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Child-centered memory conversations facilitate children's episodic thinking



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ABSTRACT

Episodic thinking is involved in the representation of specific personal events occurring at a particular time and place. Although a fundamental human cognitive faculty directly associated with neurocognitive functioning, episodic thinking and its development is subject to socio-cultural experiences. This study integrated experimental and longitudinal approaches to test the effect of training mothers to have child-centered memory conversations – the type of conversations frequently observed in Western families – on children's episodic thinking. Six-year-old Chinese and European American children ($N = 103$) were pretested and randomly assigned to a maternal training or control condition. In the following 6 months, mothers were encouraged to share memories with their children, and those in the training condition were further asked to focus the conversation on their children's thoughts, desires, and feelings. One year after the completion of training, children of training group mothers represented past and future events in greater episodic detail than those of control group mothers. These findings provide critical experimental evidence for the development of episodic thinking as a sociocultural process.

1. Introduction

Children learn to remember where, when, and what about the past and anticipate what will happen in the future from an early age. This episodic thinking ability to re-experience events from the past and to conjure and pre-experience events in the future is regarded as a true marvel of nature that makes mental time travel possible (Tulving, 2002). The past and future aspects of episodic thinking further involve similar neurocognitive processes (Addis, Wong, & Schacter, 2008; Addis, 2018; D'Argembeau & Mathy, 2011) and develop hand-in-hand as children grow older (Atance, 2008; Gott & Lah, 2014; Hayne, Gross, McNamee, Fitzgibbon, & Tustin, 2011; Wang, Capous, Koh, & Hou, 2014). Importantly, this fundamental human cognitive faculty, like many other basic cognitive processes, is subject to sociocultural experiences (Nelson & Fivush, 2004; Wang, 2004b, 2013). Here we show in an integrated experimental and longitudinal paradigm that child-centered memory conversations that are characteristic of Western family practices have long-term effects on children's representation of the episodic details of past and future personal events.

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1.1. Parent-child memory sharing in cultural contexts

Sociointeractionist theories have emphasized the critical role of family narrative practices, especially parent-child memory sharing, in the development of episodic thinking (Bauer, 2007; Nelson & Fivush, 2004; Reese & Newcombe, 2007; Wang, 2004b, 2013). It is suggested that conversations about past events between parents and children model for children how to reinstate the past through linguistic representation, provide children with the organizational framework to structure their experiences, and further highlight to children the personal significance of life events. Researchers contend that children acquire episodic thinking skills through conversing about their experiences with significant others (Hudson, 2006; Nelson & Fivush, 2004). In supporting this view, empirical studies have shown that early parent-child memory conversations have long-term positive associations with children's developing episodic thinking ability (e.g., Haden, Haine, & Fivush, 1997; Reese, Jack, & White, 2010; Wang, 2007).

Cross-cultural studies have further revealed different ways in which parents engage their children in memory conversations, which reflect different cultural beliefs and socialization goals (Wang, 2004b, 2013). In line with their cultural emphasis on individuality and autonomy, European American mothers often take a child-centered approach when sharing memory with their children, where children remain the focal point of the conversation and mothers frequently refer to children's thoughts, desires, and feelings in connection with what happened in the past event. In contrast, in line with their cultural emphasis on relatedness and social cohesion, East Asian mothers often take a mother-centered approach in which mothers set the direction of the conversation and frequently refer to general rules and behavioral expectations to their children (Kulkofsky, Wang, & Koh, 2009; Miller, Wiley, Fung, & Liang, 1997; Mullen & Yi, 1995; Wang & Fivush, 2005; Wang, Doan, & Song, 2010).

Compared with mother-centered memory conversations that situate children in a relational hierarchy, child-centered conversations may effectively motivate children to attend to and remember idiosyncratic event details that affirm their individuality and autonomy (Wang, 2004b, 2013). In particular, child-centered memory conversations highlight to children their subjective experiences in past events (e.g., "You had fun!" "You hated that."), help children connect their sense of self with what happened, and further model to children how to appreciate the personal meaning of past events from their own perspectives (e.g., "I had fun!" "That made me upset."). All these processes may facilitate children's detailed representations of personal experiences over time (Bauer, 2007; Fivush & Baker-Ward, 2005; Heatherton, Macrae, & Kelley, 2004; Reese, Bird, & Tripp, 2007; Wang, 2008). Furthermore, drawing children's attention to their own roles and perspectives in the past event may facilitate a retrieval - and possibly an encoding as well - orientation toward idiosyncratic specific details (Schacter & Madore, 2016). This orientation then guides children in their independent event construction to focus on specific details.

