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Improving Children's Interviewing Methods? The Effects of Drawing and Practice on Children's Memories for an Event

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Abstract In the present experiment, we were interested in the effects of drawings and practice on children's memory performance. Younger (6/7-year-olds; $n = 37$) and older (11/12-year-olds; $n = 44$) children were presented with two videos that differed in complexity. Half of the children had to practice recalling an experienced event (i.e., last holiday) before remembering the two videos. The other half was not presented with such practice. Then, all children had to tell what they could still recollect about the first video. For the second video, all children were allowed to draw and tell during the recollection of the event. As expected, we found that for the complex video, making a drawing increased the completeness of children's statements, but also reduced the accuracy of their statements. Although we found that including practice reduced the completeness of statements, it did not negatively impact the accuracy of children's memory reports. Taken together, our results imply that interviewers should be cautious in using drawings as an interviewing method as it might elevate the production of incorrect information.

Keywords Drawings · Children · Memory · False Memory · Interviewing

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Experimental research in how children should be interviewed in the legal arena has become a popular theme in the field of memory. One of the main goals of studies on this theme is to investigate whether new interviewing methods maximize true information and simultaneously minimize errant information. One important research line herein is to examine whether certain interviewing props can help children to accurately report autobiographical experiences (Poole and Bruck 2012). In the present experiment, we were interested in the impact of drawing and practice on children's eyewitness memory.

The underlying rationale for using interviewing props is because in certain legal cases, children are extremely young and have linguistic difficulties with reporting what allegedly happened to them. Furthermore, especially in sexual abuse cases, it is known that child victims frequently do not tell about their abusive experience immediately, but delay disclosing their experiences from days to even years (London et al. 2008). In these instances in which such children are still reluctant to talk, professionals such as therapists or the police have resorted to the use of non-verbal aids such as anatomically-detailed dolls and human figure drawings with the attempt to elicit accurate information. The use of these aids has, however, been heavily criticized (e.g., Faller 2005).

Experimentation in this area did not reveal promising results concerning the use of anatomically-detailed dolls and human figure drawings in a child interview setting. For example, researchers have found that such dolls invite fantasy play, and can lead children to create memory errors about sexual abuse (e.g., Bruck et al. 1995, 2000a; Poole and Bruck 2012). Because of these concerns, it has been advised not to use anatomically-detailed dolls to examine whether children experienced a traumatic incident such as sexual abuse. Hence, researchers have turned their attention to the efficacy of human figure drawings to elicit accurate information in children.

In the majority of studies using human figure drawings, children experienced an interactive event in which they were touched on innocuous parts of their body. Following this, children had to show on the human figure drawing where they had been touched. In one of our studies (Otgaar et al. 2012), 4/5-year-olds and 9/10-year-olds were involved in a staged event in which measurements of 10 body parts (e.g., soles of the feet) were taken. Immediately or after a delay of three weeks, children had to report where they were touched. Furthermore, they received a human figure drawing in which they also had to indicate where they had been touched. We found that the human figure drawing significantly decreased the accuracy of children reports of touch. So, although the human figure drawing resulted in more correct reports of touch, it also resulted in more incorrect reports of touch.

Studies using a somewhat similar procedure as ours have also confirmed that like anatomically-detailed dolls, human figure drawings adversely affect the reporting behaviour of children (e.g., Brown et al. 2007; Bruck 2009; Willcock et al. 2006). Several reasons can be articulated for why human figure drawings are not efficient in eliciting accurate information in children, but one of the most important reasons is that especially young children lack the ability to understand the representational nature of pictures (e.g., DeLoache and Burns 1994). Indeed, this lack of understanding representations has nicely been shown in a recent study by Lytle et al. (2015) in which 3- to 5-year-olds used dolls and human figure drawings to map body touches. Specifically, in that study, stickers were placed on different body locations of children and they had to indicate these locations on a doll, human figure drawing, and an adult experimenter. Although performance on this task improved with age, 5-year-olds did not reach perfect performance. This corroborates research showing that using symbols (such as dolls or human figure drawings) as representations for one's body undergo continued development into the school years (Liben et al. 2002). This implies that especially young children are not able to comprehend that the human figure drawings are representations of their own body and this contributes to the production of memory errors.

Because of the disadvantages of including anatomically-detailed dolls and human figure drawings in a legal interviewing context, other (nonverbal) props have been introduced to assist interviewers when asking children about their alleged traumatic experiences. That is, recent studies have looked at whether interview outcomes might be improved when children are allowed to draw something during the interview and whether letting practice retrieving an unrelated event might lead to more complete and accurate statements. So, the purpose of the current study was to examine the effect of drawing and practice on children's memory performance and to test the combined effects of these factors on statements as well. Below, we will elaborate on each of these new methods.

