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The Development of Differential Mnemonic Effects of False Denials and Forced Confabulations

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The current experiment was designed to assess the mnemonic consequences of false denials and forced confabulations. Children (aged 6–8 and 10–12 years) and adults viewed a video and then their memory and belief about the event were tested. Participants were then divided into three groups. In the "cued recall" condition, participants were asked to answer true- and false-event questions, but could choose not to respond if they did not know the answer. In the "forced confabulation" group, participants received the same set of questions, but were forced to answer all of them. In the "false denial" group, participants were instructed to falsely deny in response to each question. One week later, participants received a source memory test, and they had to provide memory and belief ratings once more. Forced confabulations resulted in false memories in the youngest group. Moreover, our analyses showed that repeated false denials led children and adults to be highly inclined to falsely deny that they had talked to the experimenter about certain presented details, when in fact they had done so. Furthermore, false denial and non-believed memory rates were more pronounced in younger than in older children and adults. Our results imply that denying experienced events is not a good strategy in an interviewing setting, as it adversely affects memory statements about the interview. Copyright © 2014 John Wiley & Sons, Ltd.

Scientific research into the fragility of memory has been dominated mainly by investigations into the mechanisms underlying false recollections of events. This almost exclusive emphasis on false memories has been catalyzed primarily by legal cases in which children and adults may have falsely remembered being sexually abused (Goodman, 2006). Although much knowledge has been gained in experimentation surrounding the phenomenon of false memories, research concerning the counterpart of false memories, false denials, is limited. That is, in many legal cases, children (and adults) sometimes falsely deny having been mistreated (Lyon, 2007). However, it is still unclear what happens to memory when people falsely *deny* having experienced traumatic events. The current experiment examines the effect of false denials on memory performance.

One reason for this imbalance between the empirical study of false memories and false denials is that "errors of impunity" are regarded as less disastrous than miscarriages of justice (Forst, 2004). Nonetheless, especially because of societal concerns regarding victimization (Levenson, Brannon, Fortney, & Baker, 2007), it is imperative to

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examine the cognitive consequences of false denials. Literature concerning the issue of false denials can be broadly distinguished in two branches. In the first research branch, field studies have concentrated on legal cases concerning child sexual abuse and in which false denial rates were examined. In the second branch of research, experimental studies have been conducted into the precise intricacies of false denials. We briefly review both of these topics next.

False Denials

The issue of false denials is intimately linked to the introduction of the child sexual abuse accommodation syndrome (CSAAS; Summit, 1983), which was initially formulated to explain the disclosure patterns of child sexual abuse victims (London, Bruck, Ceci, & Shuman, 2005). Basically, CSAAS assumes that because of the nature of child sexual abuse and the psychological dynamics surrounding the abuse (e.g., shame, fear of the perpetrator), children frequently delay disclosing the abuse, deny the traumatic event, and recant the experience. The CSAAS has, however, been the subject of much criticism because it lacks a sound empirical basis (London, Bruck, Wright, & Ceci, 2008; but see Lyon, 2007).

Although the existence of CSAAS is controversial, research has demonstrated that victims often delay disclosing abusive experiences. A vast number of studies has revealed that victims have difficulties revealing a history of traumatic child sexual abuse experience (for a review, see Goodman-Brown, Edelstein, Goodman, Jones, & Gordon, 2003). Victims often limit the disclosure and delay reporting core parts of an abusive event. What these studies have found is that victims of traumatic experiences often delay disclosure for reasons such as being in fear of the perpetrator. More intriguingly for the present experiment is the observation that a minority of victims deny that they have been abused when in fact they were abused (e.g., Sjöberg & Lindblad, 2002).

The research does not paint a clear picture of whether false denials present a common phenomenon in child sexual abuse cases. The difficulty in ascertaining false denial rates lies in the problem of obtaining substantiated child sexual abuse cases (see also Lyon, 2007). In a study by Sjöberg and Lindblad (2002), for example, 10 children provided many descriptions of incidents of sexual abuse during interviews with the police. Their descriptions were compared with videotapes made by the perpetrator. Four children denied that certain sexual abuse acts had occurred. Although one might assume that these negative answers referred to false denials, the authors acknowledged that forgetting might have played a role in the response pattern of these children. Nonetheless, the finding that almost half of the children denied all or part of having been abused invites the possibility that false denials can occur in child sexual abuse cases.

