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## Narrative Skills, Gender, Culture, and Children's Long-Term Memory Accuracy of a Staged Event



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### ABSTRACT

This study examined the extent to which school-aged children's general narrative skills provide cognitive benefits for accurate remembering or enable good storytelling that undermines memory accuracy. European American and Chinese American 6-year-old boys and girls ( $N = 114$ ) experienced a staged event in the laboratory and were asked to tell a story from a picture book that accessed their narrative skill. Children were interviewed about the staged event 6 months later to assess memory accuracy. Greater narrative skill when storytelling was associated with *decreased* free recall and recognition memory accuracy for the staged event. In free recall responses, this effect was driven by an increase in the likelihood that inaccurate details would be included in responses from children with better general narrative skills. For girls only, narrative skill predicted poorer recognition accuracy. Girls were also more language-proficient and provided more correct details in free recall than did boys. Chinese American children were more accurate than European American children when responding to recall prompts due to less frequent provision of incorrect details, particularly in girls. Findings are discussed in light of the roles of socialization in memory-reporting accuracy.

Narrative skills are critical for the development of personal event memory. At a broad level, theorists have argued that narratives enhance memory through facilitation of conversation about the past (Bauer, 2007; Nelson & Fivush, 2004). The development of narrative skills allows children to discuss past experiences with others, and in so doing, they further rehearse a specific event's contents. During the process of narrative interaction, children also learn what event elements are important to remember and how to structure their memories into a form that can later aid with recall. According to the basic-systems model of episodic memory (Rubin, 2006), the temporal and causal structures created through narratives, like those captured through measures of cohesion and coherence, provide a critical framework that can be used to retain episodic information in memory. Through these narrative interactions, children further learn social-cultural expectations about personal storytelling (Nelson & Fivush, 2004; Wang, 2013). Notably, previous research has largely focused on the links between narrative skills and the amount of information that is recalled. Empirical evidence demonstrating benefits of narrative skills for episodic memory *accuracy*, including how this association varies by gender and culture, is surprisingly limited.

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### ***Narrative skills and memory accuracy***

The development of narrative skills is varied and protracted (Reese et al., 2011). Yet children, on average, begin to practice narrating past events with caregivers as early as 2 years of age (see Nelson & Fivush, 2004) and can use advanced story structure as early as middle childhood (Peterson, 1994; Peterson & McCabe, 1983). Narrative skills may involve two different processes that have different implications for memory accuracy. On one hand, narrative skills should help impose structure to event elements that facilitates encoding and retention of information. Indeed, children who tell more coherent narratives that are organized with greater temporal and causal structure tend to have more accurate episodic recall of the narrated memory content over time (Kulkofsky & Klemfuss, 2008; Kulkofsky, Wang, & Ceci, 2008; Morris, Baker-Ward, & Bauer, 2010; Wang, Bui, & Song, 2015). Thus, children who are skilled narrators may have more accurate memory reports, which would benefit them in applied contexts requiring factual reporting such as in the classroom, in clinical settings, or when reporting victimization to a teacher, parent, or legal professional.

On the other hand, skilled narrators are, in essence, good storytellers. Particularly in Western cultures, a primary goal of narrating is to entertain one's social partners to facilitate social bonding (Kulkofsky & Koh, 2009; Kulkofsky, Wang, & Koh, 2009). High-quality narratives are defined as including not just a complete account of an event in sequence, but also elaboration, interpretation, and evaluation that likely entertain and build an interpersonal connection with the listener (e.g., Levinger, 1980; Wang, 2013). This goal of telling good stories in service of the social functions of narrating can work against memory accuracy. In both adults and children, exaggerations and inaccurate details are commonplace to enhance the entertainment value of a story (Dudukovic, Marsh, & Tversky, 2004; Kulkofsky, Principe, Debaran, & Stouch, 2011; Marsh & Tversky, 2004). For example, Kulkofsky and colleagues (2011) found that when 6- to 8-year-old children were instructed to tell an entertaining story, their narratives were less accurate than when they were instructed to tell a factual story. Also, children who highly valued accuracy tended to tell less coherent stories when compared with children who paid little attention to accuracy. Thus, children who are attempting to entertain their listener tend to produce narratives of higher narrative quality but lower accuracy. Children who are socialized over time to prioritize the social functions of narrating (i.e., entertaining the listener and cultivating interpersonal relationships) may also eventually lower their accuracy criterion. This body of work suggests that memory accuracy may not always be beneficial. Instead, there may be a tradeoff between accuracy and the social functions of memory reporting.

Thus, the skills of producing high-quality narratives can result in both accurate and inaccurate memories depending on the underlying mechanisms at play. Cognitively, narrative skills can facilitate memory accuracy by imposing a temporal-causal structure to the event information. Socially, narrative skills enable good storytelling for entertainment and social bonding, during which memory accuracy is frequently downplayed. Delineating these processes is critical to understanding the influence of narrative skills on memory.