Drawing Children's Memories

Research outcomes demonstrate that allowing children to draw during an interview is an efficient alternative to the inclusion of dolls and human figure drawings. The first study investigating the effect of drawing on children's memory was conducted by Butler et al. (1995). In two experiments, children experienced a unique event. Specifically, children visited a fire station in which several interrelated events occurred (e.g., watching real firefighters, climbing onto the fire engines). One day (Experiment 1) or one month (Experiment 2) after the event, children were randomly assigned to two groups. One half of the children were instructed to tell what happened whereas the other half had to draw what occurred. The principal result was that drawing resulted in more accurate and more complete accounts than the group of children who only had to tell what happened.

Since this first study, the beneficial effects of drawing have been replicated and well-documented (e.g., Bruck et al. 2000b; Gross and Hayne 1998; Pipe and Salmon 2009; Poole and Dickinson 2014; Salmon et al. 2012; Wesson and Salmon 2001; Woolford et al. 2015). For example, studies have shown that besides only instructing children to draw, an even more superior way to facilitate the reporting of information is to include an interactive draw and tell group in which children had to draw and tell what happened in interaction with the interviewer (e.g., Barlow et al. 2011). Furthermore, the drawing superiority effect has been confirmed when 1) children witnessed emotionally-negative events (Gross and Hayne 1999; Wesson and Salmon 2001), 2) when children were interviewed after a long delay (e.g., 1 year; Gross and Hayne 1999), 3) when children were tested of varying ages (i.e., 5- to 12-year-olds; Patterson and Hayne 2011), and 4) when children had an alleged history of sexual abuse (Katz and Hershkowitz 2010).

Theoretically, there are several explanations as to why drawing might positively impact memory performance. Butler et al. (1995) argued that drawing improved children's statements because drawings permit children to come up with their own retrieval cues that promote recall. As support for this idea, Butler et al. found that children who had to draw not only described most of the information that was drawn, but also provided information that was not part of their drawing. Relatedly, it is implied that more information is given by children when they themselves initiate the retrieval (Todd and Perlmutter 2006) like is being done when children are being asked to draw about an alleged event. Bruck et al. (2000b) suggested that drawing might lead to more rehearsal of memories because it adds to the verbal components of a merely verbal interview. This may result in dual encoding of information and hence, better retrieval of memories. (Paivio 1971). Specifically, children who draw experienced details will invest more mental effort and time about these details than when they

are only interviewed. The consequence of this is that experienced details are "tagged" and hence, are easily retrieved.

Nonetheless, although research has revealed that drawings can help children to report more complete and accurate information, there are also studies that have shown the negative side-effects of using drawings in an interviewing context. For example, in Bruck et al. (2000b) study, children (3- to 6-years old) participated in a magic show. After this, children were presented with true (e.g., the magician hurt her hand) and false reminders (e.g., the magician fell on a toy) concerning the show. Half of the children had to verbally answer questions related to the reminders whereas the other had to draw these reminders. The basic result was that although the drawing group had better recall of true reminders than the control group, the drawing group also recollected more false reminders than the control group.

There are also other studies that have shown that in certain situations, drawings are not efficient for recall. Davison and Thomas (2001) showed that drawings can help for autobiographical experiences but that this is ineffective for methods that rely on item memory (e.g., words, objects). Furthermore, Strange et al. (2003) showed that children who drew about implausible, fictitious events were more likely to claim that the event happened than children who did not draw. Finally, Macleod et al. (2014) found that when no specific instructions were provided to children about what they had to draw, more errors were made than when children were instructed what to draw or were interviewed about their drawing. To conclude, although a plethora of experimentation has demonstrated the positive effects of drawings for children's memory performance, evidence exists that drawings can be harmful in a child interviewing setting as well. Our study was designed to assess both the beneficial and/or negative aspects of drawing on memory performance.

Practice

As subsidiary aim of the present study was to assess the effect of practice on children's memories for an event. In the psychological literature, there are different ways on how to practice and how this might affect subsequent (memory) performance. This could be done on a somewhat more "specific" level by practicing retrieval *after* a witnessed event or on a more general by training children in memory retrieval *before* a witnessed event. Regarding a specific level of practicing, letting children practice recalling a previous childhood memory is linked to a recent line of studies showing that before a focused interview with children starts, a practice narrative should be included in order to stimulate children's responding behaviour in a favourable way. A practice narrative refers to a practice session in which children are asked to describe an unrelated neutral or positive past known to be true event before the interview is focused on the target event (e.g., sexual abuse). Such a session frequently comes after the rapport building phase that is recommended before open-ended questions about the target event are asked (Lamb et al. 2008). In this phase, children are put at ease and are asked neutral questions. Research has demonstrated that rapport building leads to accurate reports in children (e.g., Roberts et al. 2004).

There are various reasons why practice narratives might foster more complete and accurate accounts than when no practice narrative is included. First, practice narrative might help train interviewers in asking follow-up open-ended questions. Open-ended questions are likely to generate complete and accurate statements (Roberts et al. 2004). Furthermore, when practice narratives fuel the use of open-ended questions, this also provides practice in using certain retrieval strategies that lead to complete and accurate reports.

