

Do Better Stories Make Better Memories? Narrative Quality and Memory Accuracy in Preschool Children

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SUMMARY

The present study examines how the quality of children's narratives relates to the accuracy of those narratives. Sixty-one 3- to 5-year-olds played a novel game with a researcher in their schools. Children were questioned in an interview that included an open-ended free recall prompt followed by a series of directed questions. Children's narratives were coded for volume, complexity and cohesion as well as for accuracy. Correlational results showed that overall, narrative skills enable the reporting of more information, while decreasing the proportion of information that was accurate. These results appeared to be driven by a quantity-accuracy trade-off; in an ensuing regression analysis with all narrative variables entered into the model, volume was associated with decreases in accuracy while narrative cohesion was associated with increases in accuracy. We discuss the results in terms of their relationship to the development of autobiographical memory as well as implications for forensic contexts. Copyright © 2007 John Wiley & Sons, Ltd.

Over the past two decades a growing body of research has begun to identify the cognitive, social and neurological factors that contribute to the development of personal remembering. Increasingly, the development of narrative skills has been viewed as an important milestone in the formation of the autobiographical memory system (e.g. Fivush & Reese, 1992; Nelson, 2003; Nelson & Fivush, 2004). Narrative skills provide a culturally appropriate mode for sharing memories with others, while at the same time provide a form that aids in the long-term retention and retrieval of memories. Supporting this view, studies have shown that children's ability to construct coherent narratives is associated with their ability to provide more information about experienced events (Kleinknecht & Beike, 2001), and children whose parents use a more elaborative conversational style when sharing memories tend to remember more details of past events and talk about the events in more elaborate and narratively coherent ways (Harley & Reese, 1999; Leichtman, Pillemer, Wang, Koreishi, & Han, 2000; Reese, Haden, & Fivush, 1993).

Given the prominence that narrative skills have been afforded in the literature on children's memory development, the purpose of the present study was to relate these skills to another important aspect of children's memory: the accuracy of the child's report. This question is both theoretically and practically important. Examining narrative in the context of accuracy provides a theoretically richer account of the role of narrative in memory development compared to examining the quantity of the output alone, as is typical in many

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memory studies (cf. Kleinknecht & Beike, 2001). From a practical standpoint, understanding the relationship between narrative and accuracy in young children's statements may be informative to those interested in evaluating the accuracy of a child's statement in forensic contexts. Indeed, among some psycho-legal scholars there exists an implicit assumption that high-quality narratives are indicative of accurate reports (e.g. Honts, 1994; Raskin & Esplin, 1991; Steller, 1989; Undeutsch, 1989).

Although narrative organization of event information may aid in retention, advanced narrative skills are not necessarily associated with accurate memory reports. There may actually be a theoretical basis to make the opposite prediction, i.e. increased narrative skills may be associated with an increase of inaccurate information, at least among young children. A number of theorists have noted the social function of personal memory sharing, and considered it an important motivation for remembering (e.g. Neisser, 1988; Nelson, 1993, 2003; Reese & Farrant, 2003). Early in development, both ontologically and phylogenically, memories serve social purposes such as creating a shared cultural experience and building relationships between the teller and the listener. Neisser (1988) has further argued that because the social function of memory sharing is primary, children may learn that telling a good story supports social interaction before they acquire the conception that memories should be historically accurate representations of past events. Indeed, in social situations more broadly, the goal of accuracy may be diminished. Research with adults has shown that stories about past events that are told for social or entertainment purposes are less accurate and less tied to the original event than stories told for informational purposes (Adams, Smith, Pasupathi, & Vitolo, 2002; Dudukovic, Marsh, & Tversky, 2004; Wade & Clark, 1993), and that in everyday conversations adults often distort the past (DePaulo, Kashy, Kirkendol, Wyer, & Epstein, 1996; Marsh & Tversky, 2004). Furthermore, parents who adopt an elaborative narrative style may be placing less emphasis on the accuracy of their child's report than parents who adopt a more repetitive and less elaborative narrative style (Fivush & Reese, 1992). Thus, young children who have developed advanced narrative skills, and therefore may have an appreciation of the social value of memory sharing, may not yet have developed the awareness that there is an expectation of accuracy.