Notably, the majority of past studies examining narrative–memory relations have used the same materials to assess both narrative skills and memory quantity or accuracy (Fivush, Haden, & Adam, 1995; Harley & Reese, 1999; Kulkofsky et al., 2008; Morris

et al., 2010; Wang et al., 2015). As such, they were unable to tease apart the two processes, or they only tapped into the cognitive process—the effect of narrative structure on memory. In one exception, Kleinknecht and Beike (2004) asked preschool children to provide open-ended narratives about a mother-nominated autobiographical event and recall a presentation witnessed by all the child participants. The researchers found that narrative quality in recounting the autobiographical event was positively associated with the number of correct responses children provided to direct questions about the presentation. However, children's memory was assessed via direct, rather than open-ended, questions. Direct questions may decrease the conversational nature of the exchange and focus children on the accuracy function of memory rather than the social function of memory. Thus, this finding may reflect only the benefits of narrative organization on encoding and not the social element of narrative.

In a more recent study, Kulkofsky and Klemfuss (2008) assessed the quality of preschool children's narratives about an autobiographical event and weeks later tested children's resistance to false suggestions about a staged activity viewed by all the child participants. They found that narrative quality in recounting the autobiographical event was associated with increased suggestibility in remembering the staged activity. It appears that having strong narrative skills, as reflected in the high-quality autobiographical narrative, may facilitate the social or entertainment functions of reminiscing, which may in turn decrease the concern with memory accuracy and the ability to resist false information. Importantly, the sociocultural context in which children grow up may play a role in shaping their purpose of reminiscing and memory accuracy.

### ***Sociocultural context, narrative, and memory accuracy***

Sociocultural context influences how and why people remember their experiences (Nelson & Fivush, 2004; Wang, 2013). In particular, child gender (for a review, see Grysman & Hudson, 2013) and family cultural background (for reviews, see Ross & Wang, 2010; Wang, 2013; Wang & Ross, 2007) play significant roles in how parents socialize children to remember and narrate their experiences (for reviews, see Ross & Wang, 2010; Wang, 2013; Wang & Ross, 2007).

Though findings have been somewhat mixed, many studies have shown differences in how parents reminisce with their daughters and sons starting as early as 24 months of age (e.g., Cervantes & Callanan, 1998; Dunn et al., 1987). Parents (mothers, in particular) tend to have longer memory conversations (Fivush, Berlin, Sales, Mennuti-Washburn, & Cassidy, 2003), use more emotion language (Adams, Kuebli, Boyle, & Fivush, 1995; Kuebli & Fivush, 1992), and provide more detail (Fivush et al., 2003; Reese & Fivush, 1993; Reese et al., 1996) when discussing past events with their daughters than with their sons. Correspondingly, girls tend to provide longer narratives about the past (Flannagan & Baker-Ward, 1996) that include greater narrative detail such as evaluative and orienting information (Haden, Haine, & Fivush, 1997) and more references to thoughts and feelings compared with boys (Bohanek & Fivush, 2010; Greenhoot, Johnson, & McCloskey, 2005; Habermas & de Silveira, 2008). Girls also tend to have better episodic memory and provide more event details in conversations about past events than do boys (e.g., Reese & Fivush, 1993). There has been less consistent evidence of gender differences in the provision of incorrect information (e.g., susceptibility to suggestion; see Bruck & Melnyk,

2004, for a review). Although a majority of these investigations of gender differences in narrative and memory have examined children in the preschool years, there is evidence that gender differences in narrative skills may increase in middle childhood and adolescence (Pasupathi & Wainryb, 2010) and gender differences in verbal episodic memory are relatively stable across the life span (Herlitz & Rehnman, 2008).

Cultural background, even among families living in the United States, can also impact the style and content of children's reports of previous experiences. Parents of Western cultural heritage tend to value using memories for social purposes given that they provide an important means for people to exchange thoughts and feelings and to express sympathy and understanding (Beike, Brandon, & Cole, 2016; Levinger, 1980; Wang, 2013). Parents raised in East Asian cultures tend to place greater emphasis on memory accuracy and objectivity, which is highlighted in the educational practices of rote learning and performance orientation (Wang & Ross, 2007). European Americans report more social reasons for thinking and talking about their memories than do Chinese Americans. In contrast, Chinese Americans are more likely than European Americans to report that external cues triggered their remembering (Kulkofsky, Wang, & Hou, 2010). In the family, European Americans parents also prize the social functions of memory and report that they frequently use memory conversations to strengthen parent-child bonding. In contrast, Chinese American mothers value memory skills and report talking about the past to test children's memory and teach them how to remember (Kulkofsky et al., 2009). Interestingly, mothers who knowingly emphasize the social purposes of reminiscing tend to share memories in a more elaborative style to co-construct with children coherent stories of the past (Kulkofsky et al., 2009). Children who endorse social functions of memory tend to produce more detailed, subjectivity-laden narratives of past events (Wang, Koh, & Song, 2015). In a more recent study, European American and Chinese American mothers and their school-aged children independently recalled emotionally salient events in which mother and child participated together (Wang & Song, 2017). Both European American mothers and children produced more coherently organized memory narratives with idiosyncratic elaborations compared with their Chinese American counterparts. In summary, narrative skills, when exercised to tell good stories for social bonding, may negatively impact memory accuracy, especially when children are socialized to value social functions of memory.

