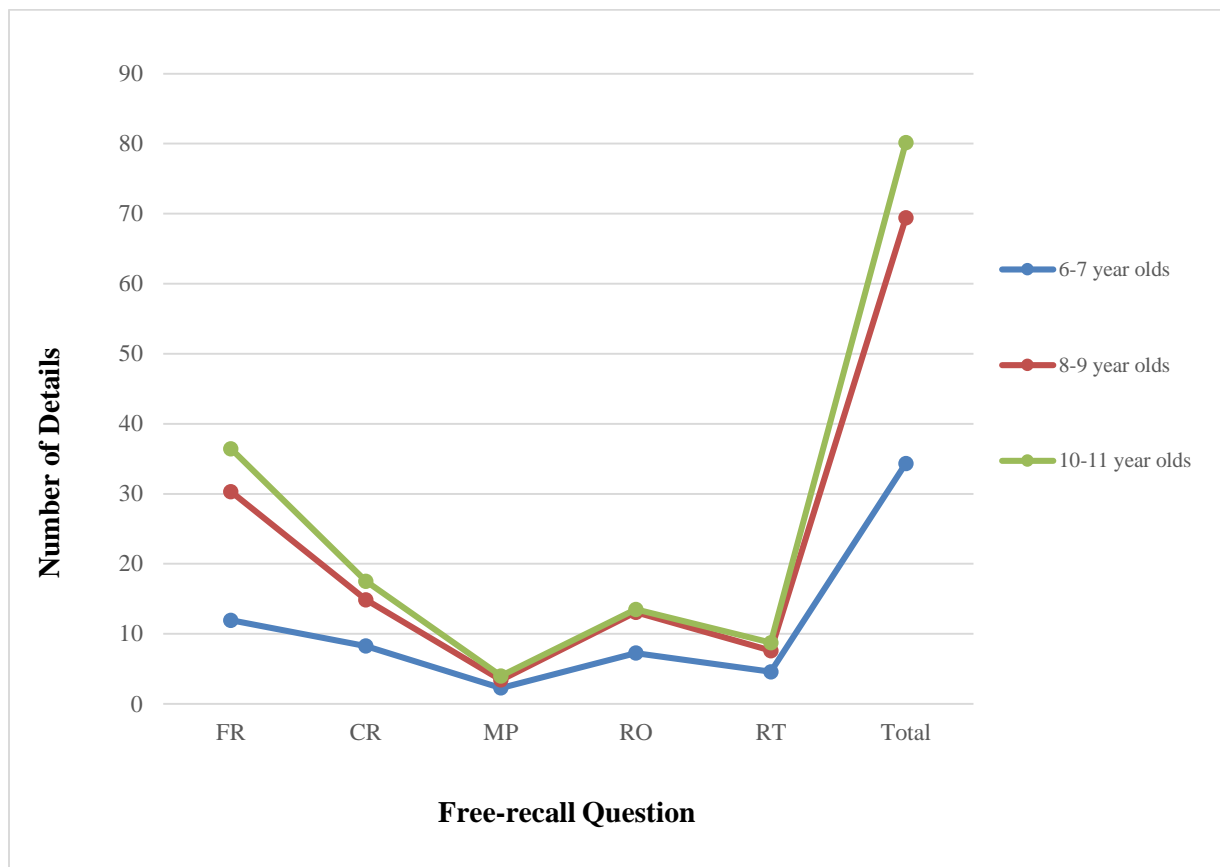
* Means differ significantly at the .05 level at the FR and CR questions, and on the total number of details.

Figure 2. Children's Mean Number of Details on each Free-recall Question by Age

Appendix A

Interview Script

What is your favorite subject in school?

What sports do you like?

Please describe in as much detail as possible, everything you can remember about your last birthday.

Please describe, in as much detail as possible, everything you can remember about the breakfast you had today?

Now I need to ask you some questions about earlier when you were in the room upstairs with E1. Please describe in as much detail as possible, everything you can about what happened from the time you arrived until the time you left.

Did anything else happen?

