Video Article

An Experimental Analysis of Children's Ability to Provide a False Report about a Crime

Joshua Wyman[1], Ida Foster[1], Victoria Talwar[1]

[1]Department of Educational and Counselling Psychology, McGill University

Correspondence to: Victoria Talwar at victoria.talwar@mcgill.ca

URL: https://www.jove.com/video/53773
DOI: doi:10.3791/53773

Keywords: Behavior, Issue 111, Law, psychology, deception, false allegations, child development, eyewitness testimony, forensic interviewing

Date Published: 5/3/2016

Citation: Wyman, J., Foster, I., Talwar, V. An Experimental Analysis of Children's Ability to Provide a False Report about a Crime. *J. Vis. Exp.* (111), e53773, doi:10.3791/53773 (2016).

Abstract

A considerable amount of research has evaluated children's lie-telling behaviors and skills[1-2]; however, limitations with the tasks used for eliciting false testimonies and interviewing children have restricted the generalizability of the findings. The primary aim of the current study is to provide an easy-to-administer and ecologically valid method for measuring the veracity and quality of school-aged children's (ages 6-11) testimonies when they are asked to provide different types of true and false reports. Moreover, the methodology enables researchers to examine the social and developmental factors that could influence the credibility of a child's testimony. In the current study, children will witness a theft, and are then asked to either falsely deny the transgression, falsely accuse a researcher of the theft, or tell the truth. Afterwards, children are to be interviewed by a second researcher using a thorough and ecologically valid interview protocol that requires children to provide closed-ended and free-recall responses about the events with the instigator (E1). Coders then evaluate the length and number of theft-related details the children give throughout the interview, as well as their ability to maintain their true and false reports. The representative results indicate that the truth and lie-telling conditions elicit the intended behaviors from the children. The open-ended interview questions encouraged children to provide free-recall information about their experiences with E1. Moreover, findings from the closed-ended questions suggest that children are significantly better at maintaining their lies with age, and when producing a false denial compared to a false accusation. Results from the current study can be used to develop a greater understanding of the characteristics of children's true and false testimonies about crime, which can potentially benefit law enforcement, legal staff and professionals who interview children.

Video Link

The video component of this article can be found at https://www.jove.com/video/53773/

Introduction

The primary goal of the present study is to provide an ecologically valid method for evaluating children's true and false testimonies in an experimental setting. Children's intentional false reports in police and forensic interviews have 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[3-6]. A considerable amount of research has evaluated children's ability to falsely deny an event or transgression to protect someone[7-12], yet considerably less is known about children's abilities to make a false accusation[13-14]. Even though children do make false denials and/or purposefully omit information in their testimonies, there have also been numerous real-life cases of children being persuaded to falsely accuse someone of committing a transgression, such as false allegations of abuse in custody battles[5, 15-18]. By having children willingly produce false denials and false accusations in an experimental setting, the current research methodology is designed to provide a stronger understanding of the types of false reports children can tell in their eyewitness testimonies.

Previous lie-telling research with children has generally involved a low-cost situation, whereby they were telling a lie about a non-threatening event, such as a broken toy[9, 12, 14]. Children who provide testimonies to police officers or forensic interviewers often disclose information about a high cost-event, such as witnessing a crime or experiencing abuse. Being asked to recall information about a non-threatening event may not promote deceitful behaviors in the same manner as when children actually witness a serious transgression or crime. For instance, children who witness a crime may experience symptoms of post-traumatic stress[19-20]; thus, they are often reluctant to discuss their potentially traumatic experience(s) with others[21-22]. To improve the understanding of children's ability to generate false reports in situations where they are asked to provide a testimony, the present study has children tell a truth or lie about an alleged theft that they may (or may not) have witnessed.

Past experimental research on children's lie-telling skills has typically used three-to-four follow-up questions to evaluate whether children's initial false claims were maintained throughout the interview[10-11, 23-25]. In addition, many of these interview protocols have relied on closed-ended questions where a child had to provide one-word responses, such as "Yes" or "No". Although such methodology does provide some insight into children's deceptive capabilities, the findings may not generalize to real-life settings where child witnesses are being questioned about an event. When providing a testimony to police officers or forensic interviewers, children often have to answer many questions that require them to provide both closed and open-ended responses; therefore, if a child is telling a lie, they will have to maintain it over multiple types of follow-up questions. To address this limitation, the present study will use a lengthier interview method to assess children's lie-telling skills, and the characteristics

of their testimonies. The interview protocol is influenced by the Cognitive Interview (CI) and the National Institute of Child Health and Human Development (NICHD) protocol, which are ecologically valid police interview techniques that are used for increasing the amount of information obtained from an eyewitness[26-30]. Rather than relying on a few closed-ended questions, the interview consists of two baselines, three open-ended, and seven closed-ended questions (refer to Appendix A). The larger number and variety of questions permits for the examination of age, gender and experimental condition-based differences in the length and types of information children are willing to disclose in their testimonies.