Given the prevalence of child-centered memory conversations in European American family narrative practices (Kulkofsky et al., 2009; Miller et al., 1997; Mullen & Yi, 1995; Wang & Fivush, 2005; Wang et al., 2010), one may expect European American children to represent more detailed personal events than do their East Asian peers. Indeed, across different ages from preschool through middle childhood, European American children have been found to recall more specific details about their past experiences than do Chinese and Korean children (Han, Leichtman, & Wang, 1998; Wang, 2004a, 2006, 2007). European American children also generate more specific details about their future experiences than do Chinese children (Wang et al., 2014). These cultural differences in episodic thinking persist into adulthood such that European American adults attend more to specific details in their representations of past and future events than do their Asian counterparts (Jobson, Moradi, Rahimi-Movaghar, Conway, & Dalgleish, 2014; Wang, 2009; Wang & Conway, 2004; Wang, Hou, Tang, & Wiprovnick, 2011). Thus, cultural differences in mother-child memory sharing parallel cultural differences in child episodic thinking at the group level. However, whether the child-centered conversational approach indeed facilitates children's detailed event representations remains an empirical question. A longitudinal training paradigm that has been previously used to examine the effect of mother-child memory sharing may be useful to directly test this link.

1.2. Memory conversations in a longitudinal training paradigm

Most studies to date on the influence of family narrative practices on the development of episodic thinking have been correlational, where individual differences in maternal conversational styles are examined in relation to children's memory and future thinking (Hudson, 2006; Nelson & Fivush, 2004). Yet there have been a few groundbreaking experimental studies that yield important findings on the effect of a maternal elaborative style on children's abilities to represent details of past events. In these studies, mothers in the training group were asked to talk frequently with their preschool children about their past (Peterson, Jesso, & McCabe, 1999; Reese & Newcombe, 2007; Van Bergen, Salmon, Dadds, & Allen, 2009) or ongoing experience (Boland, Haden, & Ornstein, 2003), ask open-ended *wh* questions (e.g., where, when), and provide event details and feedback to encourage children to contribute to the conversation, which are characteristics of an elaborative conversational style (Fivush, Haden, & Reese, 2006). The studies showed that following a short interval of a few days or weeks or a long interval of over a year, children of the training group mothers recalled more detailed memories than did children of the control group mothers. Thus, elaborative conversations that help children attend to and retrieve memory information enhance remembering.

The longitudinal training paradigm that integrates experimental and longitudinal approaches provides a promising method of examining other dimensions of parent-child memory sharing, including the child-centered conversational approach, that may facilitate the development of episodic thinking. Notably, one limitation of the extant studies is that while mothers in the training group were encouraged to share memories with their children frequently and elaborately, mothers in the control group received no instruction to do anything or were simply asked to interact with their children as they usually would (Boland et al., 2003; Peterson et al., 1999; Reese & Newcombe, 2007; Van Bergen et al., 2009). The different treatments between the training and control groups might result in confounding factors (e.g., the frequency of having memory conversations) other than the maternal conversational

style. Also, the sample sizes in these studies were generally small ($N_s < 50$, except Reese & Newcombe, 2007, $N = 115$), presumably due to the practical difficulties in following children and families overtime. In addition, no study to date has examined the effect of training mothers to converse with their children about personal experiences on children's episodic representation of future events.

1.3. The present study

In the present study, we used a longitudinal training paradigm to examine the effect of child-centered memory conversations on the development of episodic thinking. Specifically, we trained mothers to use what is typically a European American maternal conversational style and examined its subsequent effects on children's memory and future thinking. The findings will allow us to answer the question of whether the child-centered conversational approach facilitates detailed representations of personal experiences, which will further shed light on the social-familial origins of the differences in episodic thinking observed across cultures (Han et al., 1998; Jobson et al., 2014; Wang, 2004a, 2006; Wang et al., 2014).

Six-year-old European American and Chinese American children and their mothers participated. We chose to target children in middle childhood for this investigation because following the rapid growth during the preschool years (Atance, 2008; Bauer, 2007), episodic thinking remains relatively stable in middle childhood until significant developmental gains take place in adolescence (Gott & Lah, 2014; Wang et al., 2014). Given the expected stability in episodic thinking during this period, we would be able to experimentally test the robustness of parental influences. We included mothers and children - both boys and girls - from European American and Chinese American cultural backgrounds in order to test the generalizability of the training effects across cultural and gender groups (Sue, 1999; Wang, 2016).