Studies testing the effects of practice narratives on children's memory performance are limited but have found promising results. Brubacher et al. (2011) examined the effect of practice on children's statements. Here, children (5- to-8-year old) participated in 1 or 4 interactive events (e.g., completing a puzzle). One week after their last/only event, children practiced in episodic recall of unrelated experience. The crucial finding was that the younger children who received a specific kind of practice were more complete than younger children in the other practice conditions. In another study, interviews with and without practice narratives were compared (Price et al. 2013) in terms of the presence of interviewer prompts and open-ended questions. The authors found that in interviews containing practice narratives, interviewers asked fewer prompts and more open-ended questions than in interviews without practice narratives. So, although the current state of knowledge suggests that practice narratives are beneficial for children's memory performance, research in this area is still limited.

In our experiment, we were interested in the overall effect of practicing recalling a previous experience on subsequent memory performance. So, our aim was to test to what extent practicing recalling a previous experience improves memory performance on a later test. Regarding a general level of practicing, research on educational psychology has clearly demonstrated that strategies such as practice can aid later memory performance. Although some studies show that practice benefits children's memory (e.g., Pressley et al. 1989), other research shows that practice is not sufficient for children to promote memory performance (Pressley et al. 1984).

There is also related research showing that transferable skills such as practice effects on prospective memory performance can be created in an eyewitness context. That is, in one study (Gawrylowicz et al. 2014), adult participants who received a self-administered interview (interview format that have to filled in by eyewitnesses themselves including questions about mental reinstatement, drawing a sketch of the

event etc.) remembered more details immediately after viewing an event than a free recall group (i.e., this group received a response sheet in which as much information about the witnessed event should be reported), but also remembered more after a week when they viewed a second event and received only free recall instructions. Although this study was conducted with adult participants and this interview format is different from our manipulation, it does show that practicing might have beneficial effects on subsequent memory performance. The question that we addressed in the current experiment was whether the act of practicing on a more general level affected memory performance.

The Present Experiment

In the present experiment, our principal interest was in the combined effects of drawing and practice on younger and older children's memory performance. We were specifically interested in whether including both drawing and practice might lead to more positive effects on memory (i.e., more complete, fewer errors) relative to when only drawing or practice were used. Since both techniques are suggested to generate more cues and strategies for optimal retrieval, it is likely that when using techniques jointly might further aid in retrieval and hence, boost memory performance. To examine whether the effects of drawing and practice affected children from various ages (see Patterson and Hayne 2011), we included 6/7-year-olds and 11/12-year-olds. The older child group differs significantly in terms of memory (error) performance and is more likely to spontaneously use retrieval cues than the younger group (Otgaar et al. 2014, 2016). Although one might expect that drawing and practice could facilitate both groups of children, it is also possible that they are more beneficial for the youngest group. Compared with the previous experiments, we added an additional novel element that has not been studied before but which are relevant to examine.

That is, we presented children with two videos that differed in complexity. The types of events that children are asked upon in interviewing settings are not typical events (e.g., sexual abuse, murder) and concern events that are quite complex for children and of which children do not have much knowledge (e.g., Goodman-Brown et al. 2003). Although previous research shows that complex stimuli such as pictures are better remembered that simple stimuli such as words (Paivio 1971; Rajaram 1996), it is more difficult to remember the precise details of events that are quite complex (e.g., Brainerd et al. 2008). One might wonder whether the possible beneficial effects of drawing and practice are both present for simple and complex stimuli. If drawing and practice narratives are truly effective then memory improvements should be expected for both simple and complex stimuli.

Method

Participants

We recruited 83 children from primary schools in the Netherlands. Eighty-one children completed all phases of the experiments (6/7-year-olds: n = 37, mean age = 6.90, SD = 0.60, 17 girls; 11/12-year-olds: n = 44, mean age = 11.70, SD = 0.45, 21 girls). Children could only participate if they received parental consent. All children received a small present for their involvement. The experiment was approved by the standing ethical committee of the Faculty of Psychology and Neuroscience, Maastricht University.

Materials

Video Two videos were used that differed in complexity. We operationalized complexity as the following. Complex stimuli were regarded as stimuli that did not contain an obvious chronological order and was hence, difficult to follow and understand. Both videos were fragments of Dutch children's movies (i.e., "Knetter" and "Kruimeltje") and lasted both approximately 3 minutes. One video contained a clear structure (i.e., Kruimeltje: little boy is chased by a salesman and a policeman) and the other one was more difficult to follow (i.e., Knetter: teacher visits a girl at her home because the girl claimed she was not allowed to go on a school trip by her mother). To test whether children indeed perceived one video as more difficult and complex relative to the other, we conducted a pilot study in which 49 children participated (mean age = 9.56, SD = 2.12). In the pilot study, children witnessed in a counterbalanced sequence both videos and were asked to indicate the complexity of the video (easiest or difficult). Specifically, they were asked which movie they found easiest to understand and watch. Of these children, 16 indicated that "Knetter" was the easiest movie while 33 children stated that the other movie was easier. This difference was statistically significant (p = .02; one-sample binominal test).