Importantly, there are multiple ways of measuring children's narrative skills. One prominent narrative quality measure in the current literature is the quantity of detail a child provides. This can include both the overall length of the narrative (often referred to as 'volume') as well as the amount of elaborations for each individual statement that composes the narrative (often referred to as 'narrative complexity') (e.g. Clarke-Stewart & Beck, 1999; Han, Leichtman, & Wang, 1998; Sperry & Sperry, 1995). A number of studies have shown a quantity-accuracy trade-off in the memory reports of both children and adults (e.g. Koriat & Goldsmith, 1994, 1996; Koriat, Goldsmith, Schneider, & Nakash-Dura, 2001; Roebers et al., 2001). When incentives for accurate responding are increased in memory tests, adults tended to report less information with a greater proportion of that information being correct (Koriat & Goldsmith, 1994, 1996). Similarly, Koriat and colleagues (2001) found that when 7–12-year-old children were asked a series of direct questions about a previously viewed slide-show under conditions that provided greater accuracy incentives, children showed a 7% increase in accuracy that came with a 5% decrease in the amount of information they provided. It appears that adults and older children tend to strategically raise their response criterion by decreasing the amount of their recall in order to increase the overall accuracy of their report. This type of monitoring ability, however, may be particularly problematic for preschool aged children. For example

young children often fail to respond with 'I don't know' even when it is an explicit option (Roebbers & Schnieder, 2000; Seidler & Howie, 1999). They may also be insensitive to interviewing contexts that facilitate recall accuracy in older children and adults (Beuscher & Roebbers, 2005; Koriatic et al., 2001). Similarly, other research has shown that children who are more verbose tend to be less accurate when asked specific questions about past events (Gilstrap & Papierno, 2004; Poole & Lindsay, 2001).

Another key aspect of children's narrative skills is narrative cohesion, i.e. the degree to which the independent clauses in the child's narrative are linked linguistically to create a cohesive whole (Peterson & McCabe, 1991). Because narrative cohesion indexes the degree to which event details are presented in a connected form through temporal and causal relations, the variability in narrative cohesion may also index the strength of the memory trace. Past research has suggested that memory strength is associated with resistance to distortion and forgetting (Brainerd, Kingma, & Howe, 1985; Ceci, Toglia, & Ross, 1988; Marche, 1999; Marche & Howe, 1995; Pezdek & Roe, 1995). In addition, narrative cohesion may allow children to more effectively organize event information and to monitor accuracy during retrieval. Thus, to the degree that children's inaccuracies reflect actual errors of memory, as opposed to embellishments and exaggeration provided to tell a better story, narrative cohesion may predict increases in accuracy.

The motivation for the current study was to examine the relations between different aspects of children's narrative skills and the accuracy of their memory reports. Although past research has found that children's narrative skills are associated with the amount of accurate information they provide (Kleinknecht & Beike, 2001), we are unaware of studies that also examine narrative skills in relation to the amount of inaccurate information children provide. The volume, complexity and cohesion of children's narratives may increase the amount of event information children provide, both accurate and inaccurate, including the amount of information they are able to provide in response to direct questions. However, as children continue to embellish and elaborate their reports they may become more prone to providing inaccurate information. Thus, we make what at face value appears to be a counter-intuitive prediction, namely, for the reasons described above, young children's increasing narrative skills, measured by volume and complexity, would predict decreases in report accuracy. However, narrative cohesion would predict increases in accuracy, as it may protect children from distortion and forgetting. In addition, in line with previous research we also expected that children's narrative skills would predict reporting more information.

In the present study, preschool children played a novel game with a researcher in their nursery schools. We embedded this event with a number of aschematic and unusual elements for three reasons. First, we wanted to ensure that children's reports reflected their actual representation of the past event, rather than reconstructions based on their general knowledge. Although some authors (e.g. Fivush, 1998) have argued that it is impossible to disentangle these two processes in children's correct responses, including aschematic elements ensures that children's correct reports do not follow from their general knowledge or scripts because these aschematic events cannot be a part of children's general knowledge (see also Ornstein et al., 1998). Thus, if children report information based on their general knowledge they will actually be incorrect about the aschematic events. Second, in forensic contexts, children are often interviewed about events that are confusing and run counter to their everyday knowledge about the world (e.g. a family member who is supposed to be loving and supportive physically harming the child). The present methodology allows us to test children's memory in this type of context in an ethically permissible way, although admittedly the current event lacks the stressful and emotional context that forensic

situations generally evoke. Finally, how young children handle these aschematic elements is itself an interesting question. In particular, we were interested in examining whether children's tendency to distort aschematic elements may be related to narrative skills. Since both represent forms of children's cultural knowledge (Bartlett, 1932/1972; Bruner, 1991; Ochs & Capps, 1996), it is possible that children's tendency to schema-distort may be positively related to their narrative skills.

Children were interviewed either 1 week or 1 month following the event. We hypothesized that the predicted relationship between narrative volume and complexity and memory accuracy would be more pronounced at a longer interval, when children's memories of the original event have faded and thus a greater degree of inference and memory reconstruction may take place (Bartlett, 1932/1972; Ceci & Bruck, 1993). Further, at longer intervals the mnemonic benefits of increased cohesiveness may become more pronounced. Interviews included an open-ended prompt as well as a series of directed questions. These two formats allowed us to examine the relationship between narrative quality and accuracy in both children's free recall narratives as well as when they were prompted to provide additional information. Thus, in the present study we were able to examine how the quality of a child's narrative predicts both the accuracy of that narrative *and* the accuracy of their responses to additional directed questions about the event.