In order to appear convincing, lie-tellers often have to simultaneously manage their verbal and non-verbal behaviors, and assess the mental state of the lie-recipient[10, 31-32]. However, when interview questions require increased cognitive effort from the responder, lie-tellers are more likely than truth-tellers to make noticeable errors throughout their testimony[33-34]. Moreover, increasing the mental effort required by the responder actually discourages lie-telling[35], as the cognitive load of telling a lie and responding convincingly to challenging and unexpected questions can be too cognitively taxing for some[34, 36]. For these reasons, police and forensic interviewers have been encouraged to use open-ended questions and prompts, such as those in the Cognitive Interview, to increase the cognitive effort required by the interviewee[33-34, 35]. In addition, these types of questions give honest responders multiple opportunities to elaborate on the information they previously disclosed, which can lead to more detailed and accurate testimonies[30, 38-39]. The current methodology can therefore provide data on children's true and false testimonies when they are asked generalizable interview questions and prompts that are intended to increase the cognitive load of the responder, and the amount of information they are willing to disclose about an event.

To overcome limitations with past studies, the current research methodology utilizes four-experimental conditions to evaluate the different types of true and false reports children are willing to provide regarding an alleged theft. In this study, children (ages 6-11) will witness an instigator (E1) discover a stranger's wallet with twenty dollars in it. Children are then 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). In addition, some children will be asked to tell the truth about a theft that did (True Accusation condition) or did not take place (True Denial condition). Children are then to be interviewed by a second researcher (E2) about the events that took place with E1. The interview is to be videotaped, and later transcribed into written transcripts. Coders then record the number of words and wallet-related details disclosed by the children on the open-ended questions; responses on the closed-ended questions are used to evaluate children's ability to maintain their true and false reports.

Protocol

NOTE: The following protocol was developed in accordance with the ethical standards approved by the McGill University Research Ethics Board. For all studies with children and involving deception, it is required to obtain Ethics Approval from the university or institution. Please note that different Ethics Boards may have different requirements.

1. Preparation for the Experiment

1. Instruct E1 to memorize the necessary dialogue for each experimental condition (Appendix B), and E2 should become familiar with the questions in the interview protocol (Appendix A). Please click here to download Appendix A. Please click here to download Appendix B.
2. Test only one participant at a time. Use three separate rooms for the current study: testing room, interview room, common room.
3. Use a testing room for the interactions between E1 and the child participants.
4. Place the necessary protocols and materials for the filler-activities, and the wallet in the testing room. Position the wallet in a concealed location, such as behind a flowerpot on a table. Please ensure that the child does not see the wallet before the theft situation with E1.
5. Put twenty-dollars inside the wallet. Also, place fake identification cards (*e.g.*, an old bus pass and ID cards) in the wallet to give the impression to the participant that the wallet belongs to someone else.
6. Place a jacket (or other item) near the wallet to be retrieved by E1 immediately prior to the theft situation.
7. Place "Testing in Progress" sign on the door of the testing room to avoid disturbances.
8. Use an interview room for the interview with E2 and the child participant; ensure that the room has a table, two-chairs and hidden cameras that record the interview.
    1. Prepare the interview room to include a table with two chairs facing each other.
    NOTE: The interview protocol and clipboard should not be in the interview room because immediately prior to the interview between E2 and the child participant, E2 states that they are going with E1 to the testing room to get their clipboard with the interview questions. However, E2 is permitted to use the interview script during the interview.
    2. Ensure that the video-recording devices in the interview room can be easily activated when the interview begins.
9. Instruct the parents and other family members to remain in a common room for the duration of the study.
NOTE: The child participants are in this room at the beginning of the study when parents are completing the consent form. After the consent form is completed, child participants will not return to this room or interact with their parents or family until the end of the study.
10. Place the consent and demographics forms on a clipboard in the common room.

2. Participants

1. When recruiting participants, instruct the recruiters to provide the legal guardians of the participants with a detailed explanation of the study.
NOTE: To avoid influencing participant behavior during the study, parents should be discouraged from disclosing details about the theft and interview to the children. Child participants must be fluent in the language of the protocols, and have no experience participating in any other studies (*e.g.*, lie-telling research) that could lead them to identify the experimental nature of the theft and interview situations. Furthermore, children with physical, intellectual and/or developmental disabilities that prevent them from discerning the differences between truths and lies should not be recruited for this study.
2. Instruct the researcher who is the instigator of the theft (E1) to select the experimental condition for the child participant.
    1. Select the condition before the study begins.

2. Consider the age and gender of the participant when selecting the conditions; thus, ensure that each condition has a similar number of participants from each age and gender groups.
   NOTE: Within each age and gender groups, counter-balance the conditions. For example, if E1 selects the FD condition for a male participant in the 6-7 year old age group, this condition cannot be used again for this age or gender group until the other three conditions have been selected. Ensure that the interviewer (E2) is not aware of the experimental condition to avoid influencing their behavior during the interview.
   NOTE: Do not change conditions once the study begins. Only in extraordinary circumstances should E1 be instructed to change the condition, such as believing that a particular child will experience severe emotional distress from witnessing a theft and/or being asked to lie. In this situation, E1 should be asked to change the condition to true denial, whereby the child is asked to tell the truth and does not witness a theft.

3. Prior to commencing the study, ask the legal guardians to complete a consent form that explains the procedures and purpose of the research.
   NOTE: The true nature of the experiment should not be disclosed to the child participant until the end of the study.
4. Instruct the parents to complete a demographics form that provides any demographic information that is needed for the study.

