LIE TO ME

COMPLIANT FALSE ACCUSATIONS BY CHILDREN

A Thesis

Presented to the Faculty of the Graduate School

of Cornell University

in Partial Fulfillment of the Requirements for the Degree of

Master of Arts

by

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ABSTRACT

In contrast to the literature showing that repeated suggestive interviews can contaminate children's memory, in the current study we simply asked children to make a false accusation in order to help others. Results demonstrated that children would comply with an adult's request to make an accusation even if they did not have first-hand knowledge of its accuracy. Interestingly, the initial compliance seemed to create false memories in some young children because they subsequently claimed to remember seeing the false event. In a second study we further explored the extent to which children would come to remember their own false statements. High rates of false memory were found in both children and adults when they believed their statements were accurate. In addition, younger participants also developed false memories for statements that they had previously believed were false. The findings of both experiments illustrate the dangers of pressing children to make accusations.

Keywords: interviewing, memory, witnesses, age differences.

BIOGRAPHICAL SKETCH

Amelia Courtney Hritz was born in New York City. She received her B.A. in Mathematics and Psychology from the Johns Hopkins University in 2009 and her M.A. in Forensic Psychology from John Jay College of Criminal Justice, City University of New York in 2012. While attending John Jay, she also worked full-time as a paralegal and completed a clinical psychology externship at Kirby Forensic Psychiatric Center in New York City. Since 2012, she has studied at Cornell University as part of a JD/PhD program in Law and Developmental Psychology and lived in Ithaca, New York with her partner Alexander Bodell and their two dogs.

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CHAPTER 1

INTRODUCTION

In February 2014, Dylan Farrow wrote about abuse she suffered at the hands of her father, Woody Allen, in a letter to the New York Times (Farrow, 2014). Farrow described a time when they were playing with trains in the attic and Allen sexually assaulted her. In addition to that incident, she stated that she often did not like the way he would try to be alone with her and stick his thumb in her mouth or be in bed with her wearing only his underwear.

In response, Woody Allen also wrote to the New York Times and categorically denied all abuse (Allen, 2014). Allen described his acrimonious split with Farrow's mother, Mia Farrow, and how she created an "atmosphere of fear and hate towards him" (Allen, 2014 quoting their son Moses Farrow). Allen does not believe Dylan Farrow is lying. Instead, she has false memories of being abused as a consequence of years of repeated suggestions by Mia Farrow. Dylan's piece generated over 3,500 comments ranging from support for Dylan ("[y]ou are brave and strong and I support you in speaking out." (Bonnie M., 2014) to disgust with Allen ("I've boycotted his movies for all these years…Mia fought him as well as she could" (Huntley, 2014). Fewer comments supported Allen's presumed innocence: "there is nothing in Dylan's letter or apparently in the investigation to convince anyone that the abuse really happened" (WHM, 2014). Allen's piece likewise generated close to 2,500 comments that were a mix of support "it would be amazing right now if Mia would just admit publicly that she made this all up due to her jealously" (Julie, 2014) and contempt "Allen's article is a self-serving and vicious attempt to mislead the public about the facts of the case" (Sachs, 2014).

This discussion about what happened to Dylan Farrow has brought attention back to the debate over suggested child memories that inspired a vast amount of research on child memory

when the allegations of sexual abuse by Allen were made over twenty years ago. While we cannot know what happened between Allen and Farrow, previous research has shown that it is possible for adults with biases to alter children's memories through repeated suggestion.

Interviewer Bias

Adults with *a priori* beliefs about abuse may single-mindedly attempt to gather only confirmatory evidence and to avoid all avenues that may produce contradictory allegations. Biased interviewers tend to do this by not asking questions that might require alternate explanations. In addition, when provided with an inconsistent or ambiguous disclosure, biased interviewers either ignore the disclosure or interpret it within the framework of their initial hypothesis. Biased interviewers will alert the child to their beliefs through methods such as repeating specific misinformation**,** offering bribes or threats of punishment, and selectively reinforcing children's statements. This social pressure can cause the child to make statements that are consistent with the belief of the interviewer rather than the child's experiences (for a review see Bruck, Ceci, & Principe, 2006).

Even mild forms of suggestion have been found to increase inaccurate reports by children, such as inaccurate descriptions of events by parents (e.g. Poole & Lindsay, 2001), statements that their peers have already told (Principe & Ceci, 2006) or even natural sharing of memories in conversations with parents and peers (Principe & Schindewolf, 2012).

Source Credibility

The expertise of the interviewer also plays an important role in the impact of the suggestive interview. Smith and Ellsworth (1987) found that when adults were asked misleading questions by interviewers who were portrayed as more knowledgeable about the crime than the participants themselves, they were more likely to make errors consistent with the suggestions.

The adults who were suggestively interviewed by naive questioners responded similarly to the neutral interview group. Studies of children have found that they are more likely to be suggestible when the interviewers are more familiar (Bjorklund et al., 2000). Overall, studies suggest that credibility information may be more powerful for older children, but not necessarily preschool-age children as their ability to react sensitively to social demands is still developing (see Schwarz & Roebers, 2006).

Source Misattribution

In addition to causing inaccurate reports, suggestive interviews can also cause children to have false beliefs. Ceci and his colleagues hypothesized that biased interviewers may initially cause children to make inaccurate reports out of compliance to social pressure, but children can come to incorporate these inaccurate statements into their memory (Ceci, Kulkofsky, Klemfuss, Sweeney & Bruck, 2007). One theoretical approach to false memory is the source-monitoring framework. Source monitoring is the process of identifying the origins of memory, knowledge or beliefs (Johnson, Hashtroudi & Lindsay, 1993). The differentiation between sources is made based on differences in characteristics of memories for various sources such as the amount of perceptual information. For example, a memory with a great deal of visual and auditory information may be attributed to something that was experienced rather than imagined. Source attributions can also be based on the extent to which the memory activates schemas that are more consistent with a particular source. Therefore, according to the source-monitoring framework, memory errors are made when misled participants erroneously identify memories derived from the misleading information as memories derived from the witnessed event (Johnson et al., 1993). For example, children may come to regard the inaccurate statements as true confusing the mental

images inspired by the suggestive interview with the images generated during an actual experience (Ceci, Loftus, Leichtman, & Bruck, 1994).

Forced Confabulation

Ackil and Zargoza (1998) examined if forcing children to confabulate accounts of fictitious events would later cause them to have memories of the events. Ackil and Zargoza suggested that self-generated fictitious events could be even more susceptible to source misattribution than the interviewer's suggested misinformation because the content will be consistent with the individual's idiosyncratic knowledge and beliefs. Consistent with their expectation, results indicated that participants who were forced to answer questions about events they had never witnessed later came to misremember as real some of the details they had knowingly confabulated. Furthermore, the impact of forced confabulation decreased with age, with six year olds more likely than eight year olds, who are in turn more likely than college students to remember their confabulated statements as true. Multiple studies have confirmed this result and further shown that when children and adults are coerced into providing testimony about events they never experienced and receive confirmatory feedback, they can develop highly confident false memories (Hanba & Zaragoza, 2007; Frost, LaCroix, & Sanborn, 2003; Zaragoza, Payment, Ackil, Drivdahl, & Beck, 2001).

Plausibility

Another interpretation of how suggested false events become planted in memory is based on an individual's judgment about the plausibility of the event having occurred. If a suggested false event is judged to be true, details of the general scrip for the event can be used to construct a memory for the event (Pezdek, Blandon-Gitlin, Lam, Hart, & Schooler, 2006). Consistent with this theory, Pezdek, Finger & Hodge (1997) found that suggestions would be planted in memory

to the degree to which they are plausible and relevant to previous knowledge. This suggests that when asked to confirm whether an event happened, a person will compare it with his or her memory for related instances of that event to determine if it matches. Thus, if the event is more plausible, it is more likely to be reported as true. In addition, suggestions that are implausible are significantly less likely to be planted into memory (Pezdek et al., 1997; Pezdek & Hodge, 1999; Pezdek, Gabbay, & Blandon-Gitlin, 2006; Pezdek, Blandon-Gitlin et al., 2006).