Children were pretested and randomly assigned to a maternal training or control condition. Over the following 6 months, mothers of both groups were encouraged to share memories with their children, and those in the training condition received additional instructions to focus the conversation on their children's thoughts, desires, and feelings in the past event. Thus, we kept all aspects of mother-child memory sharing consistent between the two conditions except the manipulation of the child-centered conversational approach. Approximately 1 year following the completion of training or 1.5 years following the pretest, children's episodic thinking of past and future personal events was tested.

To examine the episodic quality of children's past and future event representations, we distinguished specific and general details in children's event descriptions, following a standardized coding procedure (Addis et al., 2008; Levine, Svoboda, Hay, Winocur, & Moscovitch, 2002). Specific details concern event-specific information directly relevant to what happened or would happen and thus reflect episodic thinking (also referred to as internal details; e.g., "I visited the Science Museum last Saturday"). In contrast, general details concern semantic and other non-event-specific information (also referred to as external details; e.g., "The Science Museum was built in 1983"). Notably, in adults, changes in specific and general details differ in directions such that those who produce more specific details tend to produce fewer general details (Addis et al., 2008; Wang et al., 2011). In contrast, in children, specific and general details co-vary in the same direction across individuals and age groups, whereby those who produce more specific details also tend to produce more general details (Gott & Lah, 2014; Picard, Reffuveille, Eustachea, & Piolino, 2009; Wang et al., 2014). This may reflect age-related growth in both semantic knowledge and episodic thinking, as well as individual and age differences in general cognitive abilities such as verbal skills. As a result, when examining developmental changes in episodic thinking, the provision of specific relative to general details seems to be a more sensitive measure for the episodic quality of event representations. Research has shown that children produce a smaller ratio of specific to general details than do adolescents and young adults (Gott & Lah, 2014; Wang et al., 2014).

We thus adopted the measure of specific-to-general-detail ratio to index the episodic quality of children's event representations. We expected that child-centered memory conversations, relative to memory conversations in general, would encourage children to attend to and remember personal event details and further improve the episodic quality of children's event representations. Thus, if our training was effective such that training group mothers came to have more child-centered memory conversations with their children than did control group mothers, we expected that at the posttest children of the training group mothers would produce more specific relative to general details in their event representations than children of the control group mothers. Given the intimate connection between past and future episodic thinking in mechanism and developmental process (Addis et al., 2008; Addis, 2018; Atance, 2008; D'Argebeau & Mathy, 2011; Hayne et al., 2011), we expected the effect of child-centered memory conversations to be evident in children's representations of both past and future events.

In addition, we expected the training to be effective across culture and gender groups. However, given that Chinese mothers often take a mother-centered approach when sharing memories with their children (Kulkofsky et al., 2009; Miller et al., 1997; Wang & Fivush, 2005), encouraging them to focus the conversation on the subjective perspectives of the child, as European American mothers often do, might gain additional attention and effort from the Chinese mothers to engage children in the conversation. Consequently, the maternal training effect might be more salient among Chinese children, when compared with European American children.

2. Method

2.1. Participants

The target sample size was 128 participants in order to achieve a power of .8 for detecting medium effect sizes ($d = .5$), as determined using GPower software. A total of 130 children and their mothers from a university town and suburban areas in upstate New York participated in the study. Twenty-seven children did not complete the posttest; they were not included in the final sample.

There was no difference on any measure at the pretest between the children who did and did not remain in the study.

The final sample consisted of 103 children and their mothers, including 54 European American (35 girls, 19 boys) and 49 first-generation Chinese American children (23 girls, 26 boys). Children were aged 5.67 to 7.51 years ($M = 6.63$, $SD = .45$) at the pretest and 7.11 to 9.23 years ($M = 8.17$, $SD = .47$) at the posttest. All children were from middle-class families, with 98% of the mothers having a college degree or beyond. Children were recruited through local schools or by word of mouth, and they were taking part in a longitudinal study of social-cognitive development in middle childhood. Parents gave informed consent for themselves and their children to participate and children gave informed assent. Each family received a \$30 gift certificate at each time point and children each received a small gift to keep.

2.2. Procedure

The procedure included three phases. At phase 1, a pretest was carried out on mother-child memory conversations and children's episodic memory skill and verbal skill, which allowed the completion of group assignment and the establishment of baseline equivalence between training and control conditions. Phase 2 immediately followed, during which maternal training for child-centered memory conversations took place over the next 6 months. Upon the completion of the training, a manipulation check was conducted for mother-child memory conversations. Finally, phase 3 took place 1 year after the completion of the maternal training or 1.5 years following the pretest, in which a posttest of children's episodic thinking was carried out. The general procedure is illustrated in the following chart.