3. Filler Activities

1. After the parents have completed the consent form, instruct E1 to ask the child participant to go with them to the testing room.
2. Prior to commencing the filler activities, notify the child that they will engage in some games with E1, and that they are free to stop the study at any time if they feel uncomfortable or upset.
   1. If a child shows or articulates emotional distress at any time during the study, instruct the researchers (E1 and E2) to stop the study immediately and return the child to their parents to be debriefed about the true nature of the study.

3. Begin the filler-activities after the child provides verbal assent that they understand the instructions of the study.
   NOTE: The filler-activities should take between 30-40 min. The purpose of the activities is to help build rapport between E1 and the child participants, as well as to disguise the true nature of the study.
   NOTE: Filler activities can include a series of cognitive tasks (*e.g.*, standardized verbal ability task) or they can be a game. The purpose of these tasks is to engage the child, and for E1 to develop a rapport with the child.

4. Theft Situation

1. After completing the filler activities, instruct E1 to grab his or her jacket (or another item) before going with the child to the interview room.
   1. Locate the wallet near the jacket. Open the wallet, and notify the child that the wallet belongs to another researcher.
   2. Remove twenty-dollars from the wallet, and depending on the condition the child was placed in, either take the money or place it back in the wallet.
   3. During the theft situation, if the child appears distracted, instruct E1 to get the child's attention before engaging with the wallet.
   4. Place the wallet back in its original position. Discourage E1 from giving any additional information about the wallet or their rationale for taking or leaving the money. If the child asks about the wallet, divert the conversation, such as by praising the child's performance on the filler tasks.

2. After the wallet situation, go with the child to the interview room. Leave the jacket or other item (that E1 was looking for) in the testing room.

5. Setting the Experimental Condition

1. In the interview room, instruct E2 to greet E1 and the child. Next, have E1 introduce the child to E2. Instruct E1 to state that they forgot their jacket in the testing room. At this time, E2 should indicate that they forgot their clipboard with the interview questions in the same room. Have E2 go with E1 to the testing room to get the questions.
   NOTE: Later, the child learns that E2 thought that E1 stole money from the wallet; thus, the purpose of the interaction between E1 and E2 is to help the child acknowledge how E2 became aware of the situation with the wallet.
2. Prior to E2 leaving the room with E1, instruct the child to complete a filler activity (*e.g.*, a puzzle) while they are gone.
3. After 2 min, instruct E1 to return to the interview room without E2. During this time, have E1 ask the child to tell a truth or a lie about the situation with the wallet. Refer to Appendix B for the dialogue used by E1 for setting each condition.
   1. False Accusation Condition (FA)
      1. Have children witness E1 leave the money in the wallet; however, ask them to tell a lie to E2 by falsely accusing E1 of taking the money.

   2. False Denial Condition (FD)
      1. Take the money from the wallet, but ask the children to falsely deny the theft to E2 by saying that E1 did not take the money.

   3. True Accusation Condition (TA)
      1. Have children witness E1 take the money from the wallet, and ask them to truthfully accuse E1 of taking the money.

   4. True Denial Condition (TD)
      1. Do not take the money from the wallet. Ask the children to truthfully deny the theft to E2.
         NOTE: By the end of the interaction with E1, the child should understand what E1 is asking them to do by repeating the instructions of their condition. If the child does not appear to understand what is asked of them, ask E1 to repeat the instructions of the condition to them. Discourage E1 from providing any additional information about the theft situation or the condition.

NOTE: The child does not have to agree to comply with the instructions for each condition. For example, discourage E1 from further persuading the child if they state that they are unwilling to lie for them.

4. Instruct E1 to leave the room after setting the condition.
5. One min after E1 sets the condition and leaves the room, instruct E2 to return to interview the child about the events with E1.

6. Interview

1. If the child wants to talk about the wallet situation before the interview, instruct E2 to divert the conversation.
2. After the child completes the activity (*e.g.*, puzzle), begin the interview with the child. Refer to Appendix A for the interview script.
    1. Ask baseline questions (n = 2) at the beginning of the interview to build rapport between E2 and the child, as well as to provide baseline data regarding each child's verbal ability and/or willingness to disclose information.
    2. Use open-ended questions (n = 3) throughout the interview to encourage children to describe their experiences with E1 in their own words. Moreover, use prompts after each question (*e.g.*, “Can you tell me more?”) to provide the children with additional opportunities to disclose information. Below are the types of open-ended questions that are used:
        1. Ask two free-recall questions that require the children to describe in as much detail as possible everything they remembered from their experiences with E1. Ask one free-recall question immediately after the baseline questions, and ask the second one at the end of the interview.
        2. Ask children to describe everything they remembered from their time with E1, but in reverse-order. Describing events in several orders has shown to increase the cognitive effort required to maintain a lie[34, 37].
        3. Ask closed-ended questions (n = 7) to encourage children to provide short and direct information about the wallet situation.
3. To maintain consistent interview protocols for all participants, discourage E2 from rephrasing or altering the information provided in the interview script.
4. If the child does not understand a question, restate the question to them.
5. To avoid influencing the length, veracity and quality of the child's testimony, do not allow E2 to provide any additional prompts (outside of those in the script) and/or reinforcements for the child's responses. For this reason, instruct E2 to maintain a consistent tone of voice throughout the interview, and to avoid using non-verbal behaviors that could reinforce a response, such as nodding or shaking of the head.