London et al. (2008) showed that although false denials sometimes occur in child sexual abuse cases, they do not seem to be that common among child sexual abuse victims. They reviewed many studies containing cases in which children denied or recanted the abuse and found that, although (false) denials do occur, they do so relatively infrequently (<25%; see also Malloy, Lyon, & Quas, 2007). Whether such denials also represent actual false denials is often unclear because of a lack of evidence verifying the abusive incidents. Although false denial rates could be low, it would be premature to assume they do not merit study. Both false denials and false memories can exert devastating consequences in the legal arena, with false denials potentially leading to perpetrators escaping conviction and false memories potentially resulting in imprisonment of innocent suspects.

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Experimental Findings

When we examine experimental work relevant to false denials and memory, it is evident that several psychological mechanisms could underlie false denials (e.g., memory, deception, social influences). Although false memories rely on similar memory mechanisms as true memories (e.g., Bernstein & Loftus, 2009; Otgaar, Verschuere, Meijer, & van Oorsouw, 2012), it is not the case that false denials can be directly connected to memory processes such as forgetting. Hence, in the psychological literature, there are many phenomena intimately connected to false denials.

One area of research that matches the phenomenon of false denials has to do with the production of omission errors (e.g., Otgaar, Candel, Smeets, & Merckelbach, 2010; Wright, Loftus, & Hall, 2001). In such studies, participants witness or are involved in an event and are then presented with suggestive information that certain details were not present while in fact they were. The critical outcome in such studies is the rate of participants failing to report details or events that were once experienced. In a study by Otgaar et al. (2010), 4- and 9-year-olds had to remove three pieces of clothing from a puppet. Half of the participants were presented with suggestive false evidence that they only removed two pieces of clothing (omission group), whereas the other half was presented with false evidence that they removed four pieces of clothing (false memory group). During three interviews separated by 1-week intervals, children were asked which pieces of clothing they took off the puppet. At the first interview, 45% ($n = 27$) of the children omitted having removed the third critical piece of clothing; this percentage dropped to 13% ($n = 6$) at the last interview. Both omissions and false memory rates declined significantly over time, but this decline was more pronounced for omission rates. Furthermore, false memories were more likely to occur relative to omission errors at all interviews.

Another field that bears a relation to false denials is that of memory silence, in which people decide not to express a memory (Stone, Coman, Brown, Koppel, & Hirst, 2012). This area of investigation shows that people often remain silent about certain memories, including, for example, childhood sexual abuse. Memory silence is an umbrella term for a set of diverse memory phenomena. To give an example, retrieval-induced forgetting (RIF) refers to the forgetting of related, but not-practiced events (Anderson, Bjork, & Bjork, 1994). In a typical RIF experiment, participants have to learn category–exemplar pairs (e.g., fruit–apple, fruit–banana, vegetable–broccoli, vegetable–cucumber). In a second phase, they are instructed to practice retrieving half of the exemplars from half of the categories (e.g., fruit–ap_). In a final memory test, participants are asked to recall all the words they can remember from the first phase while being presented with the category labels. The standard effect is that related items that were not practiced are recalled at a lower rate than unrelated items that were also not practiced (for a demonstration that silence leads to a facilitating effect on memory, see Chan, 2009, 2010).

Another example related to memory silence is deception in which a person remembers an event but withholds expressing it. Of interest, there is research showing that deception, in the form of lying, affects memory performance. In research conducted by Polage (2004), participants had to indicate the likelihood of certain events having happened to them before the age of 10 (e.g., hospitalization). After this, they had to convince other people that these fabricated events had truly been experienced. One week later, the participants were asked once more to rate the likelihood of these events having happened to them. The chief finding was that after a week, participants were less likely

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to believe that they experienced the events than they were at the start of the experiment. Polage referred to this as fabrication deflation.

Extending this line of work, certain types of false denials might also be caused by victims lying that nothing happened to them (e.g., about sexual abuse; Block et al., 2012; Pickel, 2004). Indeed, recently, there has been an attempt to examine the mnemonic effects of (deceptive) false denials. In a recent experiment (Vieira & Lane, 2013), participants viewed several pictures (e.g., apple). Following this, participants were presented with labels of studied and unstudied pictures. Under each label, participants received an instruction to repeatedly lie or tell the truth by describing the picture or by denying that they witnessed the picture (i.e., studied truth–describe, studied lie–deny, unstudied truth–deny, and unstudied lie–describe). Two days later, participants received a source test in which they had to indicate if they studied the picture or not and if they had to tell the truth or lie. Of most relevance for the current experiment are the results concerning false denials. These led to relatively poor memory performance of previously studied pictures, whereas participants had good memory for falsely describing unstudied pictures. So, according to this experiment, falsely denying experiences adversely affects memory performance.