Phase	Phase 1	Phase 2	1-year interval	Phase 3
Purpose	Pretest Group assignment	6-month maternal training Manipulation check		Posttest
Tasks		Mother-child memory sharing		Child past and future episodic thinking; child verbal skill

Two female researchers visited the families each time. English-Chinese bilingual researchers visited Chinese families and conducted the interview in the language preferred by children and mothers. At the pretest, 69% of the Chinese children and mothers chose to speak English and the rest spoke Chinese or a mixture of English and Chinese. At the posttest on episodic thinking, all except one Chinese child chose to speak English. All interviews were video tape-recorded and later transcribed verbatim for coding.

2.2.1. Pretests

Mothers were asked to talk with their children about a specific recent event that they experienced together in the past two months, such as a trip to a science museum or an amusement park. It was emphasized to the mothers that they should talk with their children about the event as they usually would for as long as they wanted. The length of the conversations was recorded for group assignment (see next section). To establish the baseline in the degree of child centeredness in maternal conversation, mother-child conversations were later coded for child-focus, where maternal references to children's thoughts, desires, and feelings in the past event (e.g., "Did you have fun?") were tallied to form a child-focus score (Han et al., 1998; Reese et al., 2007; Wang et al., 2010). Two independent coders, both blind to condition, coded 20% of the data. The average intercoder reliability Pearson's r was .98.

After the mother-child conversation, one researcher interviewed children about two recent specific events nominated by their mothers beforehand. One event was emotionally positive to the child, one negative. The researcher used standard prompts to encourage children to remember (e.g., "That's great. Can you tell me more?"). The sequence of recalling positive and negative events was counterbalanced across the sample. Children's memories were later coded following prior research (e.g., Boland et al., 2003; Wang, 2008), with a coarse coding scheme based on proposition (a subject-verb construct) to establish the baseline equivalence between training and control groups. Propositions concerning distinct aspects of the past event in question were coded as specific details (e.g., "I played football"). Propositions not directly about what happened in the event but of generic information were coded as general details (e.g., "We've been friends forever"). Off-topic speech irrelevant to the task (e.g., talking about the video camera) was not scored. Mean frequencies were computed across the two events. Then a specific-to-general-detail ratio was calculated to form an index of episodic memory skill. The average intercoder reliability r between two independent coders based on 25% of the data was .95 for specific details and .98 for general details.

During the child interview, mothers completed in a separate room a Child Communication Survey (Feagans & Farrans, 1997) that assessed school-aged children's narrative and discourse abilities. They answered 18 questions (e.g., "Child is easily understood when he/she is talking to you") by rating on scales of 1 (well below average) to 5 (well above average). The aggregated rating score was used to index the children's verbal skill (maximum score 90, Cronbach's $\alpha = .93$). Chinese mothers gave ratings on their children's abilities to communicate in English and Chinese, respectively, and the scores for the children's language of interview were used in analysis. For children who spoke English and Chinese interchangeably, the mean score between English and Chinese was used.

2.2.2. Maternal training

Group assignment was done at the end of the pretest home visit. A matched pairs design as a special case of randomized block design was used. The length of mother-child memory conversations has been found to be closely associated with maternal elaborative discussion of details in children's past experiences (Nelson & Fivush, 2004; Reese & Newcombe, 2007; Wang, 2006). It was therefore taken into consideration in the group assignment to ensure equivalence between training and control conditions at the outset.

Mother-child conversations were categorized into three roughly equal-sized groups as short (3 min or shorter), medium (3–6 min), and long (6 min or longer) and children's age was median split as young and old. Then children in each of the culture and gender groups were matched for conversation length and age and randomly assigned to either the training or control condition. No child was excluded.

In both conditions, mothers were each given a pamphlet about sharing memory with their children. They were told in the pamphlet that talking about past experiences could help children's conversational skills and that we would like them to share memory with their children as often as they could in the next 6 months. Mothers were also told that they could have the conversations anywhere and anytime and that they should focus on novel or one-time experiences that their children were interested in.

The key manipulation was the additional instruction in the training group pamphlet, where mothers were told that techniques focusing on children's thoughts, desires, and feelings in the past event were particularly effective for memory conversations. Specifically, it was described in the pamphlet that these child-centered techniques included asking what the child thought about things in the event and why (e.g., "What did you think when you saw the big dinosaur?"), what the child wanted, desired, or wished in the event and why (e.g., "Did you want to go to the Science Museum?"), and how the child felt in the event and why (e.g., "Did you feel sad when Sarah had to go home?"). Mothers were asked to use these techniques when sharing memory with their children.