### ***Aims and hypotheses***

In the present study, we tested the relation between narrative skills in European American and Chinese American school-aged children and the children's long-term memory for a staged event. We were particularly interested in studying children in the early school years given that at this point, children have internalized elements of parental conversational styles in their memory operations (e.g., Haden et al., 1997; Kulkofsky et al., 2011; Wang & Song, 2017). Children in this age group are also capable of retaining lengthy, detailed representations of past events for extended periods and are capable of later independently reporting that information in narrative form (Nelson & Fivush, 2004; Wang et al., 2015). We expected that these developing skills would afford the opportunity to observe breadth in memory completeness and accuracy.

Children's narrative skills were assessed by the narratives children produced about a fictional story, and their memories were assessed by their recall of a separate, scripted,

interactive event. Using this methodology, we intended to examine the extent to which general narrative skills provide cognitive benefits for accurate remembering or enable good storytelling that undermines memory accuracy. We hypothesized that narrative skills would enable or motivate a social emphasis while reminiscing and a decreased emphasis on accuracy and, as such, children who narrated a story with higher narrative quality would have lower accuracy when remembering a scripted activity with an experimenter months later. We expected this pattern of results in children's free recall, cued recall, and recognition. Furthermore, we expected that in line with previous research, girls would demonstrate greater narrative skill and better recall of correct details. We also tentatively hypothesized that they would provide more inaccurate details given the documented differences in social focus in parent-child reminiscing conversations with girls versus boys. Finally, given the European American cultural emphasis on telling good stories for social purposes and the Chinese American cultural emphasis on memory skills and accuracy (Kulkofsky et al., 2009), we expected that the Chinese American children would demonstrate higher memory accuracy and perhaps lower narrative quality than European American children.

## Method

### Participants

The participants included 114 children (63 female) who were aged 5;8 to 7;6 ( $M_{\text{age}} = 6;8$ ,  $SD = 5$  months) at the initial interview and 6;2 to 8;2 ( $M_{\text{age}} = 7;2$ ,  $SD = 6$  months) at the second interview. Half of the children ( $N = 57$ ) identified as European American, and the other half ( $N = 57$ ) identified as Chinese American via parent report. The majority of the Chinese immigrant (CI) children (91%) were born in the United States, and the rest moved to the United States when they were on average 2;10 (range = 0;4–4;9); the immigrant mothers were all born in China. All children were from middle-class families, with 97.6% of mothers (97% of the European American mothers; 98% of the CI mothers) having a college degree or beyond. The children were taking part in a longitudinal study of social-cognitive development in middle childhood. Only tasks relevant to the present study are described here. Sixteen additional children were excluded from the present sample because they did not complete all relevant measures at both time points.

### Procedure

Children were interviewed in their homes at two time points approximately 6 months apart ( $M = 6.27$  months,  $SD = 0.41$  months). English-Chinese bilingual interviewers conducted all interviews with the Chinese American families, and children could choose to complete study tasks in either English or Chinese. At each time point, approximately 60% of the Chinese American children opted to speak English exclusively, and approximately 43% of the Chinese American sample spoke English exclusively across both time points. The remaining children spoke Chinese exclusively or spoke a combination of English and Chinese. The home visits lasted approximately 2 hr and were always conducted by two female interviewers. The sessions were video-recorded for later transcription and coding.

## Measures

**Storytelling.** At the first home visit, children completed a storytelling activity that has been used in previous research to assess children's narrative skills (Han, Leichtman, & Wang, 1998; Wang et al., 2015). The book used for this activity is 17 pages long, with a storyline containing multiple interconnected episodes about a mother bear and a baby bear (e.g., dropping off mail, going to the grocery store, and playing at a playground). None of the children in this study had read the book before. The interviewer told the children that they were going to play a "storytelling game." She asked the children to talk about what was happening on each page of the picture book and to make up a story as they went along. She also told the children that they could tell the story in any way they would like. Standard prompts (e.g., "What else happened?" "Can you tell me more?") were used to encourage children to narrate. This task took approximately 10 min.

**Zookeeper game.** During the first visit, an interviewer engaged children in a zookeeper game adapted from McGuigan and Salmon (2004). Five bags were placed on the floor in a room in the child's house separate from where the primary interviewing took place. The bags each contained a stuffed animal and/or materials for one of five scripted event elements, always performed in the same order. A stuffed elephant was also hidden in the room. The interviewer introduced the game by stating, "Next, we are going to play a game about going to visit a pretend zoo." There were six total sections of the zookeeper game, and the full scripts for each section can be found in Appendix A. First, children were told that they would act as the zookeeper. They then put on a zookeeper costume (first bag) and were told that their goal as zookeeper was to find a lost baby elephant. Next, they visited and interacted with each of four stuffed animals (Bags 2–5) before being guided through the process of searching for and finding the stuffed elephant.