METHOD

Participants

Participants were 61 children ($N = 30$ female) recruited from local preschools. Their ages ranged from 3.25 years to 5.25 years ($M = 4.37$ years, Median = 4.30 years, $SD = 0.60$). Data from one additional child were excluded for failure to complete the interview protocol and from a second child because he was outside the target age-range (6.08 years). The children were predominately Caucasian ($N = 47$), with a few children of Asian ($N = 2$), Latin American ($N = 3$), and multiethnic ($N = 2$) backgrounds (the parents of seven children did not provide ethnic information). The majority of children were from middle to upper-middle class families and 90% of mothers had at least a college education. Written consent was obtained from each child's parent or legal guardian prior to the start of the study, and children received a small toy for their participation.

Procedure

One female and two male trained research assistants collected the data. Prior to the research sessions, the researchers visited children in their classrooms on two to three occasions to establish familiarity. One of the male researchers staged the event with the children and the other videotaped the event and took notes. The female researcher (the interviewer) conducted the memory interviews. Children were randomly assigned to one of two retention intervals: one week (15 males, 16 females) and one month (16 males, 14 females). The staged event and the interviews were conducted in the children's schools.

Staged event

Children participated in a staged event, adapted from Chae, Kulkofsky, and Wang (2006), 'The Pizza Chef Game', in small groups of two to seven. On the day of the game, the

researcher first played with the children for a few minutes in the children's classroom to establish rapport, and then led a small group of children to a separate room to play the game.

The Pizza Chef Game involved children making and pretending to eat a simulated pizza. The game was designed to include a number of schematic and aschematic elements. First, the researcher put on a chef hat and gave each child a chef hat to wear. The researcher then stated that before they make the pizza he must wash his hands, and produced a chalkboard eraser to wash his hands. He then presented the simulated pizza toppings and crust to the children. Each topping was presented one by one and clearly labelled for the children (e.g. 'Here's the cheese, does everyone see the cheese?'). The children were then given the opportunity to choose two different toppings to put on the pizza crust. When each child had taken a turn placing toppings on the pizza, the researcher placed the pizza in the 'magic refrigerator' (a large box decorated to resemble a refrigerator) to bake. The children were next told it was time to set the table and were given paper placemats and plates. The researcher then exclaimed 'Oh my! I forgot to brush my teeth today!' and began to pretend to brush his teeth with a hairbrush. Following this, children were given stickers to decorate their plates. Children were given 2–3 minutes for this activity, when the researcher exclaimed, 'Oh my goodness! I forgot how long the pizza was in the refrigerator! I'd better call my friend Max; he'll know what to do'. He then produced a shoe and pretended to call his friend Max (i.e. he audibly participated in one end of the pretend conversation). He then informed the children, 'Max said I need to take the pizza out right now, or it might burn!' He then removed a pizza box that had been placed in the 'magic refrigerator' prior to initiating the game, which contained a second pizza that had been prepared by gluing the toppings on the simulated crust and cutting it into pieces. With the contents of the box out of the view of the children, he took a pair of chopsticks and 'cut' the pizza. The children were then each given one slice of pizza and pretended to eat it. The game play took approximately 15 minutes. After the completion of the game, the researcher thanked the children and returned with them to their classroom.

There were five aschematic elements: Washing hands with a chalkboard eraser, baking the pizza in a refrigerator, brushing teeth with a hairbrush, using a shoe to make a telephone call, and cutting the pizza with chopsticks. There were also five other 'everyday' elements including wearing the chef hat, putting toppings on the pizza, setting the table, decorating the plates, and pretending to eat the cooked pizza. The entire event was videotaped.

Interview

The female researcher interviewed children individually either 1 week ($M = 6.37$, $SD = 1.22$ days) or 1 month ($M = 29.59$, $SD = 5.30$ days) following the staged event. She asked children an open-ended question followed by a series of direct questions. Interviews were conducted outside of the children's classroom, most often in the same room in which the game was played. After chatting with the child to establish rapport, the interviewer said: 'I heard that my friend came here and played the Pizza Chef Game with you awhile back. I couldn't come to the school that day, so I thought maybe you could tell me about the game. What's everything you remember from when my friend came here to play?' The interviewer used neutral prompts such as 'Tell me more', and 'What else do you remember?' The interviewer continued prompting the child until the child indicated that he or she remembered nothing else or if the child remained silent for a minimum 10 seconds.

Following the open-ended question, the interviewer asked the child 12 direct questions (see Appendix for a list of direct questions). She prefaced the questions stating, 'You're

doing a good job so far. I have some other questions to ask you, but if you don't remember the answer, it's okay to say "I don't know"" The direct questions were designed to assess memory for the major aspects of the event, including the aschematic elements. If a child previously mentioned an item in the open-ended response, the relevant question was still asked, and the interviewer prefaced the question with 'I think you told me this already, but I forget. Can you tell me again ...?' This preface was designed to reduce the child's expectancy that he or she had previously provided the wrong answer and needed to change his or her answer for the interviewer.¹

The interview session lasted approximately 5–10 minutes. All interviews were audio-recorded and transcribed verbatim for coding.