To facilitate the mother-child conversations, we provided mothers in both conditions with a "certificate" (monthly schedule) and stickers and asked them to let their children put a sticker on the certificate every time they shared a memory. Over the following 6 months, monthly reminders were sent to mothers by mail, together with a copy of the pamphlet, a new certificate for the month, and additional stickers.¹

2.2.3. Manipulation check

At the end of the 6-month training, mothers and children were visited at home. Mothers were asked to talk with their children about a specific recent event that they experienced together, following the same instruction as in the pretest. For a manipulation check, the mother-child conversations were again coded for child-focus, where maternal references to their children's thoughts, desires, and feelings in the past event were tallied to form a child-focus score (Han et al., 1998; Reese et al., 2007; Wang et al., 2010). The average intercoder reliability r based on 25% of the data between two independent coders was .96.

2.2.4. Posttest on episodic thinking

After approximately 1.5 years (*Mean interval* = 1.54 years, *SD* = .20) following the pretest, children were interviewed at home for episodic thinking. A task of "past and future game" was used following previous research (Han et al., 1998; Wang, 2004a; Wang et al., 2014). The researcher, who was blind to condition, first explained to children that the game was to talk about specific events from the past and future. She further explained that specific events meant things happening at a particular time and place and provided examples (e.g., "I went to the Science Museum last Saturday" was a specific event, whereas "I went to the Science Museum all the time" was not). Children were asked to recall two specific past events, one happening to them recently and one when they were little, and to imagine two specific future events, one that could happen to them soon and one when they were grown-ups. The researcher used standard prompts for each event (e.g., "Can you tell me more?"). The two temporal distances (near and distant) were blocked within each temporal direction (past and future) and their order of presentation was counterbalanced. The order of the past and future sections was further counterbalanced. This task took approximately 20 min.

Children's event descriptions were coded following a standardized scoring procedure on episodic thinking (Addis et al., 2008; Levine et al., 2002; Wang et al., 2011, 2014). Each event description was segmented into distinct details that were further categorized as either specific or general. Specific details (or internal details) concern episodic information directly relevant to the central event, including event happenings, time, place, perceptual information, and thoughts and emotions (e.g., "I'm gonna have to go on 4 planes rides"). General details (or external details) concern information non-episodic or external to the event in question, including semantic facts, information pertaining to other non-central events or extended events, repetitions, and metacognitive statements (e.g., "They live in Montana in the summer and Mexico in the winter"). Off-topic speech irrelevant to the task (e.g., talking about the video camera) was not scored. The mean numbers of specific and general details were computed across the near and distant events for past and future, respectively, and a specific-to-general-detail ratio was calculated for each temporal direction to index episodic thinking (Gott & Lah, 2014; Wang et al., 2014). The average intercoder reliability r established on the basis of 20% of the data between two independent coders was .91 for specific details and .86 for general details.

Child verbal skill was measured again at the posttest, whereby mothers filled out the Child Communication Survey (Feagans & Farrans, 1997; Cronbach's α = .95).

¹ Following Reese and Newcombe (2007), we asked mothers in both groups to record their memory conversations at the beginning, the middle, and the end of the 6-month period, and we provided each family with a tape recorder and tapes. Same as in Reese and Newcombe (2007), not all mothers returned tapes (approximately 72% of both training and control group mothers returned tapes with one or more conversations recorded). The tapes were therefore not analyzed.

Table 1
Demographic Information and Pretest Measures by Condition.

	Training n = 57	Control n = 46
Culture	30 (53%) EA; 27 (47%) CA	24 (52%) EA; 22 (48%) CA
Gender	33 (58%) F; 24 (42%) M	25 (54%) F; 21 (46%) M
Age	6.63 (0.45)	6.62 (0.46)
Verbal skill	66.91 (9.51)	65.44 (10.22)
Episodic memory skill	3.80 (3.08)	3.10 (2.04)
Conversation length (minute)	5.01 (3.07)	6.23 (4.38)
Conversation child-focus	7.91 (7.22)	8.93 (10.36)
Between-test interval (year)	1.56 (0.25)	1.53 (0.12)

Note: Ten additional children in the training group and 17 in the control group did not continue in the study. There was no difference on any measure between these children and those who remained. EA = European American; CA = Chinese American; F = female; M = male.