Now, when you were doing the games, what did you see, smell, hear, taste or touch? Think about it. When you are ready, tell me everything you remember. Take some time to think. (After pause, count three Mississippi). When you are ready answer as completely as possible.
If the child responds with "I don't know" OR are demonstrating clear issues with answering each component of the question, it is ok to go through each part of the question with them. E2 would state: **When you were doing the games upstairs, what did you see** *(point to your eye)?* *Wait for child to respond.* **What did you** *smell (point to nose)? Wait for child to respond.* **What did you hear** *(point to ear)? Wait for child to respond.* **What did you taste** *(point to mouth)? Wait for child to respond.* **What did you touch** *(point to finger)?*

For the following questions, please choose the best answer. If you do not know, __GUESS.__
State "yes" or "no" after each question.

> **a. Did anything happen that was unexpected? Yes/NO**
- If child does not understand the word "unexpected", say: "It's something that you didn't think would happen".
> **b. Was a crime committed? Yes/No**
> *- If child does not understand the word "crime", say: "It's something really bad that you would get in trouble for".*
> **c. Were there winter boots in the room? Yes/No**

Now, I want you to imagine your mom was in the room with you and E1. What would she remember from that time?

Would she remember anything else?

There was a wallet in the room?

Was the wallet closer to you or E1?

Were you or E1 sitting closer to the door of the room?

Did you see any money in the wallet?

Please describe everything you remember from upstairs backwards. For example, say one day you had breakfast, went to the park and then came home and had lunch. To remember it backwards you would say, I had lunch, went to the park and had breakfast. Please describe everything you did with E1 upstairs backwards. Start with when you left the room, and finish with when you entered this room, but backwards.

Anything else?

There was money in the wallet?

Was the money in the wallet green or blue? (if the child says they didn't see the money or don't know- ask them to pick one)

If a police officer were there would they have arrested someone?

Do you think that you could have been mistaken about anything you said so far?

On last time, please describe everything you remember from doing the tasks with E1.

So just one more time, did you see a wallet?

Did you see money in the wallet?

Did someone take the money from the wallet?

Did you take the money from the wallet?

Did E1 take the money from the wallet?

Okay great that's it! Thank you so much for your participation today you did great!

E2 will bring the child into the playroom with the parents to be debriefed by E1.

Appendix B

Lie-telling Conditions

Hey, you're doing a puzzle, awesome. I have to speak to you for a second okay?

Depending on condition follow one of the four following:

False denial: **Remember when we were upstairs and I found Victoria's wallet? Remember how there was 20$ in the wallet and I took it? E2 thinks I took Victoria's money. Please tell E2 I did not take the money. Victoria didn't tell me to take the money- but I really need it. It's a secret. Let's practice. If E2 asks about the money, say I didn't take it. If E2 asks about the money, what do you say?** *After the child responds correctly say:* **Good, because it's a secret.**

False allegation: **Remember when we were upstairs and I found Victoria's wallet? Remember how there was 20$ in the wallet and I did not take it? E2 thinks that I took the money. Please tell E2 that I took the money even though I did not take the money. Victoria had not told me to take the 20$ so I didn't. It's a secret. So if E2 asks about the money, say I took it, even though I didn't. Let's practice. If E2 asks about the money, what do you say?** *After child responds correctly say:* **Good, because it's a secret.**

In the FD/FA conditions, the child may comment on your request (e.g., "That's a lie") or refuse to comply. In these cases, do not respond directly to the child, and continue with the script. If child refuses to comply, do not try to convince them any further.

True assertion: **Remember when we were upstairs and I found Victoria's wallet? Remember how there was 20$ in the wallet and I took it? E2 thinks that I took the money. Please tell E2 that I did take the money. Victoria had told me to take the 20$ and I need it. So if E2 asks about the wallet, say I took it, because it's not a secret. If E2 asks about the wallet, what do you say?** *After child responds say:* **Good, because it's not a secret.**

True denial: **Remember when we were upstairs and I found Victoria's wallet? Remember how there was 20$ in the wallet and I did not take the 20$? E2 thinks that I took the money. Please tell E2 that I did not take the money. Victoria had told me to take the 20$ but I do not need it. So if E2 asks about the wallet say I didn't take it, because it's not a secret. If E2 asks about the wallet, what do you say?** *After child responds say:* **Good, because it's not a secret.**

E1 then gets up and leaves the room (closes door behind them).