The Present Study

In the present experiment, we were interested in the mnemonic effects of false denials from a developmental perspective. Although the paradigm of Vieira and Lane (2013) is promising, in this experiment, we used a paradigm containing more control over the instructions to falsely deny. Furthermore, we used a paradigm with more ecologically valid stimuli (e.g., videos) than the use of simple pictures. Taking these issues into account, we decided to modify the forced confabulation paradigm invented by Ackil and Zaragoza (1998) into a method in which we could simultaneously study false denials and false memories (i.e., using forced confabulations). From a practical angle, our new method comes close to how interviewers often attempt to elicit statements from children and adults. That is, in certain situations, interviewers are convinced that certain events might or might not have occurred, thereby pushing potential witnesses to falsely confabulate or deny events (e.g., Kassin, Dror, & Kukucka, 2013).

In a standard forced confabulation experiment (Ackil & Zaragoza, 1998; Chrobak & Zaragoza, 2013), participants are first presented with a video (e.g., video of robbery). Immediately after this presentation, participants are asked some questions about details they had seen in the video. Participants assigned to the forced confabulation condition are instructed to provide an answer to each question and, if they could not do so, to guess. Of importance, some questions that are asked concern details that were not part of the original video (e.g., "What kind of weapon did the culprit have?"). One week later, participants are involved in a source memory test in which they are asked questions about the source of each item. Studies that have used this procedure have consistently found that participants develop false memories for details that they had earlier been forced to confabulate (e.g., Chrobak & Zaragoza, 2008; Hanba & Zaragoza, 2007; Memon, Zaragoza, Clifford, & Kidd, 2010).

In our new version, we modified the standard forced confabulation procedure by including an extra condition to examine the ramifications of false denials on memory performance. Specifically, 6- to 8-year-olds, 10- to 12-year-olds, and adults were presented with a video of a theft. These child age groups were selected because studies have revealed

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that they differ significantly in terms of false memory propensity (e.g., Brainerd, Reyna, & Ceci, 2008; Howe, 2011) and because children from these ages are able to falsely deny events and understand the linguistic concept behind denials (Cameron-Faulkner, Lieven, & Theakston, 2007; Pea, 1980). After witnessing the video, participants' memory and belief for certain presented details in the video were queried. Then, participants were divided into three groups and received several questions about details that were presented (true-event questions) and not presented (false-event questions) during the video. In the "cued recall" condition, participants were instructed to only answer questions to which they knew the answer without guessing. In the "forced confabulation" condition, participants were forced to answer all questions and had to guess if they did not know the answer. In the "false denial" condition, participants had to deny witnessing any details that were asked about during the questioning phase. One week later, participants were presented with a source memory task, and their memory and beliefs about the details were queried once more. In the source memory task, participants were asked if they talked about a certain detail and if they saw this detail in the video.

In this novel paradigm, we measured participants' memory and belief for details that were or were not presented. Our reasoning behind this was that one might expect that false denials do not specifically target the memorial representation of an event, but affect beliefs in the occurrence of the details. Recently, there has been increased scientific interest in differences and commonalities between memory and belief. This is relevant because in the memory field, research mainly concentrates on believed memories. However, recent studies have revealed that under certain conditions, people develop non-believed memories, memories that are no longer believed to have occurred, although vivid recollective characteristics still exist (Otgaar, Scoboria, & Mazzoni, 2014; Mazzoni, Scoboria, & Harvey, 2010). Non-believed memories are most likely to occur when people receive social feedback suggesting that an event did not occur (Otgaar, Scoboria, & Smeets, 2013; Scoboria, Boucher, & Mazzoni, in press). Translating this into the current experiment, our argument is that if our instruction to falsely deny is related to social feedback, then false denials might lead to the formation of non-believed memories in both children and adults (Otgaar et al., 2013).