Coding

The unit of coding is the proposition, defined as a subject-verb construct (Fivush, Haden, & Adam, 1995). In each proposition, the subject or verb may be explicit or implied. For example 'It was fun' would be counted as a single proposition as well as 'Fun'. Exact and substantive repetitions were not coded. Additionally, place holders such as 'umm' and 'I don't know' and off-topic talk (e.g. talk about the tape recorder) were not counted.

Children's utterances were coded as either *spontaneous* or *prompted* (see Bruck, Ceci, & Hembroke, 2002 for similar coding). Spontaneous propositions occurred during the open-ended question, or when the child volunteered additional information in response to a direct question (e.g. Interviewer: What toppings did you put on the pizza? Child: Pepperonis and mushrooms. *And then we put stickers on our plates.*). Prompted propositions were responses to direct questions (e.g. Interviewer: What colour hat did you wear? Child: *Blue*). Although there were 12 prompted questions, it was possible for children to receive a score of greater than 12 for their prompted responses, since they could respond to a question with multiple propositions (e.g. 'He brought pepperonis. And he also brought some peppers and ham').

Memory accuracy

To assess the accuracy of children's memory reports, all propositions, both spontaneous and prompted, were first classified as either *event details* whenever they referred directly to what happened in the event, or *extra-event details* whenever they referred to the children's idiosyncratic opinions, feelings and thoughts about the event. Only event details were submitted to accuracy coding, since children's idiosyncratic responses could not be deemed correct or incorrect. Accuracy coding was based on records of the event. If a proposition contained any incorrect information, the entire proposition was coded as incorrect (e.g. 'He used a knife to cut the pizza' would be counted as incorrect because he used chopsticks to cut the pizza). Occasionally, the veracity of an event detail could not be checked, for example, when a child mentioned something that happened after the videotaping ended ('When he left he said 'Goodbye!'), or when the information was unclear from the records ('I put 4 stickers on my plate' when the number of stickers were

¹Occasionally children gave fantastical or improbable answers about aspects of the event that did not actually occur (e.g. saying the researcher brought poop or bugs to put on the pizza, or that the researcher told the children to put the stickers on his face). In these cases the interviewer gently challenged the children by saying, 'That really happened when Aaron (the researcher) came?! I want to know what *really* happened'. In all cases the children maintained that the events actually happened when they played the Pizza Chef Game, thus these types of statements were included and coded as incorrect statements.

not clearly visible). These utterances did not receive a correct/incorrect code, although they were counted in total event details. The accuracy coding yielded a total correct statements score and a total incorrect statements score for each child. We then calculated a *proportion correct* score by dividing the total correct statements score over the total number of event details.

For each aschematic element children further received a categorical code describing how they dealt with the element in their narratives. The code included four levels, where the child either correctly recalled the item (e.g. recalling the refrigerator), schematically distorted the item (e.g. recalling an oven instead of the refrigerator), gave a completely wrong answer (e.g. recalling a television for the refrigerator), or omitted the item. Additionally, each time a child produced a schema distortion (e.g. each time the child referred to the refrigerator as an oven) was noted.

Narrative quality

Children's spontaneous propositions, including both event and extra-event details, were coded for narrative quality. Prompted statements were not coded for narrative quality as they often were skeletal in nature and do not provide an index of children's free narrative skills (see Bruck et al., 2002 for similar coding). In line with our main hypotheses, three commonly used measures of narrative quality were used: Volume, narrative complexity and narrative cohesion.

Volume provides a measure of the length of the child's statement and was indexed by the number of words the children provided in their spontaneous statement (Han et al., 1998). The word count was conducted via a computer program.

Narrative complexity represents the degree of complexity and detail of children's narrative (Han et al., 1998; Sperry & Sperry, 1995). It was indexed by words per proposition, that is, the total number of words in children's spontaneous propositions divided by the total number of spontaneous propositions.

Narrative cohesion represents the temporal and elaborative cohesion of children's narrative (Buckner & Fivush, 1998; Fivush et al., 1995; Peterson & McCabe, 1991). It is reflected in the uses of simple temporal markers of chronological time (e.g., first, next, then, before, after); complex temporal markers about conditional states (e.g., when, if/then, until), causal relations (e.g., because, so, in order to), or optional states (e.g., sometimes, usually, always, or, probably); and words that provide descriptive texture to the narrative, including adjectives, adverbs, and modifiers. Children's uses of temporal markers and descriptives were counted and combined.

Two independent coders coded 20% of the transcripts for reliability check. The mean Cohen's kappa score was 0.87, ranging from 0.74 (for coding of spontaneous vs. prompted statements) to 0.96 (for coding event details vs. extra-event details). All other measures fell between this range. Disagreements were resolved by discussion. One coder coded the remaining transcripts.