7. Concluding the Study

1. After completing the interview, bring the child into the common-room. Next, instruct E1 and E2 to debrief the child about the deceptive nature of the study, and to tell him or her that the theft was pretend and did not actually occur.
   NOTE: Furthermore, ensure that E1 or E2 tells the child that their involvement in the study may help other children in the future, and that they should tell their guardians if they are ever asked to lie by another adult.
2. After the debriefing, compensate the participants and thank them for their involvement in the study.

8. Preparation of Interview Transcripts

1. Create written manuscripts of each child's verbal responses and non-verbal behaviors throughout the interview based on the video-recordings.
2. Transcribe all information provided by the child, even if they repeat certain details multiple times.
3. Do not use acronyms or symbols (*e.g.*, numbers) when transcribing the video-recordings.
4. Instruct the transcribers to record participant responses below the appropriate question being asked. Tell them to only record the behaviors and statements of the interviewer if they differ considerably from the interview script.

9. Coding Children's Open-ended Responses

1. Evaluate the amount and type of information children disclose on the 3 open-ended questions.
   NOTE: Ensure that the three coders are blind to the experimental condition of the child they are evaluating.
2. Calculate the children's total number of words (*Response length*) and details about the wallet and theft situation (*Event Details*).
   NOTE: Response Length is the number of words the child uses across the three open-ended questions. A word processing program can be used to determine the child's response length.
   NOTE: Event Details includes information that the child discloses about the situation with the wallet in their three open-ended responses. Record each individual and new detail about the wallet situation. For example, the sentence, "E1 took the money from inside the wallet", contains five event details. However, if the child says in a later question, "E1 took twenty dollars from inside the wallet", then only two new event details were provided.
3. Instruct the coders to evaluate the Event Details of each script independently from the other coders to avoid any potential biases in the coding of the scripts. Use the mean number of words and event details from the three coders for statistical analyses.

10. Coding Children's Closed-ended Responses

1. Instruct one coder to evaluate the children's abilities to maintain their stories across the 4 closed-ended questions listed in Appendix C. Refer to Appendix C for the coding measures used to evaluate children's maintenance of their story in the four experimental conditions. Please click here to download Appendix C.

2. First, determine if the child told a truth or lie during the interview.
    1. Use the final closed-ended question ("Did E1 take the money from the wallet?") to determine if a child is telling a truth (scored as 0) or a lie (scored as 1) about the potential theft.
    NOTE: Children who provide reports that do not comply with their condition should not be included in the maintenance of story assessment. Thus, children who tell the truth in the lie-telling conditions or a lie in the truth conditions are excluded from this analysis.

3. Give children one-point for each closed-ended response that supports their true or false report (total possible maintenance score of 4).
4. Use statistical tests to analyze data from the study. For example, perform chi-square or logistic regressions for children's willingness to lie data, and linear regressions on children's maintenance scores.

Representative Results

Patterns of Lie-telling Behavior

Figure 1 shows the rate of children's lie-telling behavior in each experimental condition. As reported in Wyman, Taieb-Lachance, Foster, Crossman and Talwar (under review), child participants were more willing to tell a lie in the lie-telling conditions compared to the truth-conditions; however, no differences were found in the percentage of lie-tellers in the FD and FA conditions. In addition, no age or gender-related differences regarding children's willingness to lie were found[Wyman, J., Taieb-Lachance, C., Foster, I., Crossman, A., & Talwar, V. False denials and false accusations in school-aged children's disclosures of a theft. Manuscript submitted for publication., (Under Review)]. Therefore, children's general willingness to lie in the FD (70%) and FA (73%) conditions and tell the truth in the TD (97%) and TA (93%) conditions suggests that each condition incited the intended behaviors from the participants. In accordance with past research[8, 12, 14, 24], most children were willing to make a false denial to protect another. Nevertheless, due to the lack of experimental research on false accusations[14], it is difficult to determine how the findings from the FA group relate to other research in the field.

Characteristics of Children's Testimonies

Table 1 displays the mean number of words and new information added by the children on each open-ended question. Although children did provide significantly more words and new details on the first open-ended question, the follow-up questions did encourage children to discuss more information regarding their experiences with E1. Children particularly demonstrated an increased willingness and ability to provide new information on the reverse-order question, which supports previous research regarding the value of this question[30, 38-39]. The current findings therefore show that the open-ended questions used in the current study encouraged children to provide qualitative information regarding their experiences with E1 continuously throughout the interview.

As reported in Wyman and colleagues (under review), children's abilities to maintain their lies improved significantly with age; however, no gender differences were found. Children in the FD condition had significantly higher lie-maintenance scores compared to those in the FA condition, while children's maintenance scores in the truth conditions corresponded to those in the FD condition. Children in the FA condition were therefore able to generate a false report on the open-ended questions, but they may have more difficulty maintaining that story when asked direct questions about the event[Wyman, J., Taieb-Lachance, C., Foster, I., Crossman, A., & Talwar, V. False denials and false accusations in school-aged children's disclosures of a theft. Manuscript submitted for publication., (Under Review)].