3. Results

3.1. Pretest measures

Table 1 summarizes the demographic information and pretest measures by training condition. There was no significant difference between the training and control conditions on any measure. The interview language had no effect on any measure in the Chinese group. In addition, the sheer frequencies of specific (training $M = 9.82$, $SD = 6.66$; control $M = 10.68$, $SD = 10.71$) and general details (training $M = 3.13$, $SD = 4.06$; control $M = 4.04$, $SD = 4.98$) in children's memory representations also did not differ between the two conditions. Furthermore, there were no significant Condition x Culture or Condition x Gender interactions on any of the measured variables at the pretest. Episodic memory skill indexed by the specific-to-general-detail ratio did not differ between Chinese ($M = 3.63$, $SD = 3.00$) and European American children ($M = 3.36$, $SD = 2.37$), or between girls ($M = 3.83$, $SD = 2.71$) and boys ($M = 3.05$, $SD = 2.60$).

3.2. Manipulation check

Following prior training studies (Peterson et al., 1999; Reese & Newcombe, 2007), a manipulation check was done at the end of the training. Although mother-child conversations did not initially differ between the two conditions in the child-focus score (see Table 1), at the completion of the 6-month training, mothers in the training condition ($M = 11.26$, $SD = 9.85$) referred more frequently to their children's thoughts, desires, and feelings in the past event than did mothers in the control condition ($M = 7.42$, $SD = 8.23$), $t(100) = 2.10$, $p = .038$, $d = .42$. A posttest-pretest difference score was further computed and subject to a Training Condition x Culture x Gender 3-way ANOVA. Only a main effect of training condition emerged, $F(1, 94) = 6.20$, $p = .015$, $\eta_p^2 = .06$. Whereas the child-focus score increased significantly from pretest to posttest for mothers in the training condition (M difference = 3.35, $SE = 1.41$), $t(56) = 2.38$, $p = .021$, 95% CI [0.54, 6.17], it remained unchanged for mothers in the control condition (M difference = -1.44, $SE = 1.38$), $t(44) = -1.04$, $p = .30$, 95% CI [-4.23, 1.34]. The training was thus effective.

3.3. Episodic thinking at the posttest

At the posttest, children of the training and control conditions did not differ in age ($M = 8.19$, $SD = .46$; $M = 8.15$, $SD = .48$) or verbal skill ($M = 67.26$, $SD = 11.32$; $M = 65.07$, $SD = 10.46$). The sheer frequencies of specific (training past $M = 19.54$, $SD = 10.77$ and future $M = 14.53$, $SD = 9.41$; control past $M = 20.83$, $SD = 15.81$ and future $M = 12.07$, $SD = 9.42$) and general details (training past $M = 4.37$, $SD = 3.75$ and future $M = 5.22$, $SD = 5.52$; control past $M = 5.61$, $SD = 4.94$ and future $M = 4.96$, $SD = 5.52$) in children's event descriptions did not differ between the two conditions. Preliminary analyses with or without the child interviewed in Chinese yielded identical patterns of results. The final analyses thus included all children.

A mixed-model analysis on children's episodic thinking scores indexed by specific-to-general-detail ratios was conducted using SAS PROC MIXED program (Singer, 1998), with training condition (training vs. control) being a between-subject factor, temporal direction (past vs. future) being a within-subject factor, and subject being a random factor. A main effect of training condition emerged, $F(1, 97) = 4.65$, $p = .034$, $\Delta R^2 = .16$, whereby children in the training condition produced more specific relative to general details in both past and future events than did children in the control condition (see Fig. 1). There was also a main effect of temporal direction, $F(1, 97) = 7.89$, $p = .006$, $\Delta R^2 = .05$, whereby children represented past events with greater episodic quality than future events.

A further analysis was conducted with culture and gender included in the above model as between-subject factors in addition to training condition. Child verbal skill was included as a covariate because European American children ($M = 68.78$, $SD = 11.14$) scored higher than did Chinese ($M = 63.47$, $SD = 10.12$), $t(99) = 2.49$, $p = .014$, $d = .50$. The main effect of training condition remained significant, $F(1, 89) = 4.69$, $p = .033$, $\Delta R^2 = .09$, and there were no significant interactions involving culture or gender. Thus, across cultural and gender groups, children whose mothers were trained to have child-centered conversations over a year ago

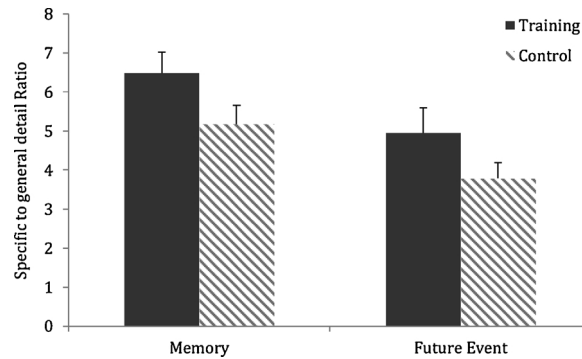


Fig. 1. Mean episodic thinking score (specific-to-general-detail ratio) for memory and future event at posttest by training condition. Error bars represent standard errors of the means.