Based on earlier work (Vieira & Lane, 2013), we hypothesized that false denials might lead to worse memory performance for details related to the event. The reasoning behind this was twofold. First, false denials might lead to participants rehearsing details less often than in the cued recall or forced confabulation condition. Because rehearsal strengthens long-term memory performance (e.g., Dark & Loftus, 1976), a lack of rehearsal might perpetuate impoverished memories for facets of the event. Furthermore, false denials might also lead to "no think" executive control mechanisms, which might lead to a reduction of unwanted memories entering the consciousness (Anderson & Green, 2001; McWilliams, Goodman, Lyons, Newton, & Avila-Mora, 2014). Secondly, false denials might affect source monitoring. The source monitoring framework (SMF; Johnson, Hashtroudi, & Lindsay, 1993) refers to the processes needed to distinguish between authentic and fabricated accounts (e.g., lies, false memories). According to SMF, fabrications involve more cognitive operations (e.g., imagination) than true recollections. However, falsely denying details of an event might actually result in memory representations containing fewer links to cognitive operations, leading to poor memory of details surrounding the event. This false denial effect might, however, also be shown in another way. That is, although repeated false denials might deteriorate memory performance of the video, it might also affect memory

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performance of the interview at Session 1 itself. So, if falsely denying might affect memory representations, it might also negatively affect the memory of the interview at Session 1. If true, then one might expect that false denials lead to participants falsely denying that they talked about certain details to the interviewer. With respect to forced confabulations, we expected to replicate earlier studies (e.g., Ackil & Zaragoza, 1998) showing that forced confabulations lead to false memories in both children and adults.

Regarding developmental mnemonic effects of false denials and forced confabulations, the following predictions were made. Because children's source monitoring abilities are less well-developed than those of adults, we expected false memories to be more evident in children than in adults (Ceci & Bruck, 1993; Lindsay, Johnson, & Kwon, 1991). Regarding false denials, we had a similar prediction. Because, overall, children's memory works less optimally than that of adults (e.g., Howe, 2011), false denials might have more profound effects in children than in adults.

METHOD

Participants

In the current study, 170 participants were tested (6- to 8-year-olds: $n = 58$, mean age = 6.91, SD = 0.78, 34 boys; 10- to 12-year-olds: $n = 55$, mean age = 10.98, SD = 0.73, 23 boys; adults: $n = 57$, mean age = 21.14, SD = 2.65, three men). Participants were primarily Caucasian. Children were recruited from primary schools in the Netherlands with parental consent. The children received a small present for their involvement in the experiment. Adult participants were undergraduates from the Faculty of Psychology and Neuroscience, Maastricht University. They received a credit point or a financial reimbursement for their participation. The experiment was approved by the standing ethical committee of the Faculty of Psychology and Neuroscience, Maastricht University.

Design and Procedure

The current experiment employed a 3 (age: 6–8 years, 10–12 years, adults) × 3 (condition: cued recall, forced confabulation, false denials) between-subjects design. Children and adults were randomly assigned to the different conditions. Children were tested in separate rooms at their elementary school, and adults were tested in laboratory rooms at the psychology faculty.

The study was adapted from the forced confabulation paradigm developed by Ackil and Zaragoza (1998) and involved two sessions separated by a 1-week interval. Participants first watched a video that has frequently been used in false memory research (Takarangi, Parker, & Garry, 2006). In this 6-minute video, a tradesman (called Eric) enters an unoccupied home to do some electrical jobs. During his stay, he steals various items. After viewing the video, participants received a short distractor task (playing Tetris) lasting for 5 minutes. Then, participants' baseline belief about and memory for details were measured. Specifically, participants were asked about nine items related to details presented in the video (e.g., "Where did Eric find the key?"), and they had to indicate their belief (1 = definitely not happened, 8 = definitely happened) and memory (1 = no memory at all for the event, 8 = clear and complete memory for the event) for these presented details. These belief and memory baseline questions were derived from the Autobiographical

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Memory and Beliefs Questions (ABMQ) format developed by Scoboria, Mazzoni, Kirsch, and Relyea (2004). The questions were asked in chronological order of the video. Following this, participants received a 5-min distractor task (playing Bejeweled).

Finally, they received five open-ended questions about details that were presented (i.e., true-event questions; these questions were already during the baseline questioning phase) and three open-ended questions pertaining to false details (i.e., false-event details; e.g., "What pet was present in the living room?"). Participants in the cued recall group were instructed only to provide answers to questions that they were completely sure about, and they were told not to guess. Participants assigned to the forced confabulation condition were instructed to respond to each question and were forced to guess if they did not know the answer. In the false denial condition, participants were instructed to deny in response to each question (e.g., "The man did not steal anything"). Of importance, all participants received the same true-event questions. For the false-event questions, we constructed two versions. That is, each participant was coupled with a yoked partner indicating that, for each pair, one partner received one version of false-event questions and the other partner received the alternative version (e.g., one partner received the false question: "On what body part did Eric bleed?," whereas the other one received: "What game console was in the house?"). The yoked procedure was included to ensure that any memorial consequences of forced confabulations were specifically due to confabulation and not caused by a specific set of false-event questions (Ackil & Zaragoza, 1998).