Recollection Rejection

Alternatively, recollection rejection theory predicts that when misinformation is familiar and provokes a verbatim memory, it will be correctly rejected. Recollection rejection is based on fuzzy-trace theory, which postulates that events are encoded in two separate ways: the exact form (verbatim trace) and the general form (gist trace). These two traces are encoded at roughly the same time (see e.g. Brainerd & Reyna, 2002). Spontaneous false memory as measured by false acceptance of non-experienced events on recognition or recall tests is most often consistent with the gist of an experience. False events that are consistent with gist traces are likely to be erroneously remembered because they seem familiar. Recollection rejection theory suggests that children may overcome the feeling of familiarity if the false-but-gist-consistent event provokes a verbatim memory (Brainerd & Reyna, 2002). For example, if children are able to retrieve their verbatim memory of an image of a house, they will be able to reject the suggestion that there was a newspaper in the driveway, even though it is consistent with their gist memory. According to fuzzy-trace theory, a verbatim trace is more likely to be recalled when it is accessible (based on delay, materials, age, instructions and prior testing) and when it is effectively cued. Brainerd and Reyna (2002) found that recollection rejection increases with age, but is still appears in children as young as pre-school age.

Taken together, source misattribution and recollection rejection indicate that uncertainty is an important antecedent to suggestibility. When participants' memories already contain a clear representation of the object, false information suggested afterwards is not likely to be incorporated into memory (Smith & Ellsworth, 1987). Once encoded, false memories can cause children to maintain inaccurate reports in later interviews and appear consistent over time. Efforts to retrieve accurate memories following the creation of false memories, such has telling children to say they do not know when they are unsure or to only disclose what actually happened to them, will not offset the impact of the false memory (e.g. Poole & Lindsay, 2001; Zargoza et al., 2001). In addition, even efforts to talk children out of their false beliefs can be unsuccessful (e.g. Ceci et al., 1994).

Age Trends

Historically, the research examining the rates of suggestibility has found that across a variety of paradigms, age is the most powerful predictor of suggestibility proneness, with younger children being more suggestible (see Ceci & Bruck, 1995 for review). Other variables, such as intelligence and language skills, have been found to predict suggestibility, although to a lesser extent (Bruck & Melnyk, 2004; Clarke-Stewart, Mallow & Allhusen, 2004). In addition, recent research has revealed that under certain circumstances, older children and adults are more suggestible and vulnerable to false memory (Brainerd, Reyna & Ceci, 2008). These "reverse age trends" are driven by more developed underlying knowledge and strategies (see e.g., Ceci, Papierno, & Kulkofsky, 2007). For example, greater associations among words can lead adults to be more likely than younger children to remember semantically related words that were never said, such as falsely recalling *sugar* was presented rather than *sweet* (see Brainerd et al., 2008 for review). More research is necessary to determine when legal contexts involve connected

meaning or age-related differences in scripts or semantic relatedness. Currently, most studies that involve legal context have found that younger children tend to be significantly more suggestible than older ones (Brainerd & Reyna, 2012).

Current Study

Previous research has focused primarily on repeated suggestive interviews that contaminate children's memory or cause them to comply with interviewers' beliefs. In contrast to this voluminous literature, in the current study we avoided suggestive questioning and simply requested that children to make a false accusation in order to help others. This alluringly straightforward and non-suggestive approach has not been employed in previous research but would seem to have important implications for court cases in which someone implores a child to make an accusation that at the time was understood to be false by the child (as was alleged by Allen, 2014). In the first study, we sought to answer two questions: (1) will children make a false accusation, merely because someone asks them to do so? And (2) will children maintain their false accusations in later interviews? In a pilot study and a follow-up experiment, we hypothesized that children will be more likely to make an accusation in both interviews if they are younger and more suggestible or have lower intelligence.

In a second study, we further explored the influence exerted on children's memories by adults in the first study. More specifically, the second study examined the different effects of children's perception of the accuracy of the adult's suggestion on their memories. We examined the extent to which children will come to incorporate statements that they initially knew were false into their memories. In addition, we widened our age range to further examine age trends. We hypothesized that both adults and children will be more likely to incorporate an adult's false suggestion into their memory when they believe it is true.

CHAPTER 2

EXPERIMENT 1

Method

Participants. Participants were elementary school-age children in Ithaca, NY. In total there were 70 children, ages 4-12 years old (M=8.53, SD=1.51), and 56% were male. 16 of these participants were enrolled in an elementary school after-school program. The remaining 54 were enrolled in 2-week sessions of summer camp at a children's science museum. Five participants were missing some data due to absences (n=2), equipment failure (n=2), or refusal to complete study (n=1).

Procedure. *Pilot Study*. Two clowns performed a magic show for a group of approximately 40 children enrolled in an after-school program. A research assistant interviewed children individually about the magic show 1-5 days later (M=2.39, SD=1.16). First, children were asked to describe everything they remembered about the show. Then they were asked directed questions about the magic wand i.e. "do you remember seeing a magic wand?" Or, "did the magician do any tricks with a wand?" After the participants described all of their memories about the magic wand, they were shown a broken wand and asked to say the magician broke it (even though he did not). Specifically, the interviewer said the following: "We have heard from children in another school that the magician accidentally broke his wand. I need your help because there is only one magic wand left and we want other classes to get to see the magic show. Can you help me so we can make sure he doesn't do this again? Can you tell me the magician accidentally broke his wand?"

Approximately one week later, a new research assistant interviewed children and asked them to describe the magic show without prompts or suggestions.[1] In order to address the concern that children would maintain the accusation made in the first interview because they did not want to admit that they were untruthful in the first interview, not because they actually had a false memory, the research assistant explained that the first interviewer had made mistakes and it was not their fault. Other studies have used this method to reduce socially desirable consistent reporting (see e.g. Ackil & Zargoza, 1998). After explaining the previous interviewer's mistake, the research assistant asked the child if the magician really accidentally broke his wand. If the child said yes, the interviewer asked if they had seen it happen with their own eyes. By setting up the questions in this way, perceived desirable responding may be to claim that the magician did not break his wand. Children also completed the Video Suggestibility Scale for Children (Scullin & Ceci, 2001), a psychometric instrument that has been validated on this age group and shown to predict report errors.

Main Experiment. Data for the Experiment 1 were collected at the summer camp at a children's museum in Ithaca, NY. In addition, some changes were made to the procedures after the pilot study. Clowns were replaced with chemists because it may have seemed likely to children that the clown broke the wand due to his clumsiness even if the children had not witnessed it. Instead, a chemist performed "magic tricks" with chemistry, such as mixing acid and base to make a rainbow in a test tube.

The vocabulary subset of the Wechsler Abbreviated Scale of Intelligence by Wechsler (1999) was added to examine if a g-loaded measure of children's verbal intelligence predicted their responses to the first and second interview. Finally, the children were not shown a broken

[1] While we attempted to interview all children a week after the first interview, a few participants were not available until much later. Therefore our data contain some outliers and time delay ranged from 4 to 46 days (M=9.54, SD=9.8).

wand (or test tube) during the first interview, because in the pilot study the children seemed to take the presence of a broken wand as strong evidence of the magician breaking it. Thus, the children were not provided with any evidence that the chemist broke a test tube during the show that they saw, only the assertion that others had said he did so during a different camp session.