represented past and future personal events with greater episodic quality than did those in the control condition. The main effect of temporal direction also remained significant, $F(1, 89) = 6.40, p = .013, \Delta R^2 = .04$, whereby children represented past events with greater episodic quality than future events. Additionally, a marginal main effect of culture emerged, $F(1, 92) = 3.43, p = .067, \Delta R^2 = .07$, whereby Chinese American children (past $M = 6.40, SD = 3.94$; future $M = 5.19, SD = 4.84$) scored higher on episodic thinking at the posttest than did European American children (past $M = 5.44, SD = 3.61$; future $M = 3.71, SD = 2.99$), independent of training condition.

4. Discussion

The development of episodic thinking, although closely associated with general neurocognitive growth (Gott & Lah, 2014; Picard et al., 2009), is responsive to sociocultural experiences (Nelson & Fivush, 2004; Wang, 2004b, 2013). We successfully trained mothers to have child-centered memory conversations by focusing on the child's thoughts, desires, and feelings in the past event. Mothers in the control condition were also encouraged to share memories with their children, although they did not receive the instruction to focus the conversation on the child's subjective states. As we expected, 1 year after the completion of training or 1.5 years following the pretest, children of the training group mothers produced past and future events in greater episodic detail than children of the control group mothers. Thus, child-centered memory conversations between mothers and children that focused on the child's subjective states, relative to memory conversations in general, facilitated children's episodic thinking over the long term.

These findings provide critical experimental evidence for the sociointeractionist proposal that parent-child memory sharing is a key contributor to the development of episodic thinking (Bauer, 2007; Nelson & Fivush, 2004; Reese & Newcombe, 2007; Wang, 2013). Extending extant studies on the effect of a maternal elaborative style on children's memory development, in which mothers draw children's attention to event details of what, where, and when (Boland et al., 2003; Peterson et al., 1999; Reese & Newcombe, 2007; Van Bergen et al., 2009), the current study examined a different dimension of mother-child memory conversations in which mothers encouraged children to reflect on their subjective states in the past event. Conversations that encourage children to attend to their past thoughts, desires, and feelings may heighten children's subjective self-awareness in mental time travel, help children connect the past with their sense of self, highlight the personal meaning of past experiences, and further facilitate a retrieval orientation toward specific details (Bauer, 2007; Fivush & Baker-Ward, 2005; Heatherton et al., 2004; Reese et al., 2007; Schacter & Madore, 2016; Wang et al., 2010). These processes may, in turn, be internalized by children into their own cognitive operations over time and further facilitate their structured representation of personal event details.

Importantly, the effect of child-centered memory conversations was also extended to children's representation of future events. This provides additional evidence to the theoretical notion that past and future episodic thinking abilities are interrelated such that memory supplies raw materials for future event simulation (Addis et al., 2008; Busby & Suddendorf, 2005). Addis (2018) contends that remembering and imagining share a common process of constructive simulation underpinned by the brain's default mode network and that this process involves the incorporation of episodic details in event representation. Compared with children of the control group mothers, children of the training group mothers came to represent their past experiences in richer episodic details that could be reassembled into their representations of future events (Gott & Lah, 2014; Hayne et al., 2011; Wang et al., 2014). In addition, consistent with previous findings with both children and adults (Addis et al., 2008; D'Argembeau & Mathy, 2011; Gott & Lah, 2014; Wang et al., 2011, 2014), children represented past events with greater episodic quality than future events. Researchers have suggested that the simulation of future events involves additional neurocognitive processes in mentally projecting into the future (Addis et al., 2008; D'Argembeau & Mathy, 2011). Furthermore, given the difference in associative strength, remembering past events is an easier and quicker process than imagining future events de novo (Addis, 2018). Consequently, representations of future events are less rich in episodic detail than past events. Still, the episodic quality of both past and future event representations improved after mothers engaged their children in memory conversations focusing on the child's subjective states, rather than having memory conversations in general.