**Zookeeper memory.** During the second visit, a new primary interviewer questioned children about their memory for the zookeeper game (see Appendix B for an example transcript with interviewer prompts). First, children were given an open-ended prompt designed to elicit a complete narrative about the zookeeper event. Interviewers encouraged children's narratives with generic prompts such as, "What else happened?" until the child indicated that they could recall nothing further. Second, children responded to six standardized cued questions prompting for additional information about each of the event elements (e.g., "Tell me what happened when you got ready to be the zookeeper"). Finally, children were given a test of their recognition memory for each of the five stuffed animals in the zookeeper game (giraffe, lion, koala, monkey, baby elephant). Children were asked to select the image of the stuffed animal used in the game out of four similar photos presented in a grid pattern on a letter-sized sheet of paper. For example, children were presented with four images of stuffed giraffes and were asked to indicate verbally or through pointing which of the four images depicted the giraffe from the game. The animal types were always presented in the order in which they were encountered in the zookeeper task. The location of the correct image varied across animals.

**Language skills.** To control for individual differences in language skills, children's mothers were asked to fill out a modified version of the Adaptive Language Inventory



(Feagans & Farrans, 1997) at the first interview. The inventory consists of 18 questions designed to assess school-aged children's verbal skills, including comprehension, production, rephrase, listening, spontaneity, and fluency (e.g., "Child is easily understood when he/she is talking to you"). Mothers answered each question by choosing responses on a scale of 1 (well below average) to 5 (well above average). This survey has shown excellent internal consistency reliability and discriminant validity and was reliable (*Cronbach's*  $\alpha = .93$ ) for the current sample. The sum of ratings was used to index the children's verbal skills (maximum score = 90). Chinese American mothers gave ratings on their children's ability to communicate in English and Chinese, respectively, and the score for the child's interview language was used in the analysis. For children who spoke English and Chinese interchangeably, the mean score between English and Chinese was used.

### **Coding**

**Storytelling.** Data were coded in the original language. All the children's on-topic propositions (i.e., subject-verb constructions; Fivush et al., 1995; Han et al., 1998) were coded for standard narrative elements (Wang et al., 2015). Any proposition that referenced the story directly or indirectly were considered on-topic. Off-topic propositions (e.g., talking about the recorder) were rare and not coded. The narrative categories of interest were structure, which included provision of context (orientations), description of actions, people, or objects, and narrator commentary (evaluations; Fivush et al., 1995); complexity, measured as the number of subordinate clauses (Stein & Albro, 1997); cohesion, measured by interconnection of story elements through simple temporal markers (e.g., and, now, next) and complex temporal markers (e.g., but, when, sometimes; Cain, 2003; Han et al., 1998); and productivity, measured as the number of propositions children provided. Narratives were also scored for coherence on a 3-point scale: 0 = no sequencing of events; 1 = events were sequenced, but without causality; and 2 = story was presented as a causally sequenced series of events. Children's scores for each of the narrative categories were largely intercorrelated ( $r$ 's = .08-.95;  $M = 0.43$ ). They were standardized and summed to create a composite *narrative quality* variable. The narrative quality variable was square root-transformed to meet normality assumptions. The narrative categories were each significantly correlated with the composite narrative quality variable ( $r$ 's = .44-.89,  $M = 0.71$ ).

**Zookeeper memory.** Children's memory for the zookeeper game was coded for correct and incorrect responses. A Chinese-English bilingual research assistant who was fluent in both languages and naïve to the study design and hypotheses first translated any portions of children's memory reports that were in Chinese into English. The translator was not involved in any other data processing for this study. Responses to both the open-ended prompt and the cued prompts were then parsed into propositions using the same criteria as that used for the storytelling task. All on-topic, verifiable propositions were coded as either correct or incorrect. Propositions unrelated to the zookeeper game or those referencing internal states (e.g., "It was fun") were not coded for accuracy. Memory accuracy variables were created by dividing the number of correct details by the total number of verifiable details provided for free recall and prompted recall, respectively.

Two sets of coders independently coded a random sample of approximately 20% of the transcripts to assess interrater reliability  $r$  (Rosnow & Rosenthal, 1991). One set of coders



coded the storytelling task, and another coded the zookeeper memory task. Agreement was high for both the narrative elements (production = .99, orientations = .89, referentials = .99, complexity = .89, simple temporal markers = .99, complex temporal markers = .98, coherence = .76; Cronbach's alpha = .86) and recall elements (correct free recall = .99, incorrect free recall = .93, correct cued recall = .82, incorrect cued recall = .98). Disagreements were discussed until coders agreed on a final set of codes, and then one of the two coders from each pair who was naïve to the study design and hypotheses coded the remaining transcripts.

## Results

### *Preliminary analyses*

The European American and Chinese American samples were balanced across gender,  $\chi^2(1, 114) = 1.74, p = .187$ , and age at Time 1,  $t(112) = 0.70, p = .486$ , and at Time 2,  $t(112) = 0.81, p = .423$ . There were culture and gender differences but no age differences in language proficiency. European American children were more language-proficient ( $M = 68.83, SD = 9.68$ ) than Chinese children ( $M = 63.71, SD = 9.23$ ),  $t(112) = 2.89, p = .005$ , and girls ( $M = 68.27, SD = 10.33$ ) were more language-proficient than boys ( $M = 63.80, SD = 8.47$ ),  $t(112) = 2.49, p = .014$ .