Design and Procedure

The current experiment made use of a 2(Age: 6/7-year-olds vs. 11/12-year-olds) x 2 (Practice: Yes vs. No) x 2 (Condition: Tell vs. Draw and tell) x 2 (Video: Complex vs. Simple) split-plot design with the first two factors constituting between-subjects variables. Children were randomly assigned to the practice groups (Yes: n = 43; No: n = 38).

Children were tested in separate quiet rooms at their primary school. Children were interviewed by research assistants that were trained in conducting child interviews. That is, two female research assistants received training from Dutch police child interviewers on how children are interviewed in the Netherlands. Furthermore, in the current experiment, an

interview protocol was used with specific guidelines on the procedure of this experiment. Each child was interviewed according to this protocol (see Appendix). For the children that received practice, the practice instruction was presented first. Specifically, they first were asked questions about an unrelated "neutral" event (i.e., their latest vacation). The other children were not asked any questions about a neutral event. Children were then individually presented with two videos (complex and easy). The order of this presentation was counterbalanced. After being presented with the first video, children had to report everything they could still recollect about the video (i.e., Tell condition). Following this, children received the second video and were asked after watching the video, to draw and tell what they could remember about the event (i.e., Draw and tell condition). During their reporting, they could use their drawing to clarify what they intended to state. We did not counterbalance this order because if children would be allowed to draw and tell after the first video, this might affect the reporting of information for the second video as well. All interviews about the videos were audio-taped. After the experiment, children were debriefed about the purpose of the experiment.

Scoring

All interviews were verbatim transcribed from the audiotapes by two research assistants (second and third co-authors). Two checklists were created for each video in which the most critical details of the videos were included. These checklists were made separately by the same two research assistants. After independently constructing these checklists, the checklists were discussed by the research assistants and the lead researcher (first author). This resulted in two checklists (complex video: 40 critical items; easy video: 36 critical items) that were used for the scoring of the statements of the children (for a similar procedure, see Smeets et al. 2004). Completeness was scored by dividing the amount of accurately reported details by the amount of possible details. An index of accuracy was calculated by dividing the amount of correctly reported details by the sum of the amount of correctly reported details plus the number of commissions (not-presented details; Smeets et al. 2004). Commissions were scored when children described details that were not present in the videos (e.g., one child reported that he had seen balls while no balls were present). We also measured distortions when children incorrectly changed details (e.g., one child stated that a policeman grabbed a boy while someone else did that).

Results

Completeness

Because the factors Condition and Video were nested within each other, we analyzed the memory effects of drawing and practice separately for each video. For the complex video, we first examined the effects of drawing and practice on completeness by using a 2(Age: younger vs. children) x 2(Condition: Tell vs. Draw and tell) x 2(Practice: Yes vs. No) factorial ANOVA. No significant three-way interaction was observed ($F(1,73) = 0.58$, $p = .58$, $\eta^2_{partial} = .01$). We did find a statistically significant Age x Practice interaction ($F(1,73) = 10.16$, $p = .002$, $\eta^2_{partial} = .12$). Simple effect analysis showed the following. For the younger children, we unexpectedly found that the children who did not receive any practice were more complete in their accounts ($M = 0.17$, $SD = 0.06$) than the children who did receive this practice ($M = 0.10$, SD 0.04; $F(1,33) = 10.93$, $p = .002$, $\eta^2_{partial} = .25$). Although this difference was in the expected direction (practice: $M = 0.24$, $SD = 0.11$; no practice: $M = 0.19$, $SD = 0.10$) for the older children, this difference was not significant ($p = .06$). All other effects were not statistically significant.

As expected, we also found a significant effect of drawing showing that children who were instructed to draw and tell had more complete accounts ($M = 0.20$, $SD = 0.10$) than children who only had to tell what occurred ($M = 0.15$, $SD = 0.08$; $F(1, 73) = 5.25$, $p = .03$, $\eta^2_{partial} = .07$; see Figure 1). Furthermore, we found that the older children recollected more details ($M = 0.21$, $SD = 0.10$) than the younger children ($M = 0.13$, $SD = 0.50$; ($F(1,73) = 22.33$, $p < .001$, $\eta^2_{partial} = .23$) (Figure 2).

For the easy video, like in the complex video condition, no significant three-way interaction was detected ($F(1,73) = 3.03$, $p = .09$, $\eta^2_{partial} = .04$). Again, we did find a significant Age x Practice interaction ($F(1,73) = 6.31$, $p = .01$, $\eta^2_{partial} = .08$) with simple effects showing that only for the younger children, more complete accounts were provided when a practice narrative was absent ($M = 0.28$, $SD = 0.16$) than when the practice was included ($M = 0.15$, $SD = 0.08$; $p < .05$). We also found that older children had more complete statements ($M = 0.34$, $SD = 0.13$) than the younger children ($M = 0.21$, $SD = 0.14$; $F(1,73) = 19.28$, $p < .001$, $\eta^2_{partial} = .21$).