The second session took place after 1 week. A different experimenter questioned the participants at Session 2. This was done to make sure that participants were not inclined to be consistent in their statements that they provided to the first experimenter. The second session started by informing the participants that the first experimenter made some mistakes by asking the false-event questions. Furthermore, they were told that the purpose was to distinguish between true and false questions. After this, participants received a source memory and belief test containing 15 source-monitoring items each consisting of two yes/no questions concerning the source of each test phase – for example, (a) "When you talked to [experimenter's name], did you talk about a pet in the living room?" (i.e., person questions); and (b) "When you watched the video, did you see a pet in the living room?" (i.e., video questions). Then, participants had to provide memory and belief ratings once more. The 15 source memory items contained five true-event questions asked in Session 1, four true-event questions not asked in Session 1, three false-event questions mentioned in Session 1, and three false-event questions not mentioned in Session 1 (i.e., the yoked partner version). They were asked in a fixed order. Finally, participants were debriefed about the aim of this study.

RESULTS

Baseline Scores

We first checked whether any differences were present between age groups and condition on the total number of correct answers to the open-ended questions at Session 1. A 3 (age: 6–8 years, 10–12 years, adults) × 3 (condition: cued recall, forced confabulation, false denials) factorial ANOVA was conducted on the total number of correct answers. No statistically significant interaction [$F(4, 161) = 1.77$, $p = 0.14$, $\eta^2_{\text{partial}} = 0.04$] or condition effect [$F(2, 161) = 0.19$, $p = 0.83$, $\eta^2_{\text{partial}} = 0.002$] emerged. We did find a

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significant age effect [$F(4, 161) = 42, 93$, $p < 0.001$, $\eta^2_{partial} = 0.35$], with *post hoc* Bonferroni tests showing that adults ($M = 6.30$, SD = 1.61) had statistically more correct answers than the older ($M = 4.98$, SD = 1.38) and younger children ($M = 3.88$, SD = 1.39; $p < 0.001$). Older children were also statistically more correct than the younger children ($p < 0.001$).

Forced Confabulations

One of the key questions was to assess whether the forced confabulation manipulation at Session 1 resulted in false memories at Session 2. We performed a 3 (age: 6–8 years, 10–12 years, adults) × 3 (condition: cued recall, forced confabulation, false denials) factorial ANOVA on the mean total false memory scores of the video questions of the source memory test at Session 2 (see earlier). As expected, our manipulation was successful. A statistically significant age × condition interaction was detected [$F(4, 160) = 3.95$, $p = 0.004$, $\eta^2_{partial} = 0.09$; one missing value]. Simple effects analyses revealed the following: in the youngest child group, forced confabulations resulted in particularly high levels of false memories. That is, statistically more 6- to 8-year-olds' false memories were detected in the forced confabulation group ($M = 1.67$, SD = 1.03) than in the cued recall group ($M = 0.75$, SD = 0.72) or false denial group ($M = 0.95$, SD = 1.00; p-values < 0.01). The pattern was not evident in the other age groups (p-values > 0.05; see Figure 1).

We also examined whether the effects of forced confabulations spilled over to false-event questions that were *not* asked during Session 1. No significant effects emerged (p-values > 0.05). Furthermore, we tested the impact of forced confabulation on the total number of false memories for the person questions (see earlier). We only found a statistically significant effect of age [$F(2, 160) = 10.93$, $p < 0.001$, $\eta^2_{partial} = 0.12$; one missing value], with the youngest child group ($M = 0.43$, SD = 0.77) falsely recollecting more often that they spoke to the experimenter about false details than the other age groups (older children, $M = 0.09$, SD = 0.35; adults, $M = 0.04$, SD = 0.19, p-values < 0.01).