### *Story narrative*

Children's narrative quality scores ranged from  $-8.66$  to  $18.83$  ( $M = 0.45, SD = 6.59$ ). An analysis of covariance with culture and gender predicting narrative quality, while controlling for child age at Time 1 and language proficiency at Time 1, revealed no significant main effects or interactions with culture or gender, nor did it show effects of child age or language proficiency at Time 1.

### *The relation of narrative quality to memory accuracy*

**Free recall.** Children provided anywhere from 1 to 24 verifiable propositions in free recall ( $M = 6.72, SD = 4.16$ ). Correct propositions ranged from 0 to 16 ( $M = 5.09, SD = 3.56$ ), and incorrect propositions ranged from 0 to 11 ( $M = 1.63, SD = 2.09$ ). The proportion of correct propositions ranged from 0 to 1 ( $M = 0.73, SD = 0.30$ ). Thus, on average, 27% of children's statements in free recall were inaccurate. However, more than 40% of the sample provided no incorrect details in free recall, thereby making the data heavily skewed. As such, to test the relation of narrative quality to free recall accuracy without violating regression assumptions, free recall accuracy was recoded as a binary variable representing whether or not children provided any inaccurate details in free recall. To control for overall response productivity in free recall, the total number of propositions children provided in free recall, correct + incorrect, was included in the model. A hierarchical logistic regression was conducted with age (Time 2), verbal ability (Time 1), and total propositions at the first step; culture, gender, and narrative quality at the second step; and all two-way interactions at the third step predicting whether children provided any inaccurate details in response to the free recall prompt. All continuous variables were

centered prior to calculating the interaction terms, and the centered variables were included in the regression analyses. The second step was significant,  $\chi^2(3, N = 114) = 9.23, p = .026$ . The only significant coefficient was the narrative quality variable ( $B = 0.66, SE = 0.26, OR = 1.93, 95\% CI [1.15, 3.25], p = .013$ ). For each unit increase in narrative quality, participants were 1.93 times more likely to give an inaccurate response. The fact that the interactions in the third step of the equation were not significant demonstrated that the pattern was consistent across culture and gender.

To further unpack the negative association between narrative quality and free recall memory inaccuracy, a follow-up regression was conducted to examine whether narrative quality was associated with provision of correct responses to the free recall prompt, in addition to the likelihood of providing incorrect responses. The steps of the regression equation were consistent with the previous model, but this time, the outcome was the number of correct responses to the free recall prompt, as opposed to whether the child reported any inaccurate details. The second step was significant,  $F(5, 113) = 2.56, p = .032$ , but only gender significantly predicted correct responses ( $B = 0.54, SE = 0.17, p = .002$ ). Girls ( $M = 5.97, SD = 3.67$ ) gave more correct responses than boys ( $M = 4.00, SD = 3.12$ ). Thus, narrative quality predicted the likelihood that children would provide inaccurate details with no corresponding increase in accurate details.

**Prompted recall.** Children provided anywhere from 3 to 45 verifiable propositions in prompted recall ( $M = 11.53, SD = 5.88$ ) across all six prompts. Of these, anywhere from 0 to 22 were correct propositions ( $M = 5.58, SD = 3.41$ ) and anywhere from 0 to 44 were incorrect propositions ( $M = 5.94, SD = 5.43$ ). The proportion of correct propositions ranged from 0 to 1 ( $M = 0.50, SD = 0.23$ ). When a hierarchical linear regression model was conducted with the same predictors as in the previous model, but this time predicting children's accuracy in response to the prompted recall questions, none of the steps were significant. However, the coefficient for culture was a significant predictor of accuracy in response to the prompted questions ( $B = -2.55, SE = 1.05, p = .016$ ). Chinese American children ( $M = 0.55, SD = 0.21$ ) provided a higher proportion of accurate details in response to the prompts compared with European American children ( $M = 0.44, SD = 0.25$ ).

The primary regression model was repeated, this time predicting children's correct and incorrect responses to the prompted recall questions in separate models. None of the steps were significant in either model. However, the addition of culture, gender, and narrative quality at Step 2 marginally improved the fit of the model ( $\Delta R^2 = .07, p = .051$ ). The coefficient for culture significantly predicted incorrect responses to the prompted questions ( $B = -2.55, SE = 0.10, p = .016$ ). Chinese American children ( $M = 4.74, SD = 3.34$ ) provided fewer inaccurate details in response to the prompts than did European American children ( $M = 7.14, SD = 6.73$ ). The coefficient for the interaction between culture and gender also significantly predicted incorrect responses to the prompted questions ( $B = -4.83, SE = 2.05, p = .020$ ). These models were repeated, each with one outlier that was more than 3 standard deviations from the mean, removed. The patterns of results remained consistent. To follow up, regression equations were conducted for each gender. The model was significant at Step 2 for girls only,  $F(4, 62) = 2.57, p = .047$ . Culture significantly predicted incorrect responses to the prompted questions for girls ( $B = -4.76, SE = 1.66, p = .006$ ), such that European American girls gave significantly more incorrect responses to the prompted questions ( $M = 8.37, SD = 7.94$ ) compared with Chinese

American girls ( $M = 4.18$ ,  $SD = 2.54$ ). However, we hesitate to draw conclusions about these effects, particularly regarding the significant interaction coefficient, given that the original model was not statistically significant and we had no a-priori hypotheses regarding the interaction between culture and gender.