Accuracy

When we examined the accuracy scores, we only found a statistically significant main effect for the complex video of Drawing ($F(1,73) = 7.52$, $p = .008$, $\eta^2_{partial} = .09$) showing that drawing resulted in less accurate statements (Draw and tell: $M = 0.96$, $SD = 0.09$; Tell: $M = 0.99$; $SD = 0.03$). For the easy video, our data only revealed that the younger children were less accurate in their statements ($M = 0.92$, $SD = 0.11$) than the older children ($M = 0.98$, $SD = 0.05$; $F(1,73) = 10.67$, $p = .002$, $\eta^2_{partial} = .13$).

Commissions

For analyses on commissions, we looked at the raw scores. In line with the findings concerning the accuracy scores, for the

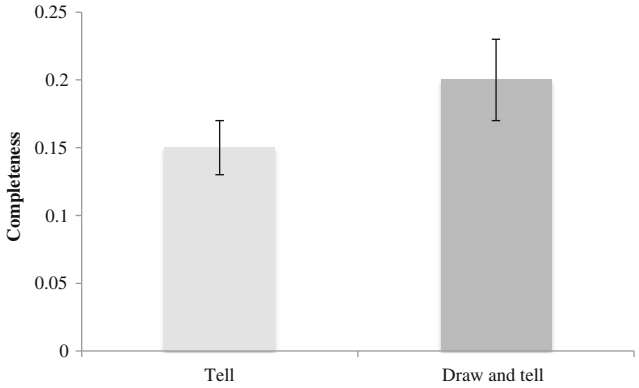

Figure 1 Completeness scores as a function of drawing for the complex video (error bars represent confidence intervals).

complex video, our results only showed that drawing resulted in more commissions ($M = 0.26$, $SD = 0.44$) than when children only talked about the event ($M = 0.05$, $SD = 0.22$; $F(1,73) = 7.88$, $p = .006$, $\eta^2_{partial} = 0.10$). All other effects were not statistically significant (all ps > .05) For the simple video, we only found that younger children had statistically significantly higher commission levels ($M = 0.47$, $SD = 0.51$) than the older children ($M = 0.20$, $SD = 0.41$; $F(1,74) = 7.03$, $p = .01$, $\eta^2_{partial} = 0.10$).

Exploratory analysis

We also explored differences in completeness scores between the complex and easy video using a paired samples t-test. As expected, we found that in the easy video ($M = 27.71$, $SD = 14.45$), completeness scores were statistically higher than in the complex video ($M = 17.84$, $SD = 9.40$; $t(78) = 4.95$, $p < .001$).

Discussion

The principal aim of the current experiment was to examine the effects of drawing and practice on children's memory performance. Some novel findings emerged. First of all, as expected, we found that drawing resulted in more complete accounts for children that received the complex video. However, when we concentrated on the accuracy, our data showed that drawing also led to more inaccurate statements in children receiving the complex video. Furthermore, our results revealed that including a practice instruction resulted in less complete accounts, yet did not impact the accuracy of statements.

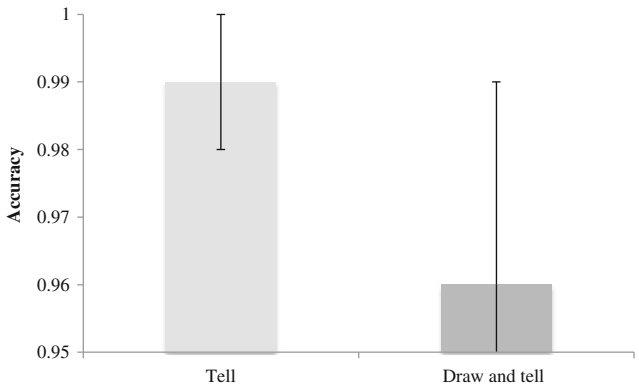

Figure 2 Accuracy scores as a function of drawing for the complex video (error bars represent confidence intervals).

The finding that younger and older children who were allowed to draw and tell had more complete accounts than children who did not make a drawing parallels previous experimentation concerning the reporting benefits of drawing (e.g., Butler et al. 1995; Gross and Hayne 1999; Macleod et al. 2014; Wesson and Salmon 2001). This research also demonstrated that drawing facilitated the reporting behaviour of children in terms of completeness. One likely explanation for this effect is that drawing grants children to come up with their own retrieval cues and that when they start drawing and talking that related information is activated in their memory system as well (Bruck et al. 2000b; Butler et al. 1995).