RESULTS

Preliminary analyses found no main effects or interactions with the variables of interest for gender, ethnicity, mother's education, birth order, or school attended. Thus these variables

were not considered further. One child was dropped from the analysis after inspection of the plots revealed she was a high-influence outlier (Her scores on volume and cohesion were more than three standard deviations above the group mean and her score on proportion correct was more than two standard deviations below the group mean). This led to a final sample of 60 children (29 female, 31 male).

All analyses were first conducted including age, measured continuously in months, either as a covariate in analyses of variance models or as a predictor in regression models. No main effects or interactions involving age emerged in any analyses, possibly due to the limited age range of the sample (primarily 4-year-olds). Because there were no effects for age, and because the parents of two children did not report their age, which would require dropping them from all further analyses, age was not considered further.

Effects of retention interval and response type on memory responses and narrative scores

Table 1 presents the means and standard deviations of all variables of interest as a function of retention interval and response type.

Separate 2 (response type: spontaneous vs. prompted) \times 2 (retention interval: 1 week vs. 1 month) mixed ANOVA were conducted on the number of event details (total, correct and incorrect) as well as proportion correct. Analysis of total event details recalled revealed main effects of response type, $F(1, 58) = 102.73, p < 0.001, \eta_p^2 = 0.64$, and retention interval, $F(1, 58) = 4.35, p < 0.05, \eta_p^2 = 0.07$, whereby children provided more prompted than spontaneous event details and provided more event details at 1 week than at 1 month. Analyses of total correct and total incorrect responses both revealed a main effect of response type, $F(1, 58) = 57.06, p < 0.001, \eta_p^2 = 0.50$ for correct details, $F(1, 58) = 24.98, p < 0.001, \eta_p^2 = 0.30$ for incorrect details, indicating that children provided more prompted than spontaneous correct and incorrect event details. The analyses of children's proportion correct scores excluded three children in the 1-month interval who failed to provide any spontaneous event details (although they provided prompted event details) because a

Table 1. Mean and standard deviations of memory and narrative variables as a function of retention interval and response type

	Retention interval			
	1 week		1 month	
	Spontaneous	Prompted	Spontaneous	Prompted
Amount and accuracy				
Event details	9.90 (7.46) _a	17.00 (5.71) _b	6.94 (5.84) _a	14.35 (4.23) _c
Correct details	6.90 (4.77) _a	11.31 (4.93) _b	5.03 (3.95) _a	10.22 (4.03) _b
Incorrect details	2.55 (3.36) _a	5.14 (5.19) _b	1.64 (3.66) _a	3.94 (3.93) _b
Proportion correct	0.76 (0.23) _a	0.68 (0.22) _b	0.82 (0.23) _a	0.72 (0.19) _b
Narrative variables				
Volume	75.65 (63.88) _a		53.58 (53.62) _a	
Complexity	6.37 (1.93) _a		5.74 (2.88) _a	
Cohesion	7.07 (6.42) _a		3.81 (3.76) _b	

Note: Means in the same row with different subscripts are significantly different. Event details include correct, incorrect and details that could not be verified as correct or incorrect. Narrative variables were only measured for spontaneous responses.

proportion spontaneous correct score could not be calculated for them. The results of this analysis revealed a main effect of response type, with children providing proportionally more accurate responses to the spontaneous than prompted responses, $F(1, 55) = 16.14$, $p < 0.001$, $\eta_p^2 = 0.23$.

Children's narrative scores were analysed as a function of retention interval. There were no significant differences between children's scores on volume or complexity at 1 week versus 1 month. However, children's narratives at 1 week contained significantly more cohesive elements than their narratives at 1 month, $t(58) = 2.42$, $p < 0.05$, $\eta_p^2 = 0.09$.

To examine children's schema distortions, we calculated the total number of aschematic items out of five possible items that children correctly recalled, schema distorted, recalled wrongly and omitted. These scores were analysed via a 2 (retention interval) \times 4 (recall type: correct vs. schematic vs. incorrect vs. omission) mixed ANOVA. There was a main effect for recall type, $F(3, 56) = 18.29$, $p < 0.001$, $\eta_p^2 = 0.24$. Tukey's Least-Significant-Difference tests ($ps < 0.05$) revealed that children correctly reported ($M = 1.88$, $SD = 1.36$), schema distorted ($M = 1.22$, $SD = 1.11$), or omitted ($M = 1.63$, $SD = 1.16$) more aschematic items than they incorrectly reported ($M = 0.28$, $SD = 0.67$). Children also correctly recalled more aschematic items than they schema distorted or omitted. However, even though children correctly recalled more of these items than they distorted, they still, on average, schematized about one out of the five aschematic elements in their reports. There was no effect of retention interval.