Results

The number of participants in each condition who made false accusations is presented in Table 1. The participants who saw the magic show and the broken wand were extremely likely to make the requested false accusation: 15 out of 16 children stated that the magician accidentally broke his wand. Most participants (71%) maintained this accusation in the neutral second interview, but no children said they actually saw it happen.

Participants in the chemistry show group, who were not presented with evidence in the form of a broken test tube, were less likely to make false accusations. However, most of these children (63%) still were willing to state that the chemist broke the test tube. One week later during the neutral interview, fewer children (25%) maintained the accusation, and fewer still (9%) said they saw the chemist break it. In addition, of the 23 who made the false accusation during the neutral 2nd interview, 20 maintained this false allegation despite never having been shown a broken test tube and being told the first interviewer made mistakes. On a positive note, 67% of participants accurately did not make the accusation during the neutral interview. Ultimately 7% of the participants maintained the false allegation and claimed to have witnessed it with their own eyes despite very little suggestion during the previous interview.

Table 1:

Total Number of Participants Making False Accusations

	Magician (T1 n=16) (T2 n=14)		Chemist (T1 n=54) (T2 n=53)		Total (T1 n=70) (T2 n=67)	
	No	Yes	No	Yes	No	Yes
Interview 1						
Non-suggested Memory	16 (100%)	0 (0%)	54 (100%)	0 (0%)	70 (100%)	0 (0%)
Accusation	1 (6%)	15 (94%)	20 (37%)	34 (63%)	21 (30%)	49 (70%)
Interview 2						
Accusation	4 (29%)	10 (71%)	40 (75%)	13 (25%)	44 (66%)	23 (33%)
Memory	14 (100%)	0 (0%)	48 (91%)	5 (9%)	62 (93%)	5 (7%)

The data from the two experiments were analyzed using logistic regression Age was marginally significant in predicting false allegations during the first interview and maintaining them during the second interview, X^2 (1, N = 53) = 3.66, p = 0.06. Six and seven-year-olds were more likely to comply during the first interview, but were equally likely to maintain the false allegation during the second interview. Interestingly, the 9 participants who stated that they actually saw it happen were all eight-years old or younger.

T tests and categorical analysis examining differences in suggestibility and vocabulary among children who made false allegations did not lead to significant results. These tests were underpowered, with only 8% power to detect suggestibility differences and 6% power to detect vocabulary differences at the 0.05 significance level given sample and effect sizes. Follow-up work with larger and more cognitively diverse (in terms of verbal intelligence and suggestibility-proneness) samples is needed to provide a more robust test.

Individual Differences. *Vocabulary*. Raw scores on the vocabulary subset of the Wechsler Abbreviated Scale of Intelligence were calculated based on the general scoring principles (Wechsler, 1999). These raw scores were converted to T-scores, which are age-corrected and have a wide range of scores (Wechsler, 1999). Results indicated that vocabulary was normally distributed ($M = 63.53$, $SD = 11.44$, $n = 53$) with negative skew. Vocabulary data is only available for participants who observed the chemistry show. Results indicated that vocabulary was not significantly different for participants who made allegations during either interview. In addition, vocabulary was not correlated with age or suggestibility and was not significantly different for males and females.

Suggestibility. Scores on the Video Suggestibility Scale for Children were normally distributed with a slight positive skew ($M = 39.08$, $SD = 9.44$, $n = 66$). Results indicated that vocabulary was not significantly different for participants who made false allegations during either interview. Suggestibility was not correlated with age or vocabulary and was not significantly different for males and females (all p's > 0.05). In addition, participants who saw the magic show and participants who saw the chemistry show did not significantly differ on their suggestibility scores. These results were not different when the "yield" and "shift" scores were examined separately, and therefore the combined scores were used for the remaining analyses.

Predicting Which Participants Will Make a False Accusation. We estimated a logistic regression model to predict which participants will make a false accusation in the first interview from show type (magic or chemistry), time delay since show, age, gender, and suggestibility score (from Video Suggestibility Scale for Children). We used dummy codes for all categorical predictors, mean-centered age and standardized suggestibility.

Results of the regression are displayed in Table 2. The probability of making an accusation is 15.42 times the probability of not making an accusation when the show type is magician, time delay is average (2.39 days), age is average (8.53 years), gender is female, suggestibility is average (9.64). None of these predictors significantly changed the odds of making a false accusation. The type of show was marginally significant ($p < 0.10$), with the odds of making an accusation in the chemist condition.15 times the odds of making an accusation in the magician condition. When analyses were run without taking into account suggestibility, show type was a significant predictor.[2]

Table 2:

Logistic Regression Predicting Who Will Make a False Accusation

	B	SE	Odds
Intercept	2.74**	1.14	15.42
Show Type	-1.91+	1.15	0.15
Time Delay	0.10	0.30	1.10
Age	-0.09	0.19	0.92
Gender	-0.50	0.59	0.60
Suggestibility	0.08	0.29	1.08

Note: **$p < 0.01$, *$p < 0.05$ +$p < 0.10$.

[2] Vocabulary was not measured for the children who saw the magic show. Therefore when analyses were run with the standardized vocabulary variable included as a predictor, data only included the participants who saw the chemistry show (n=54). These results indicated that vocabulary was not a significant predictor.

While age was not a significant predictor it is interesting to note that all seven of the youngest children made the false allegation (see Figure 1). It is possible that with more participants, age would be a significant predictor.

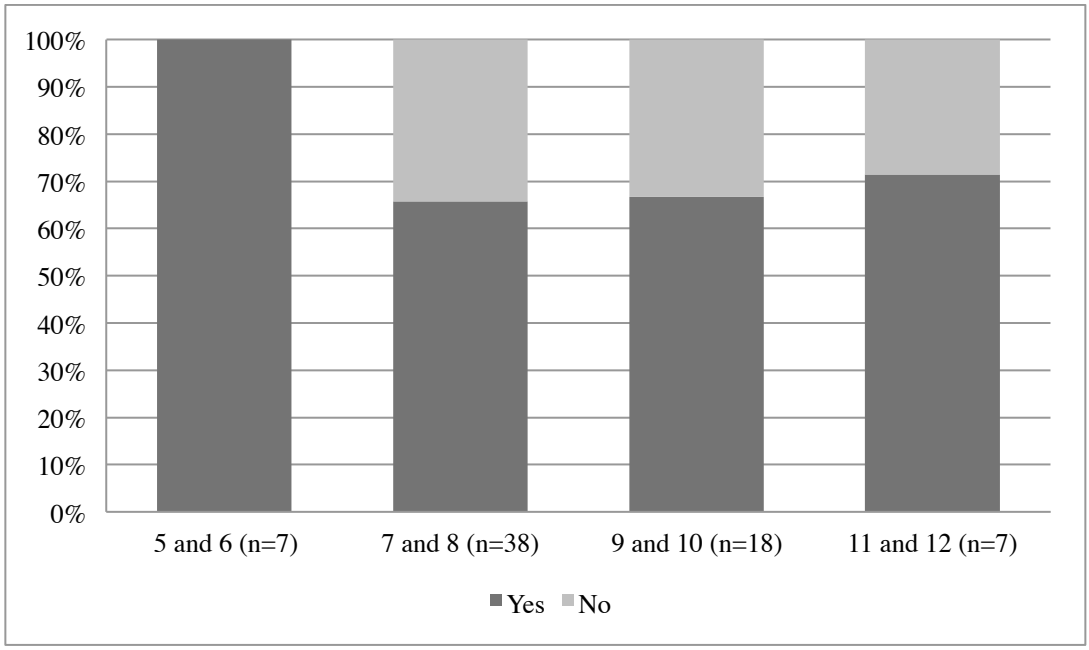

Figure 1. False accusations by age. The percent of participants making false accusations did not significantly differ by age group.