The beneficial impact of drawing was only evident for the complex video. We did not find that drawing promoted children's recall for the simple video. One might argue that, in general, drawings should affect children's memory performance across-the-board suggesting that whatever the stimuli (complex vs. simple), making a drawing should assist children in coming up with more complete accounts. This is not what we found. A probable reason for this can be traced back in the memory performance of children that were only allowed to tell about the event between the two videos. In the complex video, children who only had to tell reported less information than children who only had to tell and received the simple video. As expected, this is likely due to the complexity of the video in which the complex video was more difficult to remember than the simple video. As a consequence, for the simple video, children who only had to tell had fewer difficulties to remember the gist of the event. Making a drawing therefore did not have an added value of the reporting of information. Looking at this result from another perspective, in legal cases, children are frequently asked upon events that are also quite complex for them (e.g., sexual abuse). Our findings indicate that in such complex events, making a drawing might assist children in making complete accounts.

Although our data showed that making a drawing boosted the completeness of children's accounts for the complex video, we also found that the increase in completeness came at the expense of elevated commissions and hence, reduced accuracy. Previous work has frequently revealed that drawings had positive effects on both completeness and accuracy. Our findings are more in line with research showing that making drawings might adversely influence children's statements (e.g., Bruck et al. 2000a, b; Davison and Thomas 2001;

Macleod et al. 2014; Strange et al. 2003). What could be the underlying reason for drawings leading to reduced accuracy? According to the tenets of a theoretical framework called Associative-Activation Theory (Howe et al. 2009; Otgaar et al. 2014), when people experience an event, information spreads through a network of associatively-related concepts. During this associative activation, oftentimes, related, but non-presented concepts become activated leading to the formation of commission errors or false memories. The same might have occurred when children attempted to retrieve what they could still recollect about the video. Since the idea is that making a drawing results in activating one's own retrieval cues, it might be the case that during this process, information was activated in one's knowledge base that was not present on the video, but related to the video. This might have led to elevated commissions and hence, decreased accuracy. Nonetheless, even though drawing resulted in amplified commissions, accuracy rates were high both when children had to make a drawing and when they did not make a drawing. So, although accuracy rates statistically differed when children drew or not, the effect size was not impressively high.

Regarding the impact of including practice during an interview, we did not find that such practice resulted in increased completeness and accuracy. On the contrary, for both videos, we demonstrated that children gave more complete statements when no practice was present than when they received practice. Although this is contrast with earlier work (Brubacher et al. 2011), specific experimental work in this area is still limited. However, it is somewhat in line with research showing that strategies such as practicing are not necessarily beneficial for children's memory performance (Pressley et al. 1984). Furthermore, we did not find that practice affected accuracy. So, practice might negatively impact the completeness, it did not negatively affect the accuracy of children's statements. Our failure for finding a beneficial effect of practice on children's memory performance might also be due to the nature of practice. It might be that our practice instruction was not well-selected and indeed, a wide variety of events was retrieved by children. All these events could have differed on a number of dimensions (e.g., emotional valence, distinctiveness) which might have interfered with the processing of the stimuli afterwards. Furthermore, in previous studies, a practice narrative was introduced after having witnessed an event. This methodological difference might have affected our findings. On the other hand, our entire experiment was conducted in one session, so it is unlikely that the practicing before or after seeing the first video could have a marked differential influence in subsequent memory performance. Future research should examine whether different practice events might differentially affect children's statements.

It is also relevant to acknowledge the limitations of the current experiment. First of all, one might argue that to increase the ecological validity of this experiment, staged events should be presented to children instead of videos. Indeed, it has been revealed that staged events are more interactive, more self-relevant and thus might boost memory performance more (Symons and Blair 1997) than the mere presentation of videos. Second, interactive events are more likely to tap into the autobiographical experiences that children have to report on when involved in legal cases. Also, in the current experiment, children were interviewed directly after watching the videos while from an applied perspective, children are often interviewed after long delays (e.g., days, months). Fourth, in the current study, children could draw *and* tell while often in forensic interviews (Pipe and Salmon 2009), drawing takes place after free recall reports are exhaustive. Future experiments might consider to test whether the timing of the drawing manipulation matters for optimal memory performance. Finally, in the current study, children that did not practice recalling a previous experience were interviewed slightly shorter than the practice group. To make sure both groups undergo a similar length of interviewing, it would be worthwhile to have the control group perform an unrelated task that lasts on average the same as the practice manipulation.

Nonetheless, from a legal perspective, our results imply that although previous research has revealed the beneficial outcomes of using drawings during an interview, our study adds to the work showing that such methods might also affect the reporting of incorrect information. Our result implies that legal professionals should not immediately resort to the use of these drawings as long as we have no clear answer about the circumstances when making drawings do or do not affect accuracy. In a sense, our results are related to work showing that other props such as dolls and human figure drawings also increase the reporting of erroneous details (e.g., Otgaar et al. 2012). Future research should look more closely on whether drawing might foster the reporting of incorrect information by conducting studies similar as ours but including more realistic stimuli (e.g., interactive events).