Relations between narrative quality and amount and accuracy of information reported

Although we initially expected that the relationship between narrative quality and proportion correct would be influenced by the retention interval, we found no significant differences in these relationships between the two retention intervals. Further, when we examined the relationships between narrative and total number of event details and proportion correct separately for spontaneous and prompted responses, we found the pattern of relationships between these measures were consistent across response types (i.e. correlations were not significantly different from each other), and the conclusions drawn did not vary for spontaneous versus prompted responses. Therefore, subsequent analyses are collapsed across retention intervals and response types.

Table 2 displays correlations between the measures of narrative quality and the number of event details (measured in total number of both spontaneous and prompted propositions) and accuracy of the information (measured in proportion correct) the child reported.

The different measures of narrative quality were all positively and significantly correlated with each other, indicating that as children's narratives became more voluminous they also became more complex and utilized more cohesive terms.

As predicted, all measures of narrative quality were positively and significantly correlated with the total number of details the children provided. That is, as children used more words, produced more complex narratives, and used more cohesion terms, the amount of information they provided (both correct and incorrect) across the entire interview increased.

Of primary interest was the relationship between the various measures of narrative quality and accuracy. As predicted, volume and complexity were negatively correlated with proportion correct. Counter to our predictions, the correlation with cohesion was also negative but failed to reach statistical significance. Thus, as children provided more

Table 2. Correlations between narrative and the amount and accuracy of children's reports

	2	3	4	5	6
1. Volume	0.52***	0.83***	0.90***	-0.45***	0.19
2. Complexity	—	0.37**	0.42**	-0.31*	0.22
3. Cohesion		—	0.88***	-0.20	0.22
4. Event Details			—	-0.36**	0.26*
5. Proportion Correct				—	-0.18
6. Schema Distortions					—

Note: Event details include correct, incorrect and details that could not be verified as correct or incorrect.

* $p < 0.05$.

** $p < 0.01$.

*** $p < 0.001$.

voluminous and complex narratives, the proportion of correct information they provided decreased.

Table 2 also displays the correlations between each child's narrative scores and the number of aschematic elements the child distorted in a schema-consistent manner. As can be seen in the table, although there is a positive correlation between the number of elements that were schema-distorted and each of the narrative quality measures (suggesting that better narratives were associated with more schema-consistent distortions) none of these correlations reached statistical significance. Schema distortions were positively correlated with event details, indicating that children who provided more details about the event schema distorted more of the aschematic elements.

Independent contributions of narrative variables to memory accuracy

Given the high correlations between narrative variables, it was possible that the effects we uncovered in the correlational analyses were driven primarily by a subset of the narrative quality variables. It is possible, for example that volume might drive this relationship given the quantity-accuracy trade-off. Thus, we next examined the independent contribution of each narrative variable to the amount and accuracy of information children provided. We performed two regression analyses to test total event details and proportion correct, respectively, as a function of the three narrative variables. Because of the possibility of multicollinearity we calculated the tolerance and variance inflation factor (VIF) values for all predictor variables as well as the condition number for the set. All tolerance values were greater than 0.10 and all VIF values were less than 10, and the condition number was less than 30 ($CN = 8.04$), indicating multicollinearity is not an issue with this data (see Kleinbaum, Kupper, Muller, & Nizam, 1998).

Both linear regression models were significant, $F(3, 59) = 117.49, p < 0.001, R^2 = 0.86$ for total event details, $F(3, 59) = 8.01, p < 0.001, R^2 = 0.30$ for proportion correct. The standardized beta coefficients and t statistics are listed in Table 3.

When controlling for all narrative variables, both volume and cohesion were significant predictors of total number of details the child provided. As we expected, increases in volume and cohesion were associated with increases in the number of event details the child provided across the entire interview. Narrative complexity did not independently predict the number of details children provided.

Table 3. Standardized Beta coefficients predicting proportion correct from volume, complexity, and cohesion

Predictor	Event details		Accuracy	
	β	t	β	t
Volume	0.55	5.65***	-0.88	3.98***
Complexity	-0.02	0.33	-0.06	0.50
Cohesion	0.42	4.71***	0.56	2.73**

Note: $N = 60$. Event details include correct, incorrect and details that could not be verified as correct or incorrect.

** $p < 0.01$.

*** $p < 0.001$.

Greater narrative volume was associated with decreases in the proportion of the child's statements that were correct. Conversely, increases in the number of narrative cohesion items were associated with increases in the proportion of correct statements. Again, narrative complexity was not independently associated with the accuracy of the child's statement.

To assess whether these results were affected by children's tendency to make schema distortions, we re-ran these analyses removing every error that was the result of a schema distortion. The results of this analysis were nearly identical to the original analysis. In addition, analyses examining models with interactions between each of the narrative variables, as well as between only narrative volume and cohesion (the significant predictors) were conducted. No significant interactions emerged from any of these analyses.