Predicting Which Participants Maintain the False Accusation. Next, a logistic regression was run to predict who would maintain the false accusation during the second interview. In addition to the variables considered in the previous regression (show type, time delay show, age, gender, suggestibility), this regression took into account whether the participant made an accusation during the first interview. As displayed in Table 3, results indicated that during the second interview, the odds of making the false accusation in the magician condition are approximately 33 times higher than the odds of making an accusation in the chemist condition ($p < 0.01$). During the second interview, with each increase in age of 1 year, the overall

odds of making a false allegation multiply by 0.61, which is statistically significant ($p < 0.05$). In addition, as the time delay since the show increases by 1 day, the odds of making an accusation multiply by .91, which is marginally significant $p < 0.07$. Surprisingly, participants' first interview response did not significantly predict their second interview response when all other variables were held constant. Gender and suggestibility continued to not be significant predictors.

Table 3:

Logistic Regression Predicting Who Will Maintain the Accusation

	B	SE	Odds
Intercept	1.53	1.38	4.60
T1 Compliance	0.96	0.76	2.60
Show Type	-3.53**	1.28	0.03
Time Delay	-0.09+	0.05	0.91
Age	-0.49*	0.24	0.61
Gender	-0.19	0.66	0.82
Suggestibility	-0.15	0.34	0.86

Notes: **$p < 0.01$, *$p < 0.05$ +$p < 0.10$

Figure 2 illustrates the age trends in making a false accusation, with the percent of children making false accusations decreasing with age.

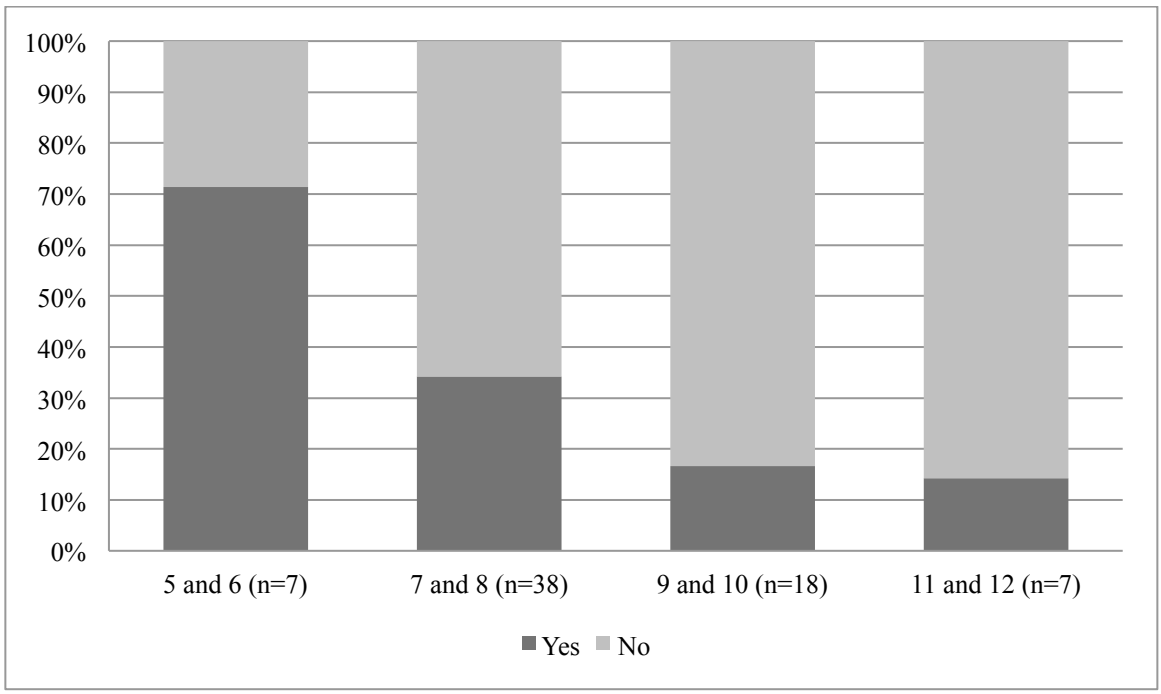

Figure 2: Maintained false accusations by age. The percent of participants maintaining false accusations decreased as age increased.

When the regression included vocabulary, which was available only for the participants who saw the chemistry show, the odds of making a false accusation are very low (.01, $p < 0.05$) this suggests that after controlling for vocabulary the odds of making an accusation decrease. In addition, the time delay is a significant predictor of maintaining the accusation over time ($p < 0.05$), with each additional day increasing the likelihood that and individual with maintain the accusation. Age was a moderately significant predictor of maintaining the accusation, with the probability decreasing as age increases ($p = 0.07$). Other predictors were not significant (including vocabulary).

Predicting False Memories. In total, 5 of the children who watched the chemistry show said they saw the chemist break the test tube despite being told that the previous interviewer had made mistakes. As displayed in Figure 3, all of these children were 8 years old and younger. This age difference was significant, t (51)= 2.02, $p < 0.05$.

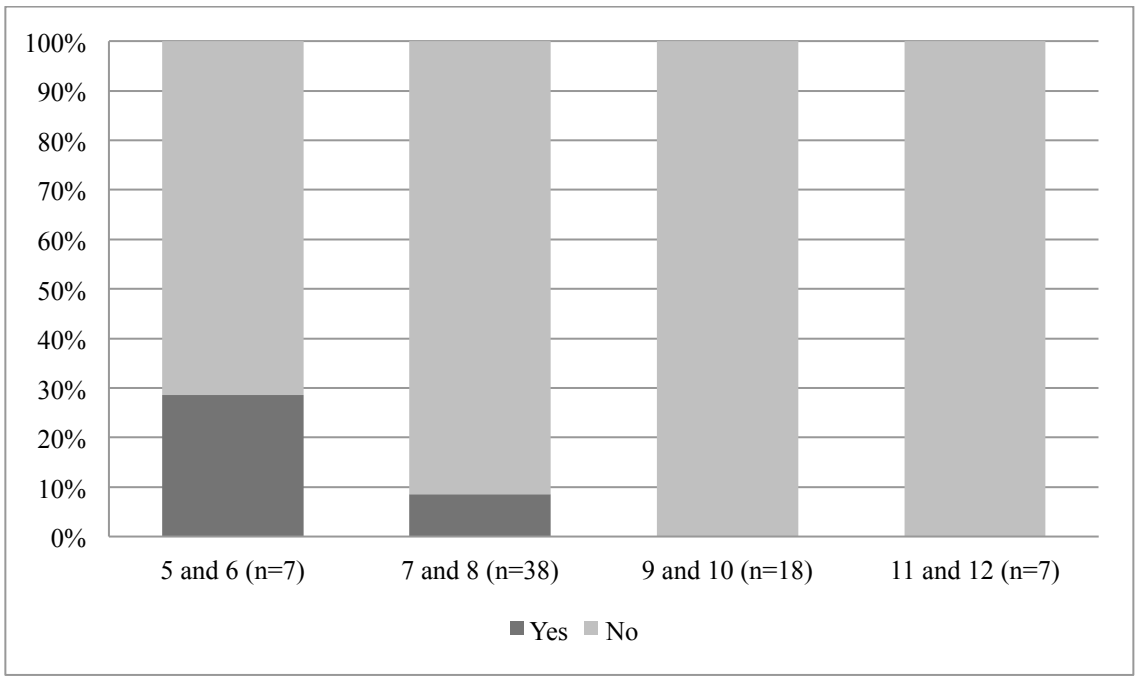

Figure 3: False memories by age. Participants who said they saw it happen were in the youngest age groups.

Further comparisons of the participants based on the presence of false memories did not lead to significant results, which is likely due to the small sample size.