False Denials

Our primary interest was to examine the mnemonic consequences of false denials on memory performance. We first examined whether falsely denying details might cause participants to report that they did not talk about certain presented details when in fact

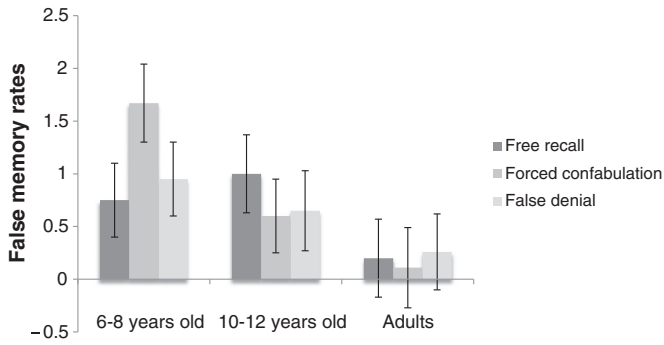

Figure 1. False memory rates as a function of condition and age (error bars represent 95% confidence intervals).

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they did (a false denial effect). Our analyses supported this. A 3 (age: 6–8 years, 10–12 years, adults) × 3 (condition: cued recall, forced confabulation, false denials) factorial ANOVA on the mean total number of false denials showed that repeated false denials resulted in worse memory performance for the person questions on the source memory test [$F(2, 161) = 3.50$, $p = 0.03$, $\eta^2_{\text{partial}} = 0.04$, one missing value]. Intriguingly, we found that in the false denial group, participants were more likely to falsely deny that they talked to an experimenter about a presented detail ($M = 0.27$, SD = 0.59) than was the case in the other groups (cued recall: $M = 0.05$, SD = 0.23; forced confabulation: $M = 0.12$, SD = 0.38; see also Figure 2). Also, we found that 6- to 8-year-olds ($M = 0.28$, SD = 0.59) had higher false denial rates than the older children ($M = 0.05$, SD = 0.23) and adults ($M = 0.11$, SD = 0.37) [$F(2, 160) = 4.39$, $p = 0.01$, $\eta^2_{\text{partial}} = 0.05$]. No significant interaction was found [$F(4, 160) = 1.18$, $p = 0.32$, $\eta^2_{\text{partial}} = 0.03$].

Of importance, this false denial effect for the person questions was only found for true-event questions that were asked at Session 1. We did not find a spillover effect to true-event questions that were not mentioned at Session 1 [$F(2, 160) = 0.85$, $p = 0.43$, $\eta^2_{\text{partial}} = 0.01$]. The false denial effect was also absent for the video questions asked [$F(2, 160) = 0.17$, $p = 0.84$, $\eta^2_{\text{partial}} = 0.002$] and not asked [$F(2, 160) = 1.43$, $p = 0.24$, $\eta^2_{\text{partial}} = 0.02$] during Session 1. For the analysis of the person-not-asked question and a new analysis of the video-not-asked questions, we found the following. Statistically higher false denial rates in the youngest child group (person questions, $M = 0.69$, SD = 0.80; video questions, $M = 0.98$, SD = 0.81) relative to the older children (person questions, $M = 0.24$, SD = 0.51; video questions, $M = 0.58$, SD = 0.69) and adults (person questions, $M = 0.14$, SD = 0.40; video questions, $M = 0.50$, SD = 0.73) were also found for person (true) questions not asked during Session 1 [$F(2, 160) = 13.15$, $p < 0.001$, $\eta^2_{\text{partial}} = 0.14$] and video questions not asked during Session 1 [$F(2, 160) = 6.57$, $p = 0.002$, $\eta^2_{\text{partial}} = 0.08$]. For the analysis of the video-not-asked questions, all other effects were not significant (all p-values >0.05).

Memory and Belief

We also examined memory and belief ratings (mean numbers) at Sessions 1 and 2 as a function of age and condition. A 2 (time: Session 1 vs. Session 2) × 3 (age: 6–8 years, 10–12 years, adults) × 3 (condition: cued recall, forced confabulation, false denials) repeated-measures ANOVA with the first factor referring to a within-subject variable was conducted on the memory and belief ratings. For the memory ratings, we found a sta-

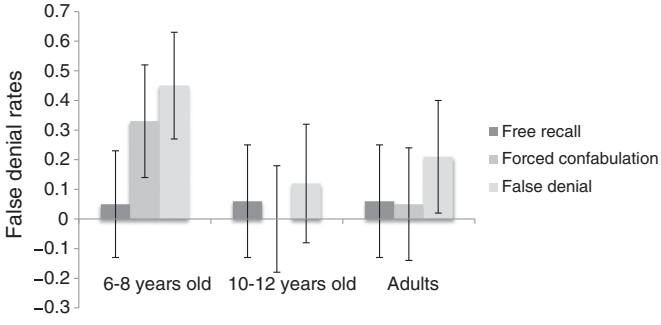

Figure 2. False denial rates as a function of condition and age (error bars represent 95% confidence intervals).