**Recognition memory.** We tested the effects of culture, gender, and narrative quality on children's recognition memory. Children selected the correct image from the presented set of four for zero to four of the five animals from the zookeeper game. More than 90% of the sample correctly recognized one, two, or three of the five animals. Because of the limited range of responses and the non-normality of the data, it was inappropriate to treat recognition scores as a continuous outcome. About half (47%) the children got zero or one of the five recognition items correct and the other half (53%) got two or more correct. We created a binary variable representing low recognition accuracy (zero to one correct items) and high recognition accuracy (two to four correct items). A binary logistic regression, predicting low versus high recognition accuracy, was then conducted following the same steps as the previously mentioned models. The third step was significant,  $\chi^2(3, N = 114) = 8.63$ ,  $p = .035$ . The only significant coefficient was for the interaction between gender and narrative quality ( $B = -1.33$ ,  $SE = 0.56$ ,  $p = .018$ ). For girls, higher narrative quality predicted lower recognition accuracy ( $B = -0.66$ ,  $SE = 0.31$ ,  $p = .035$ ), whereas for boys, narrative quality did not predict recognition accuracy ( $B = 0.51$ ,  $SE = 0.45$ ,  $p = .252$ ).

Finally, to approximate potential acculturation differences within the Chinese American sample, we repeated the primary analyses with just the Chinese American sample and replaced the ethnicity variable with a binary variable indicating whether or not children opted to speak English exclusively across interviews. The interview language variable, in conjunction with child gender, predicted children's narrative quality,  $F(5, 50) = 8.31$ ,  $p = .006$ , partial eta squared = .143. Girls who spoke at least some Chinese when interviewed had the highest narrative quality scores ( $M = 3.58$ ,  $SD = 0.96$ ), whereas boys who spoke at least some Chinese had the lowest narrative quality scores ( $M = 2.49$ ,  $SD = 0.71$ ). There were no other main effects or interactions with the interview language variable in the model predicting narrative quality or those predicting free recall accuracy, prompted recall accuracy, or recognition accuracy. Thus, the results were relatively consistent among the Chinese American sample regardless of the language children used during the interview.

## Discussion

The present study tested a novel set of empirical questions regarding links between narrative, sociocultural context, and memory. At the surface level, the main findings supported the well-established proposal in the memory field that narrative structure is closely linked with memory. However, importantly, our study design facilitated demonstration of a seemingly contradictory *positive* association between narrative quality and errors in free recall and, for girls, in a recognition memory test. These findings highlight the potential role of social motivation in reporting accuracy. The findings also revealed support for the sociocultural perspective of memory development in that sociocultural emphases and goals for remembering were reflected in the accuracy of children's long-term memory reports.

The current study is the first we know of to directly examine the relation of children's narrative skills to their spontaneous memory accuracy for a separate event. There is a sizeable body of literature demonstrating that when an event is represented with high narrative quality, it is better remembered, particularly in regard to provision of correct details (Morris et al., 2010; Peterson, Morris, Baker-Ward, & Flynn, 2014; Wang et al., 2015). However, the extent to which narrative skills in general benefit event memory is not understood as well. On one hand, narrative structure facilitates an organized and interconnected memory that should aid with recall (Bauer, 2007; Bruner, 1991; Haden et al., 1997; Nelson & Fivush, 2004). However, previous research also suggests that narrative skills may *decrease* memory accuracy for a separate event when children are exposed to suggestive questioning (Kulkofsky & Klemfuss, 2008). In the present research, we showed that narrative skills are associated with decreased accuracy for a separate event in the absence of suggestion. More specifically, narrative quality during the storytelling task had no relation to children's long-term memory for correct details of the zookeeper activity, but it was associated with a higher likelihood of providing incorrect details in free recall. Thus, children who are better narrators may not just be susceptible to incorporating false information from a conversational partner (Kulkofsky & Klemfuss, 2008). The present study suggests these children are also more likely to spontaneously include inaccurate information in their free recall memory reports. This finding is in line with the theoretical perspective that parents who socialize their children to tell rich, detailed, and structured narratives may place greater emphasis on entertaining a conversational partner than on maintaining accuracy (e.g., Fivush & Reese, 1992; Kulkofsky & Klemfuss, 2008; Kulkofsky & Koh, 2009; Kulkofsky et al., 2009, 2011). It is also important to note that context may play an important role in the association between narrative skills and memory accuracy. For example, it may be the case that skilled narrators choose not to focus on accuracy when they perceive the narrative or recall task to involve fantasy and elaboration, as they may have in the present research, but they may have heightened accuracy when they perceive the task to be focused on reporting factually (see, e.g., Kulkofsky et al., 2011). Future research can address this question by testing the links between narrative skills and memory accuracy when children are given instructions to focus on fantasy versus accuracy.