Consistent patterns of findings across cultural and gender groups further demonstrate the generalizability of the training effects

(Sue, 1999; Wang, 2016). Independent of culture and gender, mother-child conversations that highlighted children's subjective states, relative to memory conversations in general, facilitated detailed representations of personal experiences. Interestingly, while Chinese and European American children did not differ in their episodic thinking scores at the pretest, Chinese children scored higher than did European American children at the posttest across conditions. Although the culture effect was only marginally significant and thus does not warrant a reliable conclusion, it suggests that Chinese American children might have benefited more from the memory conversations with their mothers than did European American children. Research has shown that East Asian mothers tend not to frequently share memories with their children and when they do, they often take a mother-centered approach to situate the conversation in a relational context (Kulkofsky et al., 2009; Miller et al., 1997; Mullen & Yi, 1995; Wang & Fivush, 2005). Here mothers in both conditions were encouraged to share memories with their children and training group mothers were asked to focus on the subjective perspectives of the child, as European American mothers often do (Kulkofsky et al., 2009; Miller et al., 1997; Wang & Fivush, 2005). This might elicit greater attention and effort from the Chinese mothers to engage their children in memory conversations, which further facilitated Chinese children's episodic thinking over time.

The current findings further suggest that the child-centered conversational approach may be a potent contributor to cultural differences in episodic thinking observed among children and adults (Han et al., 1998; Jobson et al., 2014; Wang, 2004a, 2006, 2009; Wang et al., 2014). In other words, cultural differences in the episodic representation of personal experiences are not a result of differences in general cognitive abilities or neural processes, but may originate from different early social experiences, particularly those in the family. When sharing memories with their children, European American mothers frequently refer to children's roles and subjective perspectives in the past event. Such child-centered conversations are in alignment with the Western cultural emphasis on individuality and autonomy and highlight to children the importance of using personal experiences to build a unique individual identity. In contrast, Chinese and other East Asian mothers tend to downplay the role of the child in the past event and frequently refer to general rules and norms to regulate children's behavior in social contexts. Such mother-directed conversations reflect the East Asian cultural values of social connectedness and support the socialization goal of developing a relational sense of self (Kulkofsky et al., 2009; Miller et al., 1997; Mullen & Yi, 1995; Wang & Fivush, 2005; Wang et al., 2010). Thus, through everyday narrative practices of memory sharing, parents play a critical mediating role in transmitting to children cultural modes of understanding and constructing personal experiences (Nelson & Fivush, 2004; Wang, 2004b, 2013).

Although the current study provided experimental evidence for the effect of child-centered memory conversations on episodic thinking, there may be other dimensions of family narrative practices that are equally important. Also, we only examined the effects of training mothers to focus on the child's subjective states during memory conversations; so we do not know from these results whether other types of conversations that discuss children's thoughts, desires, and feelings, such as during storytelling or future planning, would be equally influential for episodic thinking. Furthermore, the study design was unbalanced, where we did not measure future thinking at the pretest and used different interview protocols and coding schemes for child memory at the pretest and posttest phases. Although this design served the purpose of comparing episodic thinking between training and control groups, it did not allow comparisons between pretest and posttest within each group. Future studies should use a balanced design that will make possible not only within-group comparisons across time but also test for individual differences in the degree of child focus in maternal conversation in relation to the degree of pre-to-post change in children's episodic thinking ability. In addition, the results related to cultural differences were suggestive but not conclusive, and there was an absence of any interaction effects. These results need to be corroborated in larger and more diverse samples. Future research should further examine other dimensions of parent-child conversations in a variety of contexts and across different demographic and cultural groups, as well as the persistent effect of the conversations on children's episodic thinking in daily life. Another fruitful line of future research will be to further unpack the effect of the child-centered memory conversations on children's episodic thinking, examining the neurocognitive mechanisms underlying the interplay between interpersonal and intrapersonal episodic thinking processes.

Notably, although child-centered memory conversations that focus on the child's subjective perspectives facilitated children's episodic representation of personal events, this pattern of parent-child interaction serves the goal of encouraging individuality and autonomy, which is prioritized in Western, particularly European American, cultures (Wang, 2013; Wang et al., 2010). Thus, although this conversational style may be worth developing training exercises to achieve it in families - including immigrant families - living in Western countries such as the US, it may not be beneficial for families living in other areas such as East Asia where developing a sense of relatedness and belonging is a paramount goal. Also, detailed representations of one's own personal experiences are not equally valued nor serve equal psychological functions across cultures (Wang, Hou, Koh, Song, & Yang, 2018). More research that takes into account the dynamic interaction between individual, familial, and cultural variables in the development of episodic thinking is called for.

In sum, integrating experimental and longitudinal approaches, the present study yielded critical findings to demonstrate that the development of episodic thinking is not a sole result of neurocognitive maturation but entails a socially constructed process (Nelson & Fivush, 2004; Wang, 2013). The findings further shed light on the social-familial origins of cross-cultural differences in episodic thinking. Fundamental as it is, episodic thinking, and perhaps any cognitive skill, develops in response to varied sociocultural expectations.

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