CHAPTER 3

EXPERIMENT 2

Results of the pilot study and Experiment 1 suggested that some children would comply with an adult's request to make a false accusation even if they do not have first-hand knowledge of its accuracy. Questions remained about what caused some of the younger children to incorporate the false accusation into their memory. For example, we wondered if the act of making the false accusation was creating a forced confabulation effect and causing participants to remember the accusation as true (e.g. Ackil & Zaragoza, 1998). Alternatively, it is possible that the participants were convinced of the truth of the accusation by the first interviewer because it was highly plausible and the interviewer was credible (Pezdek et al., 1997; Schwarz & Roebers, 2006). Experiment 2 was conducted in order to explore this finding further. In particular, in the following experiment we manipulated whether the participant knew the suggestion was true of false and measured if this changed the rate at which the participant came to believe the suggestion.

Method

Participants. The second experiment was conducted in a children's science museum as part of an interactive exhibit to teach visitors about human memory. Visitors of all ages who passed the table could participate in the study, with 297 participants signing up for it, but 28 of them dropped out before completing the final survey. (One participant completed the study twice, so the data from the second survey was dropped.) The participants who dropped out were significantly younger, $t(185.38)=7.21$, $p<.001$, and more likely to be male, $t(291)=-2.02$, $p<.05$. The remaining 268 participants were between the ages of 3 and 63 ($M=11.79$, $SD=10.38$) and 38% were male, likely reflecting the demographics of daytime museum visitors.

Procedure. Visitors at the children's museum were asked if they would like to participate in our study and learn about memory. Parents or caretakers signed an informed consent document for themselves and/or their children. They also were asked to fill out a demographic information sheet before participating.

Participants were told they would be playing a game called "two truths and a lie" with two research assistants, one of whom would be on their team. The research assistant on their team (RA 1) told participants to look carefully at a picture for fifteen seconds, because they would be playing the game about the picture. Then RA 1 put the picture away and explained to the participant that she had come up with two true statements and one false statement about the picture (in reality the second statement is false, but RA 1 told the participant asserted that it is true). The three statements were: a) one of the windows was round, b) there was a newspaper in the driveway of the house, and c) there was a bench in front of the house. If the participant mentioned that the second true statement was actually false (i.e. there was no newspaper in the driveway), RA 1 would repeat that it is true, for example she would say: "I don't think so. I saw a newspaper in the driveway." If the participant continued to say that the statement was false, RA 1 would let the participant make up his or her own true statement and made a note of the change. There were three versions of the house picture that only differed in which statement was true, so the statement that was actually true systematically varied across conditions as a control for memorability of the three scenes.

RA 1 explained that it would be the participant's role to tell the statements to a second experimenter (RA 2), who will guess which statement is false. RA 1 stressed to participants that in order to win the game (and win stickers) the participant needed to pretend that all the statements were true so it would make it difficult for RA 2 to guess which of the three is false.

RA 2 always guessed that the true statement is false and so the participants always won. After playing the game, a third experimenter (RA 3) asked the participant true or false questions about the picture, including questions about the statements used in the game. This was done in the absence of RA 1 and RA 2.

Before asking the participant the questions, RA 3 stressed the importance of focusing on the picture instead of the game. RA 3 said, "now, can you think really hard about the picture of the house? Sometimes adults make mistakes, think back to before you played the game and remember what was really in the picture." In addition, RA 3 told participants that if he or she got a lot of the questions right the participant would win a second sticker. (In reality, participants were always given a second sticker.) Finally, RA 3 asked the participant if he or she noticed any mistakes that RA 1 made when they were playing the game. Afterwards, RA 3 revealed that the second true statement was actually false and gave a brief lesson about memory and suggestibility.[3]

Results

Question Type and Order Effects. Participants were always given the same three statements when they played the game: one of the windows was round, there was a newspaper in the driveway and there was a bench in front of the house. Which of these statements were true, false but described as true, or false varied across the six conditions. Participants' memory of the true, false-but-asserted-to-be-true, and false statements did not differ based on which statement they were given, $F(1,235) = 0.04$, $p > 0.05$, $F(1,235) = 0.05$, $p > 0.05$, $F(1,235) = 0.21$, $p > 0.05$

[3] Participants occasionally wanted to make up their own false statements for the game (n=8). These participants are considered to have missing data because we did not ask them about their memory for their made up false statements on the survey. In addition, one participant correctly identified that the false "true" statement was false and thus created a unique second true statement.

(respectively). In addition, participants were given one of three surveys with the order of the questions regarding the target statements varied. The order that participants were asked about the true, false true and false statements on the survey did not significantly change their memories of these statements, $F(1,235) = 0.96$, $p > 0$ .05, $F(1,235) = 3.32$, $p > 0.05$, $F(1,235) = 2.78$, $p > 0.05$ (respectively). In addition, there was no significant interaction between condition and survey order ($p > 0.05$). Therefore for the remaining analyses participants are collapsed across condition and survey order.

Memory by Statement Type. Results indicated that most participants answered the question about the false "true" statement (i.e., false but asserted to be true) incorrectly on the survey: only 22% correctly said that this statement was false. Thus, despite being told to focus on the picture and not the game, most participants stated that they remembered the item in the picture that was only mentioned in the game. In contrast, participants were highly accurate on the true and false statements (90% and 78%, respectively). The picture and the game were consistent for these items, so participants did not need to differentiate the source of their memory in order to be accurate. Figure 4 illustrates the number of correct and incorrect responses by statement type.

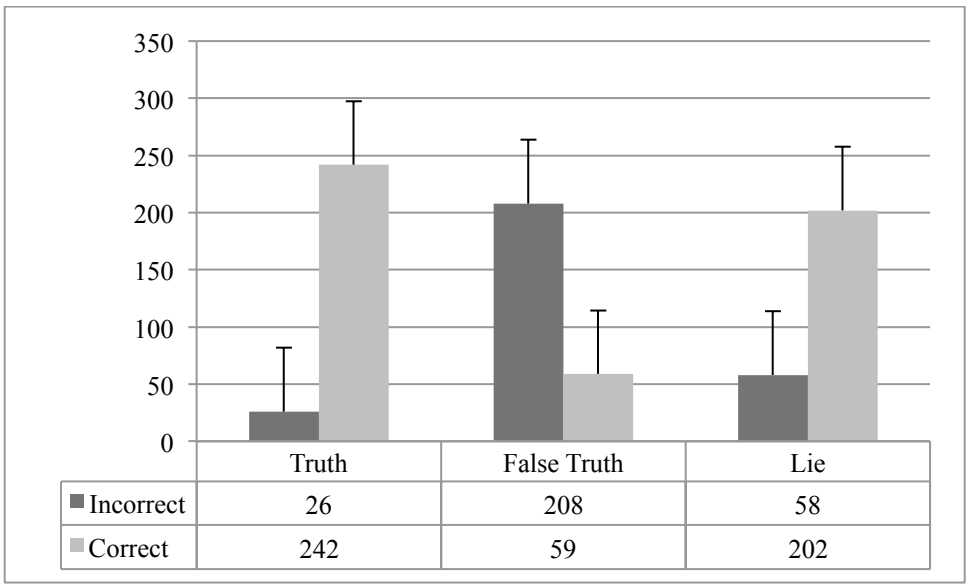

Figure 4: Number of correct and incorrect responses by statement type. Most participants said they remembered the false "true" statement even though they never saw it.

During the exit survey, 78% of participants said they remembered seeing the false "truth" item in the picture even though it was only present in the game, t (259) = -0.16, $p > 0.05$. In addition, 90% of participants remembered the true statement, t (258) = -1.02, $p > 0.05$. As shown in Figures 5 and 6, the portion of people remembering these statements was very high across all age groups. There were no significant differences across age groups, which is likely due to ceiling effects.