Interestingly, an interaction between gender and narrative quality emerged on recognition accuracy, whereby girls with high narrative skills were the least accurate. This finding partially mirrors the positive association between narrative skills and the likelihood of inaccuracy in free recall. The gender interaction may reflect the fact that parents tend to model lengthy, detailed, and rich narratives with their daughters more than with their sons (Adams et al., 1995; Fivush et al., 2003; Kuebli & Fivush, 1992; Reese & Fivush, 1993; Reese et al., 1996), and high-quality narratives have an inverse association with an accuracy focus among children in this age group (Kulkofsky et al., 2011). However, there were minimal gender differences in narrative quality in the present study. The only gender effect on narrative quality was an interaction within the Chinese-American sample such that girls who opted to speak at least some Chinese across interviews had the highest narrative quality. This finding was unexpected and should be interpreted with caution because it suggests that girls who were potentially less acculturated had better narrative quality, which is not in line with previous research on cultural differences in narrative focus (Wang, Leichtman, & Davies, 2000). Because there was no main effect of gender on narrative quality in the full sample, we hesitate to make firm conclusions based

on the Gender  $\times$  Narrative Quality interaction result without additional research. As a final note on gender effects, in line with previous research indicating that girls have an advantage over boys in verbal autobiographical memory (Bauer, 2007; Herlitz & Rehnman, 2008; Reese & Fivush, 1993; Wang, 2013), we found that girls were more language-proficient than boys and provided more correct details about the zookeeper event in free recall.

Consistent with our hypotheses about cross-cultural differences in memory accuracy, Chinese American children had more accurate responses in prompted recall than did European American children. This finding is in line with the notion that Chinese and Chinese American cultures place a greater emphasis on memory accuracy, whereas European American culture has a greater appreciation for good storytelling (Wang et al., 2000). The majority of cross-cultural research to date on autobiographical memory has focused on the amount or the specific content of what is recalled (for reviews, see Ross & Wang, 2010; Wang, 2013; Wang & Ross, 2007). There have been only a handful of cross-cultural studies to examine the accuracy of recall partly due to the lack of objective standards for autobiographical memory accuracy. Using parental reports, Wang, Peterson, and Hou (2010) found that a great majority of childhood memories recalled by 8- to 14-year-old Chinese and Canadian children were verified by their parents as having happened or being reasonable and very few memories were disputed by the parents. Wang and Song (2017) found that 6- to 8-year old European American children told more divergent stories from their mothers' accounts of the same events when compared with Chinese American children. This finding is consistent with the present finding that European American children were less accurate than Chinese American children in prompted recall. Nevertheless, the cultural differences in the present study were limited to only the prompted recall task. We speculate that this finding might be due to the variables we examined in the storytelling task and the free recall task, which reflect more on basic cognitive skills and less on culturally relevant meaning making. Obviously, more research on cultural influences on memory accuracy is warranted.

In conclusion, together, the findings linking narrative skills with memory accuracy and those connecting culture with memory accuracy point to the critical role of context in learning how to remember. Children with better narrative skills may have been socialized to believe that telling a "good" story—a story rich in narrative quality—is more important than setting a high accuracy criterion (Dudukovic et al., 2004; Kulkofsky & Klemfuss, 2008; Kulkofsky et al., 2011; Marsh & Tversky, 2004). The present results largely supported this claim given that children with higher narrative quality were more likely to include inaccurate details in free recall and had poorer recognition accuracy. Similarly, there was some evidence that gender and culture, two key elements of children's socialization context, are linked to children's recall accuracy. This finding highlights the importance of considering the impact of broad social context on the development of children's autobiographical memory.

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## Declaration of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this article.