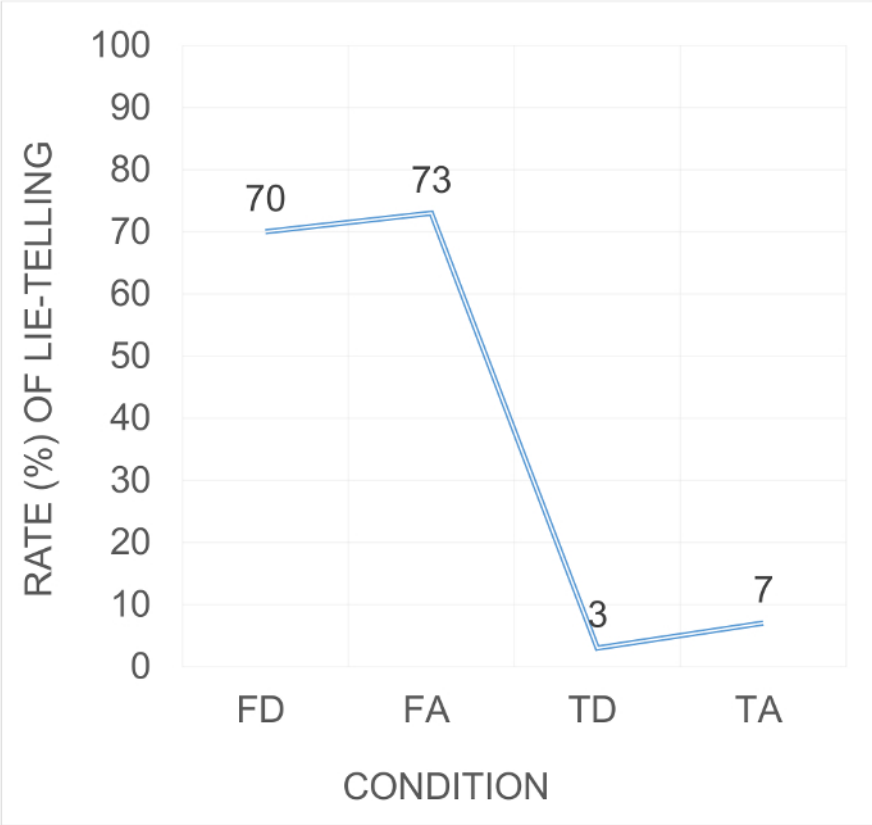

Figure 1: Children's Willingness to Lie within each Experimental Condition. The experimental conditions incited the appropriate responses from the participants as children (*N* = 103) were significantly more willing to provide false reports in the two lie-telling conditions, and give honest disclosures in the two truth conditions. No significant differences were found in children's willingness to provide an accusation versus a denial of the theft (true or false). Please click here to view a larger version of this figure.

	Response Length	Event Details
Free-Recall 1	87.11 (89.01)	2.11 (4.51)
Reverse-Order	60.37 (58.89)	0.79 (2.03)
Free-Recall 2	43.67 (49.22)	0.88 (2.25)

Table 1: Children's Mean (SDs) Response Length and Number of Event Details on each Open-ended Question. Across the three open-ended questions, children (*N* = 68) provided free-recall disclosures regarding their experiences with E1, as well as some specific details about the theft. Although children provided the longest disclosure with the most event details on the first free-recall question, the reverse-order and second free-recall question did encourage children to talk more about their experiences with E1, and give some new information about the wallet situation.

Discussion

The current methodology is designed to provide researchers with an ecologically valid method for evaluating different types of children's true and false reports. The representative findings suggest that the current methodology can encourage children to provide both false denials and false accusations about a high-cost event. In comparison to past studies that only examined children's false denials after witnessing a low-cost event (*e.g.*, breaking a toy)[8, 9, 12], the current study can produce generalizable information about child testimonies as the participants will witness a high-cost event before telling different types of true and false reports. The use of a high-cost event may enable children to potentially experience some of the emotional discomfort, cognitive dissonance and/or mental effort associated with making intentional false statements. It is worth noting, however, that no child participants showed emotional distress at the end of the study, and no adverse incidents were reported during or after the study. This paradigm was carefully constructed to create an ecologically relevant crime situation, while still minimizing the risks to the child participants. Even though children will experience a high-cost event that can cause some discomfort, the current paradigm is not designed to cause serious distress that corresponds to the real life experiences children may testify about. Thus, the challenge for researchers is to create ecologically valid contexts that examine children's abilities to provide different types of true and false reports, while still upholding ethical standards and not causing harm to the participants.