DISCUSSION

Given the important role the development of narrative skills has been afforded in the literature on children's developing memory abilities, the present study set out to test how narrative quality—measured in terms of volume, complexity and cohesiveness—may be related to another important characteristic of the child's memory report, its accuracy. Additionally, we were able to examine children's memory accuracy across two retention intervals and in response to both open-ended and direct questions.

In examining children's memories across different question types we found that children provided more prompted information than they spontaneously reported, but that spontaneously reported details were proportionally more accurate, replicating previous work (e.g. Geddie, Beer, Batosik, & Wuersch, 2001; Hutchison, Baxter, Tefler, & Warden, 1995; Ornstein et al., 1998; Peterson, Dowden, & Tobin, 1999). We also found that overall, children tended to provide more event details and more cohesive narratives at a shorter retention interval, suggesting that information was forgotten over time. However, response type and retention interval had little influence in the relationship between narrative quality and memory accuracy.

In addition, children experienced an event that included a number of aschematic elements. Although our rationale for including these elements was primarily to ensure that children's correct responses reflected their actual memory of the event and further to recreate some of the elements encountered in forensic contexts, examination of these contextual elements yielded some interesting findings in their own right. We found when

children mentioned an aschematic element, roughly 35% of the time this element was schema-distorted. This finding replicates other work showing that information is often distorted to fit with schematic knowledge (e.g. Ornstein et al., 1998).

Regarding the relationship between narrative skills and the amount and accuracy of information reported, we predicted that narratives of increased volume and complexity would be associated with increases in reporting more information overall, but that a greater proportion of that information would be incorrect. On the whole, our correlational findings supported both of these predictions. These results compliment a number of findings in the suggestibility literature showing that young children's false statements are often as detailed as their true statements, if not more so (Bruck et al., 2002; Leichtman & Ceci, 1995; Powell, Jones, & Campbell, 2003; Principe & Ceci, 2002). While this past research shows that children's false statements can be quite elaborate, especially when elicited in a suggestive manner, the current study shows that children's elaborate statements generally contain a number of inaccuracies and falsehoods.

These results suggest that for preschool children the goal of telling a 'good' story may trump the need to tell an accurate story, leading to increased embellishments. Just as adults often exaggerate and embellish stories about the past when sharing them with others (DePaulo et al., 1996; Marsh & Tversky, 2004), young children may do so as well. Children also frequently experience narratives in fictional contexts, and perhaps more often than they experience narratives in the context of sharing personal past experiences (Alexander, Miller, & Hengst, 2001; Sperry & Sperry, 1995). It is possible then that through exposure to fictional stories, young children develop an appreciation for the narrative form, and may have practiced this form long before they can appreciate that narratives about personally experienced past events should be, at least in certain contexts, veridical accounts of past experiences.

Additionally, even if young children recognize that an interview, such as the one in the present study, requires more accurate responses, they may be less able to monitor and control the accuracy of their output. Along these lines, Roebbers et al., 2001 found that although kindergarten students' accuracy increased when they were provided with explicit incentives for accurate reporting, they benefited less from these incentives than older children and adults. Other authors have similarly found that conditions that increase accurate responding in adults appear to be less beneficial for children (Beuscher & Roebbers, 2005; Koriati et al., 2001). These results suggest that young children are unable to strategically edit their memory reports for accurate recall to the same extent that adults are.

Through our regression analyses we were able to produce a more fine-grained picture of the specific mechanisms that may drive the narrative-accuracy trade-off. These analyses revealed two competing mechanisms that were masked in the correlational analyses: On the one hand, the inverse relationship between accuracy and narrative quality appeared to be driven primarily by a quantity-accuracy trade-off. When all other variables were controlled, as children used more words in their narratives a greater proportion of the details they reported were inaccurate. On the other hand, we found that greater narrative cohesion was associated with increases in accuracy. These results paint a fairly complicated picture for the relationship between narrative skills and accuracy. Although children's skills at producing a cohesive narrative account appear to partially protect them from making memory errors, these children are still often prone to inaccuracies by virtue of the fact that they are also saying more overall.

The differential effects of volume and cohesion in our regression analyses hint at a mechanism for our correlational findings. As we have already suggested, our findings with

regard to volume may result from children's general inability to appropriately monitor the output of their memory. Children who talk more, and provide more information overall, appear less able to strategically monitor the accuracy of their memory. What is not clear from the current data is whether children's general verbosity is a marker for their poor memory monitoring skills, or conversely, if the poor monitoring skills of young children in general put them at risk for making more errors, but only those children who happen to talk more have the opportunity to make these errors. Future research investigating the link between children's verbosity and meta-memory skills is warranted to clearly delineate the nature of this relationship.