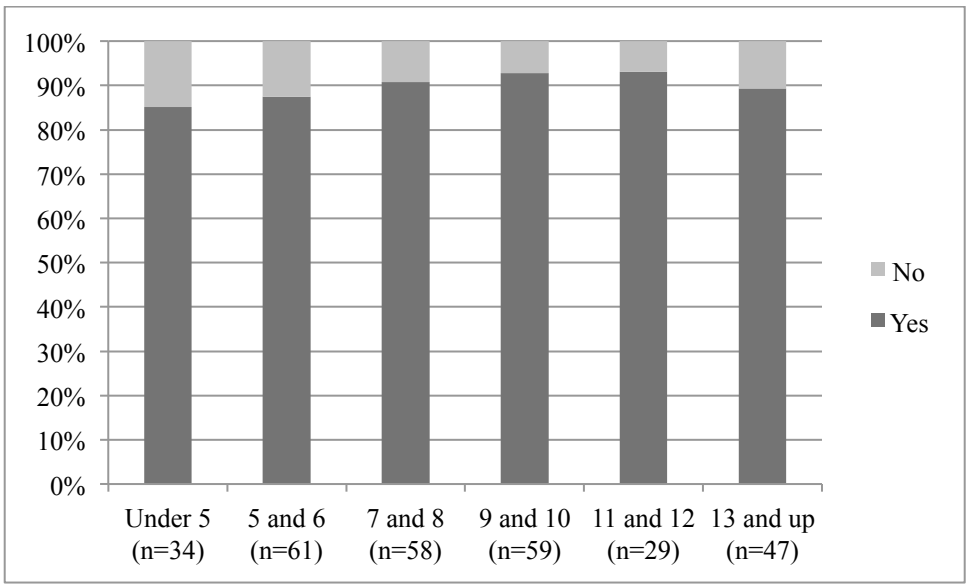

Figure 5: Percentage of participants who remembered the true statement. Most participants across all age groups accurately remembered the true statement.

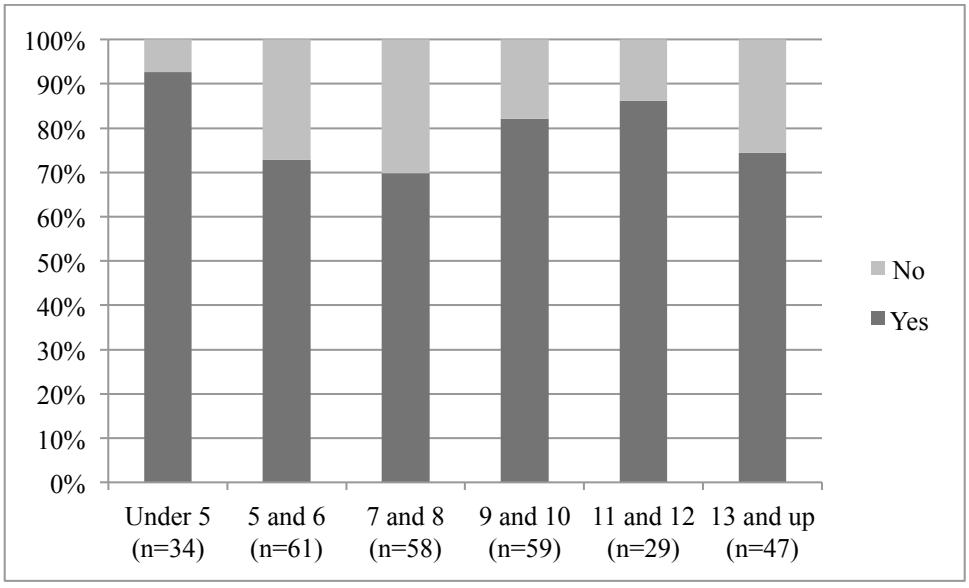

Figure 6: Percentage of participants who remembered the false "true" statement. Most participants across all age groups remembered the item that was labeled at "true" even though they never saw it.

Age trends did appear, however, when examining only the participants who remembered the false statement as true (see Figure 7); they were much younger (*M*=7.55) than participants

who identified the false statement as false on the survey (M=13.05), this difference is highly significant t (251) = -3.54, $p < 0.001$.

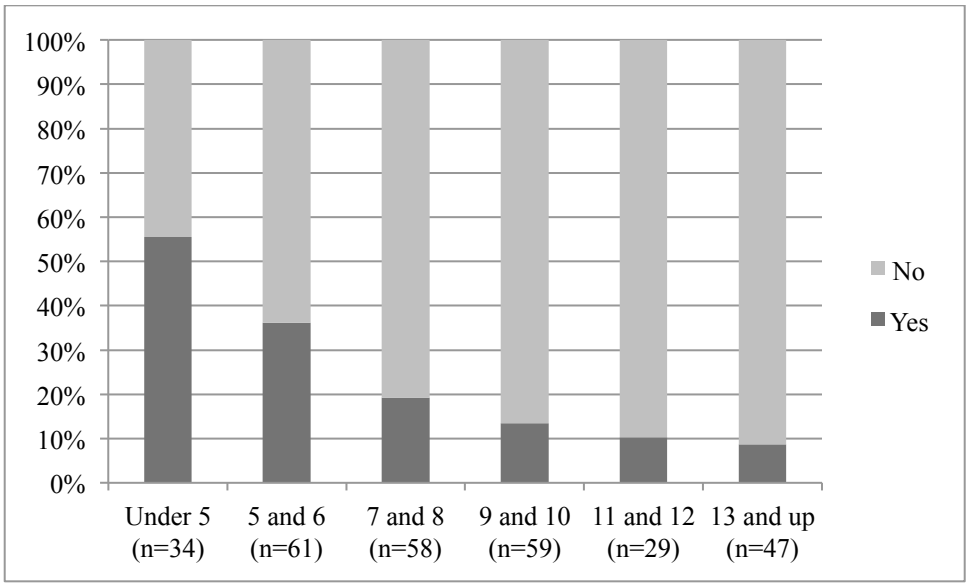

Figure 7. Percentage of participants who remembered the false statement. Over half of the youngest participants inaccurately remembered the false statement. The rates of remembering the false statement decreased with age.

Memory Discrimination. In addition to examination of the three survey questions about the true and false statements from the game, the other 17 items on the survey were examined for accuracy, bias and age trends. Participant's overall accuracy on the survey was normally distributed, with scores ranging from 29% correct to 100% correct (M = 67%, SD = 13%).

In order to separate memory discrimination from response bias, signal detection theory was used and *d'* and *C* were calculated for all survey responses excluding the target questions. Memory discrimination (*d'*) is measured by the distance between the standardized distributions of the hit-rate and the false alarm rate (Macmillan, 2002; Pallier, 2002). Due to the small number of questions, a few participants had no false alarms or hits and adjustment was necessary to calculate hit and false alarm rates. In order to correct for this, 0.5 was added to all cells (see

Snodgrass & Corwin, 1988). Participants' memory discrimination was significantly lower if they remembered the false statement $F(258) = -3.89$, $p < 0.001$. Discrimination did not differ based on memory of the true statement, memory of the false "true" statement, or gender ($p < .05$). Discrimination was highly correlated with age, $t\ (259) = 7.83$, $p < 0.001$, with progressively higher *d'* scores at older ages. Figure 8 displays the first and third quartiles (grey box), mean (dark line), variance (whiskers), and outliers (circles) of *d'* scores by age group. The widths of the boxes are proportional to the square root of the sample sizes.