Unlike past studies that only used a small number of closed-ended questions to interview the children[10-11, 23-25], the present study utilizes an empirically supported interview structure that was designed to elicit cognitive load on the responders and encourage detailed disclosures. The interview includes a number of closed and open-ended questions, which will allow researchers to acquire comprehensive information

regarding the quality of children's true and false testimonies (story maintenance), as well as the amount and type of information they are willing to disclose about a high-cost event. The representative results suggest that each open-ended question used in the interview encouraged children to provide detailed information about their experiences with E1. However, if some children were unwilling or unable to give thorough responses on the open-ended questions, the closed-ended questions could be used to gather more direct information from them. For these reasons, the ecologically valid interview structure will enable researchers to obtain generalizable data on the characteristics of children's true and false testimonies that can have direct implications to the legal and forensic fields.

There are some critical steps to this paradigm that can invalidate the results if they are not designed and/or administered properly. It is important that the two researchers conducting the study (E1 and E2) do not add or remove any information from their scripted dialogue. Children's behavior during the study, such as their willingness to lie and the type of information they disclose, can be influenced by what E1 and E2 say to them. Thus, each child should receive the same interview and information about the theft (based on their condition), and no information should be added or omitted. Also, child-parent interaction should be limited after the study begins. Previous research suggests that parents are very successful at persuading their children to tell a truth or lie[12, 14, 43]. A child's reaction to the theft and being asked to lie may be different if a parent witnesses the theft and/or discusses it with them before the interview. If a parent does interact with their child during the study, such as taking them to the washroom, the experimenters should ask the parents if any discussion of the study took place during that time. In the case that the experimenters believe that the parent influenced the child's behavior during the study, such as by discussing the wallet-situation with them, then that child's data should be excluded from the statistical analyses. Furthermore, children must not be aware of the true nature of the experiment until after the interview with E2. In order to acquire ecologically valid information on children's true and false testimonies, the participants must believe that everything they are experiencing in the study is real. If a child discloses that they are aware of the experimental nature of the study, the true denial condition should be used as the child will simply be disclosing information from memory about a non-threatening event (as no theft had taken place).

There are some limitations that should be considered when using this paradigm. First, it is unclear whether the current methodology can be used with clinical populations. For example, children with disruptive behavior disorders are more likely to have problems with aggression and impulse-control when encountered with an adverse situation[44-46]. In addition, children who have previous experiences with trauma may be reluctant to discuss the theft situation and/or react negatively to the study's procedures[21-22]. If researchers want to use clinical populations, pilot studies should be conducted to determine if any modifications or alternative research methods are needed before implementing this paradigm.

Second, the amount of time children spend with E1 and E2 should be controlled for. Past research suggests that children are more inclined to lie to an unfamiliar adult compared to someone they know[25], and are more willing to lie to conceal the transgression of someone they know[14]. For this reason, the amount of time the child spends with E1 and E2, and their familiarity and relationship to them, can potentially influence their behavior during the study.

Third, the current study assesses how children produce true and false testimonies; nevertheless, it does not explain why children tell truths and lies. Researchers can therefore make modifications to the paradigm, such as by using questionnaires and/or debrief interviews at the end of the study, to better understand each child's reasoning for their behavior during the study, as well as their reflections of their experiences with the interview. Finally, some false accusations incorporate children being asked by the offender to accuse an innocent individual of committing the transgression[47]. In the current study, however, children are given permission by the instigator (E1) to falsely accuse E1 of the theft, rather than falsely accusing another without the consent of the accused. Thus, an alternative false accusation condition can include children being asked to falsely accuse an innocent third-party, which may generalize better to situations where children are asked to make false accusations.

Finally, the current study used an interview that took elements from the Cognitive Interview and the NICHD interview protocols. While the NICHD is regularly used with children and been found to be an effective interview method, the Cognitive Interview is not as commonly used with children although there is some evidence to suggest it is also effective with this population[29]. However, actual forensic interviews do not always follow either protocols. Future modifications could be made to the interview to reflect the most common forensic interviews or specific interview protocols.

The expected results from the current study can be beneficial to law enforcement, legal staff and professionals who interview children. The use of a more generalizable paradigm that encourages children to provide different types of false reports with a real-life interview structure can enable legal professionals to develop a greater understanding of the social and developmental characteristics of children's true and false testimonies. Moreover, by understanding how children produce different types of false reports, future researchers and legal professionals can develop strategies for encouraging honest disclosures. Past findings on the characteristics of adults' testimonies when using real-world interviews, such as the CI, have also been used to develop, and later evaluate the effectiveness of verbal and nonverbal lie-detection tools[48-51]; yet, very little research has evaluated the effectiveness of these lie-detection tools with children. Therefore, the data obtained from the experimental interviews with the children can potentially be used to assess the efficacy of different lie-detection tools, and develop new ones.

Disclosures

The authors declare that they have no competing financial or conflicts of interests in regards to this manuscript.

Acknowledgements

This research was supported in part by a grant from the Social Science and Humanities Research Council. Also, a special thank you to the many families who participated in this study, and the volunteers and research staff who helped with the data collection.