In short, in the present experiment, we showed that for the complex video, making a drawing enhanced the completeness of children's memory reports, but also reduced the accuracy of their statements. We also found that although including a practice narrative reduced the completeness of statements, it did not impact the accuracy of children's accounts. Although it is often assumed that making drawings during an interview might be considered to be a viable alternative than using anatomically-detailed dolls or human figure drawings, our experiments suggests to be cautious for making drawings in an interview context. Hence, evidence-based methods to interview children should be the default way in an interview setting (e.g., Lamb et al. 2007) and future research should examine whether the inclusion of makings drawings should be part of a child interviewing setting.

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Appendix

English translation of interview protocol

Phase 1:

-Hello, my name is [name research assistant]. I am interested in the memory of children. But I first want to know you a little bit better. Can you tell me something about yourself?

-[answer child]

-Have you even participated in other research?

-[answer child]

-How are you doing at school?

-[answer child]

-In a matter of minutes, you will see two videos. These videos last approximately three minutes and after viewing each movie, we will talk about the movie. You can always quit if you want. If you do not know the answer, you can say that of course. Also, if you do not understand a word, please let me know. Is everything clear?

As you can also see, I have something to record this conversation in case I do not exactly remember what you have said. Is that ok? Before we really start, I want to know your exact full name and age.

Phase 2 (practice narrative):

-To be sure you completely understand what we are going to do, we will first practice. Can you tell me everything about your last holiday?

-[answer child]

-(if children do not come up with any details, prompt them again)

-Is there anything you want to say that you have not said before concerning your last holiday?

-[answer child]

-Thank you. We will now look at the first movie.

(present the child with the first video)

Phase 3 (free recall):

[record interview]

-This was the first video. Can you tell me everything about what you have seen?

-[answer child]

-[if children do not come up with any details, prompt them again by asking "What happened next?"]

-Is there anything you can still remember that you have not said before concerning the first video?

-[answer child]

-Can we proceed to next video?

(present the child with the second video)

Phase 4 (drawing):

-This was the second video; here are some paper and pencils. Can you draw everything what you have just have seen on the second video?

-(wait until the child is done with drawing)

-Can you tell me everything about what you have seen on the second video? You can use your drawing to help you.

-[if children do not come up with any details, prompt them again by asking "What happened next?"]

-Is there anything you can still remember that you have not said before concerning the first video?

Phase 5 (closure):

-Thank you very much for participating in our study. You did a terrific job. Do you have any questions?

-(give child a present)

[stop recording]

References

Barlow CM, Jolley RP, Hallam JL (2011) Drawing as memory aids: optimising the drawing method to facilitate young children's recall. Appl Cogn Psychol 25:480–487

Brainerd CJ, Reyna VF, Ceci SJ (2008) Developmental reversals in false memory: a review of data and theory. Psychol Bull 133:343

Brown DA, Pipe ME, Lewis C, Lamb ME, Orbach Y (2007) Supportive or suggestive: do human figure drawings help 5-to 7-year-old children to report touch? J Consult Clin Psychol 75:33

Brubacher SP, Robert KP, Powell MP (2011) Effects of practicing episodic versus scripted recall on children's subsequent narratives of a repeated event. Psychol Public Policy Law 17:286–314

Bruck M (2009) Human figure drawings and children's recall of touching. J Exp Psychol Appl 14:361–374

Bruck M, Ceci SJ, Francoeur E, Barr R (1995) "I hardly cried when I got my shot!" Influencing children's reports about a visit to their paediatrician. Child Dev 55:193–208

Bruck M, Ceci SJ, Francoeur E (2000a) Children's use of anatomically detailed dolls to report genital touching in a medical examination: developmental and gender comparisons. J Exp Psychol Appl 6:74–83

Bruck M, Melnyk L, Ceci SJ (2000b) Draw it again Sam: the effect of drawing on children's suggestibility and source monitoring ability. J Exp Child Psychol 77:169–196

Butler S, Gross J, Hayne H (1995) The effect of drawing on memory performance in young children. Dev Psychol 31:597–608

Davison LE, Thomas GV (2001) Effects of drawing on children's item recall. J Exp Child Psychol 78:155–177

DeLoache JD, Burns NM (1984) Early understanding of the representational function of pictures. Cognition 52:83–110

Faller KC (2005) Anatomical dolls: their use in assessment of children who may have been sexually abuse. J Child Sex Abus 14:1–21

Gawrylowicz J, Memon A, Scoboria A (2014) Equipping witnesses with transferable skills: the Self-Administered Interview. Psychol Crime Law 20:315–325

Goodman-Brown TB, Edelstein RS, Goodman GS, Jones DPH, Gordon DS (2003) Why children tell: a model of children's disclosure of sexual abuse. Child Abuse Negl 27:525–540

Gross J, Hayne H (1998) Drawing facilitates children's verbal reports of emotionally laden events. J Exp Psychol Appl 4:163–179

Gross J, Hayne H (1999) Drawing facilitates children's verbal reports after long delays. J Exp Psychol Appl 5:265–286