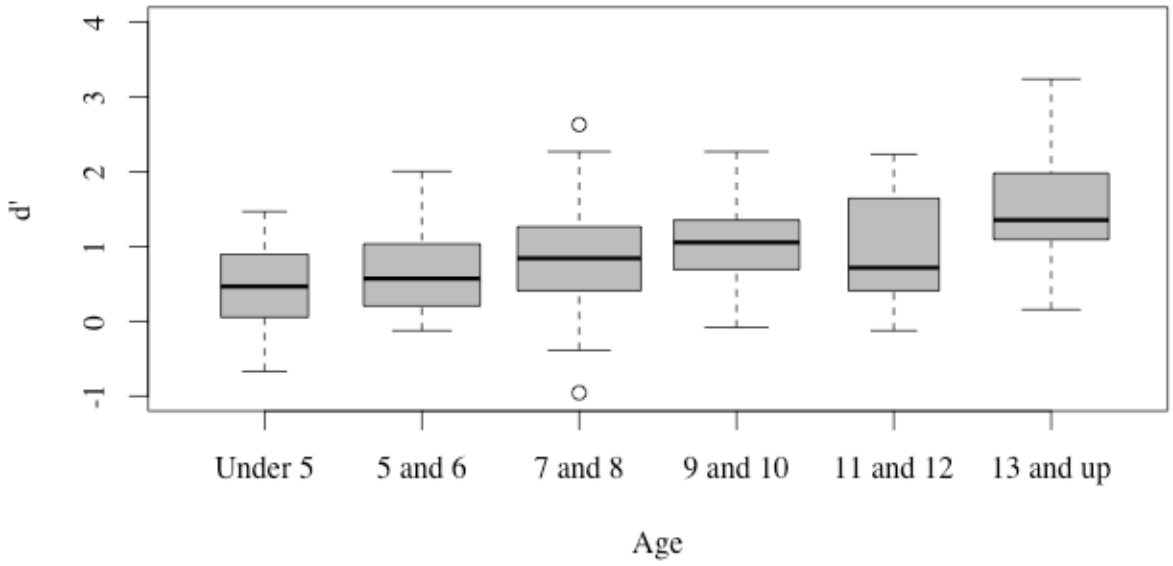

Figure 8. Boxplot of *d'* values by age (in years). Participants' average *d'* values on the exit survey increased with age.

Response Bias. The survey contained 20 questions (including the target questions), of which 10 were true. Participants who answered all "yes" or "no" would thus have an accuracy score of 50%. In order to examine how bias impacted responses to the survey questions (excluding the target questions), *C* was calculated. *C* measures the placement of the decision

criterion relative to the memory strength distributions of the items they believed were true and false (See e.g. Snodgrass & Corwin, 1988; Brainerd, Holliday, Reyna, Yang & Toglia, 2010). When $C = 0$ a participant has no bias, negative values indicate liberal biases (tendency to respond "yes") and positive values indicate conservative biases (tendency to respond "no") (Snodgrass & Corwin, 1988). In the current study, C values ranged from -3.21 to 1.57 (M = -1.24, SD = 0.88). Bias had a significant positive correlation with age, $F(259) = -6.63$, $p < .001$, with older participants being more conservative.

Figure 9 displays the first and third quartiles (grey box), mean (dark line), variance (whiskers), and outliers (circles) of C values by age group. The widths of the boxes are proportional to the square root of the sample sizes.

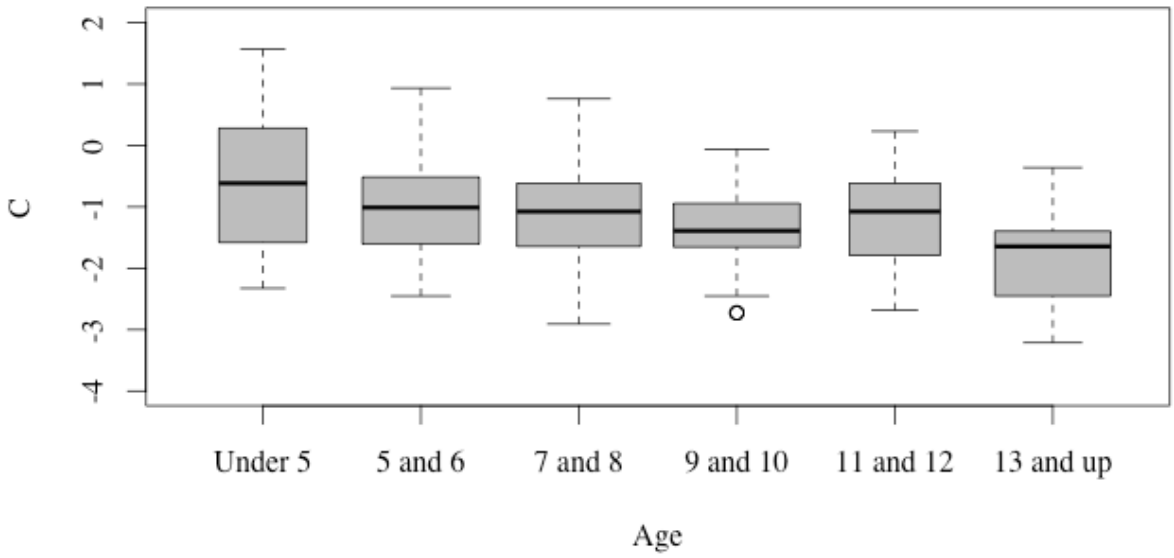

Figure 9. Boxplot of age and C values. Participants' bias becomes more liberal with age.

Individual Survey Item Analysis. Results are displayed in Table 4. T-tests revealed significant differences in average age based on response to multiple items. When there were significant age differences, average ages were higher for correct responses.

Table 4:

Accuracy and Age Trend by Survey Item

Survey Item	% Correct	Age Differences
Was the house white?	83%	No
Was there a mailbox?	51%	*Correct are older
Were there white curtains in the windows?	52%	No
Were there any purple flowers?	79%	No
Were there plants by the street?	57%	**Correct are older
Was there a dog in the back yard?	93%	*Correct are older
Was there a fence?	69%	**Correct are older
Was the front door red?	55%	No
Was there a car in the driveway?	77%	***Correct are older
Were there two garage doors?	48%	***Correct are older
Was there a swing in the yard?	88%	*Correct are older
Was there a tree that was shorter than the house?	82%	**Correct are older
Was there a girl waving in one of the windows?	93%	No
Were there black shutters on any of the windows?	31%	No
Was there a light on the garage door?	38%	No
Was there a birdhouse?	75%	*Correct are older
Was the roof black?	67%	No

Notes: $^{**}p < 0.01$, $^{*}p < 0.05$ $+p < 0.10$

Predicting Erroneous Memory of False "True" Statement. We estimated a logistic regression model to predict which participants would remember the false "true" statement even though the item was not in the picture. We used a number of variables that we hypothesized may be linked to a false memory (memory discrimination (*d'*), response bias (*C*), age, gender, and memory of the true and false statements). In this model we used dummy codes for all categorical predictors and mean-centered age. The estimates of the raw scores of the predictor variables on memory of the false "true" statement, standard errors and odds ratios are displayed in Table 5. The positive estimates indicate that memory of the false "truth" is more likely.

Results of the regression indicated that the only significant predictor of correctly identifying the false "true" statement as false is also correctly answering the other questions about the statements from the game. The participants who correctly answered the other questions from the game, especially the false statement, were able to correctly identify whether the source of their memories for the statements were from the game or from the picture. Conversely, participants who misattributed the other statements from the game to memories of the picture were more likely to do it for the false "true" statement.

Table 5:

Logistic Regression Predicting Memory of False "Truth"

	B	SE	Odds
Intercept	0.28	0.51	1.32
Age	-0.01	0.02	0.99
Gender	0.35	0.33	1.42
d'	-0.70	0.47	0.50
C	-0.33	0.35	0.72
No memory of truth	1.49***	0.44	4.43
Memory of lie	-0.77*	0.37	0.46

Notes: ***p<0.001, **p<0.01, *p<0.05

Predicting Memory of False Statement. In this next analysis we examined participants' memories for the statement that was identified by the research assistant as false during the game. We estimated a logistic regression model to predict which participants would accurately remember that the false statement was false using the same variables (memory discrimination, response bias, age, gender, and memory of the true and false "true" statements). We again used dummy codes for all categorical predictors, mean-centered age and standardized accuracy and yes/no bias.