There are a number of possible explanations for our finding that narrative cohesion was associated with better accuracy. First, narrative cohesion may be related to children's verbal intelligence or other cognitive skills that may also be related to children's accuracy of reporting. That is, children who provided more cohesive accounts, controlling for the volume of their account, may simply be more cognitively advanced and thus better able to control the accuracy of their report. Although intelligence and verbal skills have not been consistently associated with children's ability to remember accurate information (Burgwyn-Bails, Baker-Ward, Gordon, & Ornstein, 2001; Gordon et al., 1993; Greenhoot, Ornstein, Gordon, & Baker-Ward, 1999; Roebbers & Schneider, 2001), there is some limited evidence that verbal abilities may protect against suggestibility (Clarke-Stewart, Malloy, & Allhusen, 2004; McFarlane, Powell, & Dudgeon, 2002) and that receptive language (often a proxy for verbal intelligence) predicts narrative skills (Walkenfeld, 2000 cited in Nelson & Fivush, 2004). These findings suggest a link between verbal abilities, memory accuracy and narrative skills. Future research should explore the possible mediating role that cognitive factors, such as verbal ability, may play in the relationship between narrative cohesion and memory accuracy.

Another possibility, one which we tend to favour, is that memories that are more cohesive may be associated with 'stronger' memory traces which, in turn, contribute to more accurate recall. Narrative structure provides an organizational framework to event information that links events together through linguistic temporal markers and provides elaborated and evaluative information about the event (Nelson & Fivush, 2004). According to Pezdek and Roe (1995), stronger memory traces are conceptualized as retaining the original information in an elaborated form in which many of the features are preserved in a richly associated network of representations (see also Brainerd, Renya, Howe, & Kingma, 1990). This description of stronger memory traces bears striking resemblance to the description memories that are stored in a narratively cohesive manner. If cohesive narratives do represent stronger memory traces, they would increase the memorability of information. Indeed, research has indicated that information presented in a narrative form is retained better than information that lacks narrative structure (e.g. Copmann & Griffith, 1994; Lang, Sias, Chantrill, & Buerk, 1995; Monaco & Harris, 1978). This interpretation of the current findings suggests that narratives are not only how memories are shared with others, but also how they are stored and represented, as has been suggested by theorists emphasizing the importance of narrative skills for autobiographical memory development (Nelson & Fivush, 2004).

The present findings are restricted to the limited age-range of preschool-aged children. Within this range, we found no effect of age. There is conflicting evidence as to whether or not increases in age are associated with increases in accuracy. For example, Poole and White (1991) found that older children and adults provided more accurate and inaccurate information than younger children. Similarly, Cassel et al. (1996) found no age differences

in children's responses to non-biased direct questions (see also Poole & White, 1993; Poole & Lindsay, 2001). However, other authors have found greater accuracy of responding with increased age (e.g. Goodman, Quas, Batterman-Faunce, Riddlesberger, & Kuhn, 1997; Koriat et al., 2001; Peterson, 1999). We suspect that in most contexts, especially laboratory-based procedures, adults and older children are fairly able to monitor the output of their memory reports and only provide information they believe is accurate (at least when other biasing factors, such as misleading post-event information are absent). However, in social contexts, adults appear to pay less attention to accuracy (e.g. Dudukovic, Marsh, & Tversky, 2004). In these contexts adults may favour telling more elaborated and embellished stories over more accurate stories, and thus may show a narrative-accuracy trade-off. Unlike young children, however, older children and adults may be better able to both understand the accuracy demands of a given context and further may be better able to monitor their output accordingly. Thus, the negative relationship between narrative quality, particularly narrative quantity and accuracy, is likely more pervasive amongst young children, and is likely not limited to specific contexts as it may be in older children and adults. Future developmental research comparing this effect across the lifespan, and in different memory-sharing contexts, is warranted.

Despite the fact that some researchers have argued that the narrative quality of a child's statement is indicative that the statement is true (e.g. Raskin & Esplin, 1991; Steller, 1989), the present findings suggest that, on the whole, the opposite is the case. Rather than being a marker for validity, the length and elaborateness of the child's statement is more indicative that the statement contains some inaccuracies, although when volume is controlled, there does seem to be an accuracy benefit for more cohesive narratives. Though it may seem intuitive to assume that longer and more detailed narratives are probably more accurate portrayals of the truth, this intuitive belief may itself be little more than a good story.

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APPENDIX

LIST OF DIRECT QUESTIONS

1. Who did you play the game with? (If the child says 'My friends' or 'The other kids' or similar response then, 'What are the names of the friends you played with?')
2. I heard you all wore funny hats. What colour hat did you wear?
3. I heard he washed his hands, what did he wash his hands with?
4. I heard he brought a pizza and lots of toppings. What kind of toppings did he bring?

5. What did he tell you to do with those toppings?
6. I heard he baked the pizza. How did he bake it?
7. What did you do when the pizza was baking?
8. I heard he brushed his teeth, what did he brush his teeth with? (If the child says, 'A brush', then 'What kind of brush did he use?')
9. I heard he there were some stickers, what did he tell you to do with the stickers?
10. How did he know when the pizza was done baking?
11. When the pizza was done baking, how did he cut it up?
12. What did you do with the baked pizza?

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