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tistically significant time × age interaction [$F(2, 160) = 28.87$, $p < 0.001$, $\eta^2_{partial} = 0.27$]. Simple effect analyses showed that only during Session 1 did adults ($M = 54.64$, SD = 10.04) have statistically higher total memory scores than the older ($M = 47.93$, SD = 9.89) and younger children ($M = 40.74$, SD = 11.56) [$F(2, 166) = 24.80$, $p < 0.001$]. At Session 2, these differences were not significant [$F(2, 166) = 1.79$, $p = 0.17$]. All other effects were not statistically significant.

For the belief ratings, the following pattern of results emerged. We also found a statistically significant time × age interaction [$F(2, 160) = 15.98$, $p < 0.001$, $\eta^2_{partial} = 0.17$]. When we conducted simple effect analyses, we again found that only for the first session, adults ($M = 55.59$, SD = 10.59) had statistically higher belief ratings than the older children ($M = 47.89$, SD = 9.32) and younger children ($M = 43.26$, SD = 9.54) [$F(2, 166) = 22.79$, $p < 0.001$]. At Session 2, significant age differences were not obtained [$F(2, 166) = 0.44$, $p = 0.65$].

We were also interested in whether our procedure might have resulted in non-believed memories. In line with previous research (Clark, Nash, Fincham, & Mazzoni, 2012), we classified ratings as non-believed memories only if the memory ratings were at least two scale-points higher than the belief ratings. So, for example, if a participant gave a memory rating of 6, indicating a strong recollection to having seen a pet in the video, but also gave a belief rating of 4, referring to a moderate belief score, then this was scored as a non-believed memory. A 2 (time: Session 1 vs. Session 2) × 3 (age: 6–8 years, 10–12 years, adults) × 3 (condition: cued recall, forced confabulation, false denials) repeated-measures ANOVA on the mean total number of non-believed memories was conducted. We only found a significant time × age interaction [$F(2, 160) = 15.98$, $p < 0.001$, $\eta^2_{partial} = 0.17$]. Simple effects showed that only at Session 2, younger children ($M = 0.71$, SD = 0.99) had statistically higher non-believed memory rates than older children ($M = 0.13$, SD = 0.39) and adults ($M = 0.16$, SD = 0.53) [$F(2, 166) = 12.60$, $p < 0.001$]. This was not significant during the first session [$F(2, 166) = 1.40$, $p = 0.25$].

Of importance, during the second session, participants could develop non-believed memories for the true- and false-event questions. Research shows that non-believed memories can be evoked for authentic and false experiences thereby resulting in nonbelieved true and false memories, respectively (Otgaar et al., 2014). A 2 (type: non-believed true memory vs. non-believed false memory) × 3 (age: 6–8 years, 10–12 years, adults) × 3 (condition: cued recall, forced confabulation, false denials) repeated-measures ANOVA was conducted on rates of non-believed true and false memories at the second session. A statistically significant main effect of type was obtained [$F(1, 159) = 4.51$, $p = 0.04$, $\eta^2_{partial} = 0.03$], showing that non-believed true memories ($M = 0.22$, SD = 0.54) were more easily elicited than non-believed false memories ($M = 0.12$, SD = 0.42). We also found that younger children had statistically higher non-believed memory rates ($M = 0.71$, SD = 0.99) than the older children $M = 0.13$, SD = 0.39) and adults ($M = 0.16$, SD = 0.53) [$F(2, 159) = 12.69$, $p < 0.001$, $\eta^2_{partial} = 0.14$].

Exploratory Correlational Analysis

We also explored whether an increased susceptibility to false memories would go hand in hand with or protect against the formation of false denials. Our correlational analysis only found that participants with a false memory for the video questions were statistically less likely to falsely deny details that were presented in the video ($r = -0.18$, $p = 0.02$).

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DISCUSSION

The primary aim of the current investigation was to examine the memorial ramifications of false denials and forced confabulations in children and adults. Our main results can be catalogued as follows. First, we found that forced confabulations made young children falsely remember details that were not part of the video. Our most intriguing result was that in the false denial group, both children and adults had an increased tendency to falsely deny having talked with the experimenter about presented details. Also, we found that in all groups, non-believed memories were more likely to occur in children than in adults.