References

1. Talwar, V., & Crossman, A. From little white lies to filthy liars: The evolution of honesty and deception in young children. *Adv. Child. Dev. Behav.* **40**, 139-179, (2011).
2. Talwar, V., & Crossman, A. M. Children's lies and their detection: Implications for child witness testimony. *Dev. Rev.* **32***(4),* 337-359, (2012).
3. Brennan, M. The battle for credibility: Themes in the cross-examination of child victim witnesses. *Int. J. Semiotic. Law.* **7** (1), 51-73, (1994).
4. Gardner, R. A. *True and false accusations of child sex abuse.* Creative Therapeutics, Cresskill, NJ, (1992).
5. Garven, S., Wood, J. M., Malpass, R. S., & Shaw III, J. S. More than suggestion: The effect of interviewing techniques from the McMartin Preschool case. *J. Appl. Psychol.* **83** (3), 347-359, (1998).
6. Pipe, M., & Wilson, J. C. Cues and secrets: Influences on children's event reports. *Dev. Psychol.* **30** (4), 515-525, (1994).
7. Bottoms, B. L., Goodman, G. S., Schwartz-Kenney, B. M., & Thomas, S. N. Understanding children's use of secrecy in the context of eyewitness reports. *Law. Hum. Behav.* **26** (3), 285-313, (2002).
8. Gordon, H. M., Lyon, T. D., & Lee, K. Social and cognitive factors associated with children's secret-keeping for a parent. *Child. Dev.* ***85****.* (6), 2374-2388, (2014).
9. Lyon, T. D., Malloy, L. C., Quas, J. A., & Talwar, V. A. Coaching, truth induction, and young maltreated children's false allegations and false denials. *Child. Dev.* **79** (4), 914-929. (2008).
10. Talwar, V., & Lee, K. Development of lying to conceal a transgression: Children's control of expressive behavior during verbal deception. *Int. J. Behav. Dev.* ***26****.* (5), 436-444, (2002).
11. Talwar, V., & Lee, K. Social and cognitive correlates of children's lying behavior. *Child. Dev.* **79** (4), 866-881, (2008).
12. Talwar, V., Lee, K., Bala, N., & Lindsay, R. C. L. Children's lie-telling to conceal a parent's transgression: Legal implications. *Law. Hum. Behav.* **21** (4), 405-426, (2004).
13. Quas, J. A., Davis, E., Goodman, G. S., & Myers, J. E. B. Repeated questions, deception, and children's true and false reports of body touch. *Child. Maltreat.* **12** (1), 60-67, (2007).
14. Tye, M. C., Amato, S. L., Honts, C. R., Devitt, M. K., & Peters, D. The willingness of children to lie and the assessment of credibility in an ecologically relevant laboratory setting. *Appl. Dev. Sci.* **3** (2), 92-109, (1999).
15. Kelley, S. J. Ritualistic abuse of children. In: *The APSAC Handbook on Child Maltreatment.*Briere, J., Berliner, L., & Bulkley, J. A., Jenny, C., & Reid, T. eds., Sage, Thousand Oaks, CA, 90-99, (1996).
16. Kopetski, L. M., Rand, D. C., & Rand, R. Incidence, gender, and false allegations of child abuse: Data on 84 parental alienation syndrome cases. In: *The International Handbook of Parental Alienation Syndrome.* Gardner, R. A., Sauber, S. R., & Lorandos, D. eds., Charles C. Thomas Publisher Limited, Springfield, IL, 65-70, (2006).
17. Nathan, D., & Snedeker, M. *Satan's silence.* Basic Books, New York, NY, (1995).
18. Trocmé, N., & Bala, N. False allegations of abuse and neglect when parents separate. *Child. Abuse. Negl.* **29** (12), 1333-1345, (2005).
19. Famularo, R. Psychiatric comorbidity in childhood post-traumatic stress disorder. *Child. Abuse. Negl.* ***20****.* (10), 953-961, (1996).
20. Gabbay, V., Oatis, M., Silva, R., & Hirsch, G. *Post- traumatic stress disorders in children and adolescents.*Nortan & Company Inc, New York, NY, (2004).
21. Ullman, S. E. Relationship to perpetrator, disclosure, social reactions, and PTSD symptoms in child sexual abuse survivors. *J. Child. Sex. Abus.* **16** (1), 19-36, (2007).
22. Ullman, S. E., & Filipas, H. H. Gender differences in social reactions to abuse disclosures, post-abuse coping, and PTSD of child sexual abuse survivors. *Child. Abuse. Negl.* **29** (7), 767-782, (2005).
23. Evans, A. D., & Lee, K. Emergence of lying in very young children. *Dev. Psychol.* **49** (10), 1958-1963, (2013).
24. Talwar, V., Gordon, H. M., & Lee, K. Lying in the elementary school years: Verbal deception and its relation to second-order belief understanding. *Dev. Psychol.* **43** (3), 804-810, (2007).
25. Williams, S. M., Kirmayer, M., Simon, T., & Talwar, V. Children's antisocial and prosocial lies to familiar and unfamiliar adults. *Infant. Child. Dev.* **22** (4), 430-438, (2013).
26. Fisher, R. P., & Geiselman, R. E. *Memory enhancing techniques for investigative interviewing: The cognitive interview.* Charles C. Thomas Publisher Limited, Springfield, IL, (1992).
27. Lamb, M. E., Hershkowitz, I., Orbach, Y., & Esplin, P. W. *Tell me what happened: Structured investigative interviews of child victims and witnesses.* Wiley-Blackwell, Chichester, UK, (2008).
28. Lyon, T. D. Interviewing children. *Annual Review of Law and Social Science.* **10** (10), 73-89, (2014).
29. Milne, R., & Bull, R. Does the cognitive interview help children to resist the effects of suggestive questioning? *Legal. Criminol. Psychol.* **8** (1), 21-38, (2003).
30. Memon, A., Meissner, C. A., & Fraser, J. The Cognitive Interview: A meta-analytic review and study space analysis of the past 25 years. *Psychol. Public. Policy. Law.* **16** (4), 340-372, (2010).
31. DePaulo, B. M., Lindsay, J. J., Malone, B. E., Muhlenbruck, L., Charlton, K., & Cooper, H. Cues to deception. *Psychol. Bull.* **129** (1), 74-118, (2003).
32. Lee, K. Little liars: Development of verbal deception in children. *Child. Dev. Perspect.* **7** (2), 91-96, (2013).
33. Vrij, A., Fisher, R., Mann, S., & Leal, S. Detecting deception by manipulating cognitive load. *Trends. Cogn. Sci.* **10** (4), 141-142, (2006).
34. Vrij, A., Mann, S. M., Fisher, R. P., Leal, S., Milne, R., & Bull, R. Increasing cognitive load to facilitate lie detection: The benefit of recalling an event in reverse order. *Law. Hum. Behav.* **32** (3),.252-265, (2008).
35. Van't Veer, A., Stel, M., & van Beest, I. Limited capacity to lie: Cognitive load interferes with being dishonest. *Judgm. Decis. Mak.* **9** (3), 199-206 (2014).
36. Liu, M., Granhag, P. A., Landstrom, S., Roos af Hjelmsater, E., Stromwall, L., & Vrij, A. "Can you remember what was in your pocket when you were stung by a bee?": Eliciting cues to deception by asking the unanticipated. *The Open Criminology Journal,.* **3**,.31-36, (2010).
37. Vrij, A., Leal, S., Mann, S., & Fisher, R. Imposing cognitive load to elicit cues to deceit: Inducing the reverse order technique naturally. *Psychol. Crime. Law.* **18** (6),.579-594, (2012).
38. Gabbert, F., Hope, L., Fisher, R. P., & Jamieson, K. Protecting against misleading post-event information with a self-administered interview. *Appl. Cogn. Psychol.* **26** (4), 568-575, (2012).