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## Appendix A

### Zookeeper Activity Script

- (1) “The first thing we need to do is to get ready to be the pretend zookeeper. To do that, we should make sure you’re dressed like one. Here is a zookeeper hat and shirt for you to put on. That looks great! Next, we need to write your name on this zookeeper name tag so everyone at the pretend zoo will know who you are. Good work! Ok, now that you look like you’re ready to be the zookeeper, it’s important that you know what the zookeeper’s job is for today. The Baby Elephant is lost! It will be your job to find the lost Baby Elephant somewhere in the zoo. Are you ready to get started? Good.”
- (2) “This is the first animal we have to visit—the Giraffe. Hello, Giraffe. (Turning to child) (Zookeeper or child’s name), would you like to say hello to Giraffe and ask if she has seen the lost Baby Elephant? No, Giraffe says that she hasn’t seen the lost Baby Elephant, but we need to clean up Giraffe while we are here. The first thing you need to do to clean up Giraffe is blow the soapy bubbles on her fur like this. That’s terrific. Next, you need to give Giraffe’s spotty coat a brush. Just like this, great. Next thing you do to clean up Giraffe is to get down low and to polish Giraffe’s hooves with this special polishing cloth. Terrific, you are a great polisher. Look how shiny the hooves are. Last of all, you need to put this red ribbon in Giraffe’s tail. Well done—you did a great job of cleaning up Giraffe. Now that Giraffe is cleaned, let’s wave goodbye.”
- (3) “Now it’s time to visit the second animal—the Lion. Hello, Lion. (Turning to child) (Zookeeper or child’s name), would you like to say hello to Lion and ask if he has seen the lost Baby Elephant? Hmm, Lion hasn’t seen the lost Baby Elephant either. It looks like Lion is hungry though; we should feed him while we’re here. To feed Lion, we have to put his vitamin in this water bottle and shake it all up so that he can drink it. Good job! Just like that. Next, we have to put the meat chops, carrots, and beans in his bowl so that he can eat it. Those are all his favorite foods. Good, I bet he’ll love eating that. Let’s tie the napkin around his neck so he doesn’t get his nice soft fur all dirty. There, that’s much better. OK, the last thing we need to do is the dinner dance! Lion loves silly dances, and his favorite thing is when the zookeeper does the dinner dance for him. That’s wonderful!”
- (4) “The Koala is sick today, so our next stop is to go visit her. Hello, Koala. (Turning to child) (Zookeeper or child’s name), would you like to say hello to Koala and ask if she has seen the lost Baby Elephant? Too bad, Koala hasn’t seen the lost Baby Elephant either. We should help make Koala feel better while we’re here. First, we need to take her temperature with the thermometer. Let’s put it in her mouth like this and then hold it there for just a minute. Good job. Hmm, it looks like Koala has a little bit of a temperature; let’s pour her medicine into the cup for her to drink. Great, that looks like just enough; let’s give it to her. Uh oh, Koala has a runny nose; let’s wipe it with a tissue. There, that’s better! OK, let’s blow her a kiss before we go; I bet that will make her feel better really fast!”
- (5) “Our last animal to visit today is the Monkey. Hi, Monkey. (Turning to child) (Zookeeper or child’s name), would you like to say hi to Monkey and ask if he has seen the lost Baby Elephant? Not even Monkey has seen the lost Baby Elephant. While we’re visiting, we should do something nice for Monkey. Monkeys really like presents, so I bet we could make him one. I have this picture of the sun; why don’t we color it for him? Oh, that looks very nice. We should put it in a picture frame. Let’s use this clay to make the frame, and then the sun picture will look even better. Great, now the last thing to do is to put Monkey’s present into a gift bag for him. Let’s put it in this one. Excellent! Now we can give it to him. He’ll be so happy!”
- (6) “Well, none of the animals know where the lost Baby Elephant is, so the last job for the day will be to look for the lost Baby Elephant. Where haven’t we looked yet? There! You found him! He was hiding under that cushion the whole time! You are a great zookeeper! You can pick out a sticker since you did such a good job finding the lost Baby Elephant. OK, now that your job as zookeeper is done, you can take off your zookeeper’s hat and shirt. Great job solving the mystery!”

## Appendix B

Sample Coded Memory Report

Participant 33

Age: 7;9

Gender: Female

Ethnicity: European American

### Open-Ended Question

I: I heard that my friend Heather came to visit you and she played a game about visiting a pretend zoo; do you remember that?

C: (nods)

I: I'm very curious about this game. I'd like you to tell me everything that happened when you went to visit the pretend zoo.

C: Well, um, (I got to feed the lions) and (give it its pill). (*Correct*) (*Correct*)

I: Got to feed the lions.

C: And I got to wash the ... (I got to wash the giraffe). (*Correct*)

I: OK, what else?

C: (I got to carry the panda bear) and (the monkey). (*Incorrect*) (*Correct*)

I: OK, what else?

C: That's all I can remember. (I got to brush the elephant's teeth). (*Incorrect*)

I: OK.

C: And that's really it.

I: Is there anything else that you can remember?

C: No

Correct: 4

Incorrect: 2

### Prompted Questions

#### Question 1

I: I heard that you played the pretend zookeeper at the pretend zoo. Tell me what happened when you got ready to be the zookeeper.

C: (I got to put a hat on) and (a shirt on that said zookeeper). (*Correct*) (*Correct*)

I: OK, anything else?

C: No.

Correct: 2

#### Question 2

I: I heard that when you visited the pretend zoo you visited the giraffe. Tell me what happened when you visited the giraffe.

C: (I got to feed the giraffe) and (put a bow on its neck). (*Incorrect*) (*Incorrect*)

I: OK, what else?

C: I forget with the giraffe; I think that's it.

Incorrect: 2

#### Question 3

I: I heard that you also visited a lion. Will you tell me everything that happened when you visited the lion?

C: (I got to feed it meat) and (I gave it its pills) and (I got to give it a drink). That's it. (*Correct*) (*Correct*) (*Correct*)

I: Anything else that you can remember?

C: No.

Correct: 3

#### Question 4

I: I also heard that you visited the koala bear too. Tell me everything that happened when you went to visit the koala.

C: I had to ... (his paw got a sliver, so I had to take the sliver out). (*Incorrect*)

I: His what?

C: A sliver I think.

I: OK, his paw had a sliver.

C: (I had to pull it out) and (give him a Band-Aid). (*Incorrect*) (*Incorrect*)

I: OK, anything else?

C: No.

Incorrect: 3

Question 5

I: So, I also heard that you visited the monkey at the zoo. Would you tell me everything that happened when you visited the monkey?

C: I forget about the monkey.

I: Can you think really hard about what happened when you visited the monkey?

C: I don't know.

Question 6

I: I heard that you found the lost baby elephant. Would you tell me how you found the baby elephant and what happened after?

C: Umm, I can't think of it. (How I found it was I found it under the couch). (*Correct*)

I: OK.

C: And, and ... I don't know what else.

Correct: 1