Howe ML, Wimmer MC, Gagnon N, Plumpton S (2009) An associative-activation theory of children's and adults' memory illusions. J Mem Lang 60:229–251

Katz C, Hershkowitz I (2010) The effects of drawing on children's accounts of sexual abuse. Child Maltreat 2:171–179

Lamb ME, Orbach Y, Hershkowitz I, Esplin PW, Horowitz D (2007) A structured forensic interview protocol improves the quality and informativeness of investigative interviews with children: a review of research using the NICHD Investigative Interview Protocol. Child Abuse Negl 31:1201–1231

Lamb ME, Hershkowitz I, Orbach Y, Esplin PW (2008) The NICHD investigative interview protocol for young victims and witnesses. In: Lamb ME, Hershkowitz I, Orbach Y, Esplin PW (eds) Tell me what happened. Structured investigative interviews of child victims and witnesses. John Wiley and Sons Ltd, Chichester, pp 83–101

Liben LS, Kastens KA, Stevenson LM (2002) Real-world knowledge through real-word maps: a developmental guide for navigating the educational terrain. Dev Rev 22:267–322

London K, Bruck M, Wright DB, Ceci SJ (2008) Review of the contemporary literature on how children report sexual abuse to others: Findings, methodological issues, and implications for forensic interviewers. Memory 16:29–47

Lytle N, London K, Bruck M (2015) Young children's ability to use two-dimensional and three-dimensional symbols to show placements of body touches and hidden objects. J Exp Child Psychol 134:30–42

Macleod E, Gross J, Hayne H (2014) Drawing conclusions: the effect of instruction on children's confabulation and fantasy errors. Memory 37–41

Otgaar H, Horselenberg R, van Kamper R, Lalleman K (2012) Clothed and unclothed human figure drawing lead to more correct and incorrect reports of touch in children. Psychol Crime Law 18:641–645

Otgaar H, Howe ML, Peters M, Smeets T, Moritz S (2014) The production of spontaneous false memories across childhood. J Exp Child Psychol 121:28–41

Otgaar H, Howe ML, Brackmann N, Smeets T (2016) The malleability of developmental trends in neutral and negative memory illusions. J Exp Psychol Gen 145:31–55

Paivio A (1971) Imagery and verbal processes. Holt, Rinehart, and Winston, New York

Patterson T, Hayne H (2011) Does drawing facilitate older children's reports of emotionally laden events. Appl Cogn Psychol 25:119–126

Pipe ME, Salmon K (2009) Dolls, drawings, body diagrams, and other props: role of props in investigative interviews. In: Kuehnle K, Connell M (eds) The evaluation of child sexual abuse allegiations. Wiley, Hoboken, pp 365–398

Poole DA, Bruck M (2012) Divining testimony? The impact of interviewing props on children's reports of touching. Dev Rev 32: 165–180

Poole DA, Dickinson JJ (2014) Comfort drawing during investigative interviews: evidence of the safety of a popular strategy. Child Abuse Negl 38:192–201

Pressley M, Levin JR, Ghatala ES (1984) Memory strategy monitoring in adults and children. J Verbal Learn Verbal Behav 23:277–288

Pressley M, Johnson CJ, Symons S, McGoldrick JA (1989) Kurita JA Strategies that improve children's memory and comprehension of text. Elem Sch J 90:3–32

Price HL, Roberts KP, Collins A (2013) The quality of children's allegations of abuse in investigative interviews containing practice narratives. J Appl Res Mem Cogn 2:1–6

Rajaram S (1996) Perceptual effects on remembering: recollective processes in picture recognition memory. J Exp Psychol Learn Mem Cogn 22:365–377

Roberts KP, Lamb ME, Sternberg KJ (2004) The effects of rapport-building style on children's reports of a staged event. Appl Cogn Psychol 18:189–202

Salmon K, Pipe M, Malloy A, Mackay K (2012) Do non-verbal aids increase the effectiveness of 'best practice' verbal interview techniques? An experimental study. Appl Cogn Psychol 26:370–380

Smeets T, Candel I, Merckelbach H (2004) Accuracy, completeness, and consistency of emotional memories. Am J Psychol 595–609

Strange D, Garry M, Sutherland R (2003) Drawing out children's false memories. Appl Cogn Psychol 17:607–619

Symons CS, Blair JT (1997) The self-reference effect in memory: a meta-analysis. Psychol Bull 12:371–394

Todd CM, Perlmutter M (2006) Realitiy recalled by preschool children. New Dir Child Adolesc Dev 1980:69–85

Wesson M, Salmon K (2001) Drawing and showing: helping children to report emotionally laden events. Appl Cogn Psychol 15:301–319

Willcock E, Morgan K, Harlene (2006) Body maps do not facilitate children's reports of touch. Appl Cogn Psychol 20:607–615

Woolford J, Patterson T, Macleod E, Hobbs L, Hayne H (2015) Drawing helps children to talk about their presenting problems during a mental health assessment. Clin Child Psychol Psychiatry 20:68–83