39. Gentle, M., Milne, R., Powell, M. B., & Sharman, S. J. Does the cognitive interview promote the coherence of narrative accounts in children with and without an intellectual disability?. *Intl. J. Disabil. Dev. Educ.* **60** (1), 30-43, (2013).
40. Hines, A., Colwell, K., Anisman, C. H., Garrett, E., Ansarra, R., & Montalvo, L. 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 (2010).
41. Porter, S., & Yuille, J. C. The language of deceit: An investigation of the verbal clues to deception in the interrogation context. *Law. Hum. Behav.* **20** (4), 443-459, (1996).
42. Suckle-Nelson, J. A., Colwell, K., Hiscock-Anisman, C., Florence, S., Youschak, K. E., & Duarte, A. Assessment criteria indicative of deception (ACID): Replication and gender differences. *The.Open Criminology Journal.*, **3** (1), 23-30, (2010).
43. Talwar, V., Murphy, S., & Lee, K. White lie-telling in children for politeness purposes. *International Journal of Behavioral Development.* **31**, 1-11. (2007).
44. Gervais, J., Tremblay, R. E., Desmarais-Gervais, L., & Vitaro, F. Children's persistent lying, gender differences, and disruptive behaviours: A longitudinal perspective. *Int. J. Behav. Dev.* **24** (2), 213-221, (2000).
45. Ostrov, J. M. Deception and subtypes of aggression during early childhood. *J. Exp. Child. Psychol.* **93** (4), 322-336, (2006).
46. Stouthamer-Loeber, M., & Loeber, R. Boys who lie. *J. Abnorm. Child. Psychol.* **14** (4), 551-564, (1986).
47. Black, F., Schweitzer, R., & Varghese, F. Allegations of child sexual abuse in family court cases: A qualitative analysis of psychiatric evidence. *Psychiatr. Psychol. Law.* **19** (4), 482-496, (2012).
48. Colwell, K., Hiscock, C. K, & Memon, A. Interviewing techniques and the assessment of statement credibility. *Appl. Cogn. Psychol.* **16** (3),.287-300, (2002).
49. Vrij, A., Granhag, P. A., & Porter, S. Pitfalls and opportunities in nonverbal and verbal lie detection. *Psychol. Sci. Public. Interest.* **11** (3), 89-121, (2010).
50. Walczyk, J. J., Griffith, D. A., Yates, R., Visconte, S. R., Simoneaux, B., & Harris, L. L. Lie detection by inducing cognitive load eye movements and other cues to the false answers of "witnesses" to crimes. *Crim. Justice. Behav.* **39** (7), 887-909, (2012).
51. Walczyk, J. J., Igou, F. P., Dixon, A. P., & Tcholakian, T. Advancing lie detection by inducing cognitive load on liars: A review of relevant theories and techniques guided by lessons from polygraph-based approaches. *Front. Psychol.* **4** (14), 1-13, (2013).