Results of the regression are displayed in Table 6. Unlike the previous model predicting memory of the false "true" statement, age is a significant predictor ($p < 0.01$). The odds of remembering the false statement multiply by 0.16 as participants age one year. This suggests that younger participants were more likely to remember the statement as true because it was familiar, even though they had known it was false when the played the game. In addition, as with the previous model, participants who remember the false "true" statement are significantly more

likely to remember the false statement, suggesting they were more likely to misattribute statements they remember from the game to their memory of the picture.[4]

Table 6:

Logistic Regression Predicting Memory of False Statement

	B	SE	Odds
Intercept	-1.81**	0.67	0.16
Age	-0.17**	0.06	0.85
Gender	0.06	0.34	1.07
d'	-0.38	0.49	0.68
C	0.00	0.34	1.00
No memory of truth	0.19	0.54	1.21
Memory of false truth	0.76*	0.37	2.13

Notes: ***$p<0.001$, **$p<0.01$, *$p<0.05$

[4] When age was not entered into the regression, memory discrimination was a highly significant predictor of memory of the false statement. This is likely because age and memory discrimination were highly correlated.

CHAPTER 4

DISCUSSION

The results of the first experiment demonstrated that children would comply with an adult's request to make an accusation even if they do not have first-hand knowledge of its accuracy. On a positive note, the results also indicated that most children would accurately disclose the truth in a neutral interview. The significant differences in results in the chemistry show and the magic show illustrate how contextualized these results are. With more evidence (brandishing a broken test tube) or overt use of stereotypes (such as calling the chemist clumsy), which make the events more plausible, it is likely that we could have further increased the rates of compliance. Interestingly, the initial compliance may have created false memories in some of the youngest children because they subsequently claimed to remember seeing the false event despite being given "release" instructions by the neutral interviewer.

The first experiment was limited in that we were not able to induce the stress of a real interview in which children a) knew the person they were accusing, and b) understood that this individual could face adverse consequences as a result of their false statement. Ethical considerations required that we did not make the children feel uncomfortable and thus we told children that it was probably an accident, but we needed their help to make sure this did not happen again. Even though there were no negative consequences to making the false accusation, it is likely that there was also less pressure exerted on participants to make a false accusation. Analyses of real interviews with children who were suspected victims of being abused while in daycare revealed that multiple repeated suggestive methods were used such as introduction of new suggestive information, positive reinforcement, disbelief, conformity pressure and

invitations to pretend (Schreiber et al., 2006). Thus, in real cases, interviewers with biases may exert more pressure and use more suggestions than was done in the current study.

After the first experiment, questions remained about why children maintained the false accusation and what created the seemingly false memories in the younger children. Previous research suggests that children complied because the adults were very persuasive when asking children to make the accusation. Consistent with previous research, children were likely to succumb to the adult's suggestions when the event was highly plausible and the source was credible (especially in the magic show condition). Anecdotally, children seemed to believe the interviewer and not feel they were being untruthful when they made the accusations. In addition, it is possible that by asking children to make the false accusation, the interviewer created a forced confabulation effect, which caused young children to develop false memories.

In order to examine these possibilities, in the second experiment we asked children to play "two truths and a lie," a game in which they must be persuasive and deceptive to win. A highly credible source (an adult who viewed the picture with them) gave the child true and false statements about the picture that the child was to use in playing the game. Afterwards, despite the warning to focus on the picture instead of the game, both children and adults were likely claim that they remembered an item in the picture that was only present in the game. In addition, younger participants also remembered items in the picture that they had known were not present when they played the game. Accuracy on the question regarding the "false" true statement (the item that was true in the game and not the picture) predicted accuracy on the false statement (the item that was false in both the game and the picture) and visa versa. This suggests that the ability to correctly identify the source of the memory as the game rather than the picture predicted accuracy on the false "true" and false statements.

After controlling for age, memory discrimination did not predict accuracy on the target items from the game. This suggests that questions about these items did not illicit participants' verbatim memory for the picture, which would have allowed them to reject the inaccurate suggestion (the false "truth"). Participants' memory traces for the picture may have been too weak or the misinformation was not familiar enough to cause the recollection rejection effect.

Upon closer inspection of the individual items in the survey, significant age trends appeared for a number of items. All of the significant age trends revealed that older participants were more accurate. These findings seem to conflict with the research on reverse age trends that suggests that adults are more likely to have spontaneous false memories of thematically connected items (see Brainerd & Reyna, 2012, for a review). Based on this research one might expect adults to be more likely to falsely remember a mailbox in the picture because a mailbox is associated with a house. Our results may be due to the fact that children also have strong associations between such items related to house. It is possible that if the picture were about something less familiar to children, such as an office, reverse age trends would appear. However, reverse age trends are but one of myriad forces at play in producing memory inaccuracies. Other forces include mainly factors that protect older individuals from making memory errors, such as stronger traces and greater monitoring. Any full accounting of age differences in remembering will need to take into account all forces, not just associative strength of items. It is possible that even when older individuals possess stronger associations that place them at greater risk of making autosuggestions, they are on net less likely to do so because their stronger memory traces and more effective monitoring buffer them from doing so.

Overall, the findings of both experiments have implications for cases when adults with biases provide evidence or other clues during conversations with suspected victims. The

influence of the interviewer can lead some children to make accusations that they know, at least initially, are false. In addition, in later interviews some of these individuals may remember the accusation and misattribute the source as personal experience rather than the suggestive interview. Furthermore, if the interviewer is credible enough and the event is highly plausible, both adults and children may come to have memories that are consistent with the interviewer's beliefs rather than with their own experiences.

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APPENDIX A
EXPERIMENT 2 PICTURES

Picture A

Picture B

Picture C

APPENDIX B

EXPERIMENT 2 CONDITIONS

Condition 1 (Picture A):

Truth - One of the windows was round.
False Truth – There was a bench out front.
Lie – There was a newspaper in the driveway.

Condition 2 (Picture A):

Truth - One of the windows was round.
False Truth – There was a newspaper in the driveway.
Lie – There was a bench out front.

Condition 3 (Picture B):

Truth – There was a bench out front.
False Truth – One of the windows was round.
Lie – There was a newspaper in the driveway.

Condition 4 (Picture B):

Truth - There was a bench out front.
False Truth – There was a newspaper in the driveway.
Lie – One of the windows was round.

Condition 5 (Picture C):

Truth – There was a newspaper in the driveway.
False Truth – One of the windows was round.
Lie – There was a bench out front.

Condition 6 (Picture C):

Truth – There was a newspaper in the driveway.
False Truth – There was a bench out front.
Lie – One of the windows was round.

APPENDIX C

EXPERIMENT 2 SAMPLE EXIT SURVEY

1. Was the house white? _____
2. Was there a round window? _____
3. Was there a mailbox? _____
4. Were there white curtains in the windows? _____
5. Was there a newspaper in the driveway? _____
6. Were there any purple flowers? _____
7. Was there a bench in front of the house? _____
8. Were there plants by the street? _____
9. Was there a dog in the back yard? _____
10. Was there a fence? _____
11. Was the front door red? _____
12. Was there a car in the driveway? _____
13. Were there two garage doors? _____
14. Was there a swing in the yard? _____
15. Was there a tree that was shorter than the house? _____
16. Was there a girl waving in one of the windows? _____
17. Were there black shutters on any of the windows? _____
18. Was there a light on the garage door? _____
19. Was there a birdhouse? _____
20. Was the roof black? _____