We also found that forced confabulations led to the production of false memories. However, this false memory effect was most pronounced in the youngest age group. This finding replicates earlier research by Ackil and Zaragoza (1998), showing that the younger children were more prone to the contamination of forced confabulation than older children and adults. This result fits with an abundance of studies showing that younger children are more susceptible to social and suggestive pressure than older children and adults, and that this may lead to the creation of false memories (Loftus, 2005; Otgaar et al., 2010). In the current design, forcing participants to produce a confabulated response may have acted as a type of self-constructed misinformation that could have affected false memory formation.

The most novel finding of the current experiment concerns the mnemonic impact of false denials. Our analyses showed that falsely denying that certain details were present impacted correct memory performance. Specifically, we showed that in the false denial group and for the person questions only, both children and adults were highly inclined to falsely deny that they talked to the experimenter about certain presented details, when in fact they did. In a sense, this effect parallels previous experiments revealing that false denials resulted in worse memory performance (Vieira & Lane, 2013). One might argue that this finding can be explained by source monitoring (Johnson et al., 1993); that is, deceptive responses such as false denials might require few cognitive operations, leading to impoverished memory representations of an event. In the current experiment, this might mean that when participants had to repeatedly falsely deny details during the interview with the experimenter, their memory representation for the interview became impoverished (Vieira & Lane, 2013). The net result could be that participants are less likely to remember what they talked about during the interview at the first session.

Our false denial effect might also be linked to research showing that deceptive responses require more cognitive resources than truthful responses (Vrij, Fisher, Mann, & Leal, 2006; Verschuere, Spruyt, Meijer, & Otgaar, 2011). Although speculative, deceptive responses such as denials could encompass more cognitive load relative to deception based on fabrication (e.g., forced confabulation). That is, in our current experiment, participants had to inhibit a truthful reaction and also needed to falsely deny that certain details were present. One likely consequence is that, because of the increased cognitive load, fewer resources were available for the successful encoding of the interview with the experimenter (Vrij et al., 2006). Hence, children and adults were more likely to falsely deny that they discussed details with the experimenter.

A subsidiary aim of the present experiment was to examine whether false denials might affect the production of non-believed memories. Our reasoning behind this was that studies have revealed that social feedback catalyzes the formation of non-

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believed memories (for a review, see Otgaar et al., 2014). One might argue that during the interview, participants received a form of social feedback to deny that they witnessed several details. Our idea was that such denials might lead to the creation of non-believed memories. However, we did not find evidence for this. Non-believed memory rates did not differ between the different groups. It might be that non-believed memories are more likely to be produced when other people suggest to participants that certain details did not occur, a procedure that parallels the research on omission errors (Otgaar et al., 2010).

We did find that non-believed memories were more likely to occur in younger children than in older children and adults. This finding might arise as a consequence of differences in memory performance between children and adults; that is, children's memory works less optimally than that of adults (e.g., Howe, 2011). It is possible, then, that children's beliefs about the occurrence of events are more malleable than those of adults, which might lead to an increased probability to find non-believed memories in younger children. However, developmental work in the area of non-believed memories is rather limited and more research needs to be conducted on this topic (see also Otgaar et al., 2013).

From a practical perspective, our findings suggest that it would not be a good strategy for child (and adult) victims of traumatic incidents to falsely deny that experiences occurred. Take, for example, this stereotypical example. A child who is sexually abused by a family member is interviewed about the traumatic experience by an interrogator. The child, however, denies having been abused because of several external reasons (e.g., being threatened, protecting family members; Goodman-Brown et al., 2003). When the child is being interviewed on a second occasion, the child might not specifically remember what he/she declared to the interviewer and might come up with inconsistent answers. Such inconsistent answers might be regarded as a sign of low credibility of the child, potentially leading to the assumption that the child is lying (see Smeets, Candel, & Merckelbach, 2004). Of course, our experiment was not designed to target the effect of false denials on traumatic experiences, but our results do convincingly show that false denials adversely affect memory reports. So, when, for example, child witnesses are interviewed in a correct manner about an experienced event, talking about the event would be a better tactic than falsely denying or even keeping the memory silent (Stone et al., 2012).

To summarize, our experiment has shown that forced confabulations lead to the creation of false memories. Of more interest, we found that participants were most likely to falsely deny that they discussed several details with an experimenter when they were instructed to deny experienced details a week before. Our experiment is the first to show the adverse effects of false denials on the reporting of information (but see McWilliams et al., 2014). Our findings suggest that different deceptive responses (i.e., forced confabulations vs. false denials) have different mnemonic consequences. Thus, different types of lies exert differential effects on memory.

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