

**How is preschoolers' memory performance
related to parental elaboration during reminiscence?**

Abstract

The influence of parental reminiscing style – how parents discuss past events with their child – on preschoolers' independent memory skills (outside of parent-child conversations) and the processes involved in this effect (memory consolidation vs. development of strategies) is far from clear. To test this, 50 parent-child dyads ($M_{ChildAge} = 52.12$) were recruited. Parents' level of elaboration during reminiscing was measured while children completed tasks assessing their memories about two standardized events, one they had discussed with their parent and one they had not discussed, and an episodic task requiring the memorization of new information. Children of high-elaborative parents performed better than children of low-elaborative parents on the recognition test for the non-discussed event and for the episodic memory task. This suggests that parental elaboration is related to preschoolers' independent memory skills and that its effect might exceed memory consolidation and depend on processes like the acquisition of strategies.

Keywords: autobiographical memory; episodic memory; parental reminiscing; preschoolers

How is preschoolers' memory performance related to parental elaboration during reminiscence?

During the preschool years, significant changes are observed in both episodic memory (i.e., the ability to encode, store and retrieve information along with its temporo-spatial context; Tulving, 1984) and autobiographical memory (memory of past experiences integrated into personal life stories; Bauer & Fivush, 2010). Fivush (2011) proposed conceptualizing these memory systems on a continuum, with episodic representations (i.e., factual and contextual representations of past events) serving as a basis for autobiographical representations (i.e., representations of oneself as having experienced past events).

In addition to the child's neurobiological development, environmental factors are assumed to influence this development (Nelson & Fivush, 2004). One widely explored factor is parent-child conversations. Indeed, as soon as children begin to talk, most parents engage them in conversations about their life events, during and after these events. Researchers have intensively studied parent-child discussions about past events, called parental reminiscences. This literature has shown that parents differ on several dimensions (such as the degree to which they support their child's autonomy during these conversations, e.g., Cleveland & Reese, 2005). Among these dimensions, the degree of elaboration of parental reminiscences – marked by many interindividual differences – has received particular attention (Fivush, 2019; Fivush et al., 2006; Reese et al., 1993). Some parents – labeled as high-elaborative parents – engage their children in more frequent and longer conversations about past events, covering a large amount of information. These parents also stimulate their child's participation more actively, for example, by valuing their child's contributions, giving feedback, or using open questions more frequently than closed questions. Moreover, if a child fails to respond, they favor rephrasing over repetition.

It is well known that the way children reminisce with their parents is directly linked to the level of elaboration of their parents. As reported in two meta-analyses (covering 38 studies and 1733 participants (Waters et al., 2019) and 31 studies and 1488 participants (Wu & Jobson, 2019)), high-elaborative parents have children who recount their personal experiences in a more detailed and coherent manner (with effect sizes ranging from small to large depending on the study design and the coding method), suggesting that parental reminiscing style affects children's autobiographical memory skills. This observation raises questions about which processes are promoted through parental interactions and when these processes come into play.

First, because the evaluation of children's memories often concerns events experienced with their parents, it is possible that differences in parental interactions during the occurrence of events might already produce differences in how deeply the events were encoded (e.g., by drawing the child's attention to numerous elements of the environment). Indeed, Tessler and Nelson (1994) showed that elements that were jointly discussed by parent-child dyads during a museum visit were better recalled later by the children, when examined by an experimenter. However, it is very unlikely that these encoding differences alone can explain the reminiscence effect. Indeed, some studies that assessed children's memories of events that were experienced without their parents also show an effect of parent-child discussions (Camilleri et al., 2021; Leichtman et al., 2017; Leichtman et al., 2000). Specifically, in these studies, children experienced a staged event in their classroom (e.g., the surprise visit of their teacher who was on maternity leave with her baby) and then discussed it with their parents at the end of the day. The results showed that the information reported by children during parental conversations (the amount of which was positively associated with parental elaborations) was linked to their performance in a later independent memory task (administered by an experimenter). In addition to this indirect role of parental style through children's contributions to the discussion, Camilleri et al. (2021) found a direct relation between parental level of elaboration during these

conversations and children's performance on an independent recognition task about this event three days later. Therefore, both parents' and children's contributions during conversations about past events seem to favor memory consolidation of these events.

Interestingly, some data suggest that the effects of parental elaboration during reminiscence on children could also be visible in undiscussed memories, and thus support the idea that, in addition to consolidation, parental reminiscences may promote the development of more general memory skills. For example, Cleveland and Reese (2005) found that 65-month-old children of high-elaborative parents recounted past personal experiences (reported as not having been previously discussed with the parents) to the experimenter in greater detail. Note, however, that we have no information on whether these events were shared or not, which does not rule out the hypothesis that initial encoding is better. However, this result was not found earlier in development (40 months; Cleveland & Reese, 2005; 48 months; Larkina & Bauer, 2010). According to these results, it could be assumed that parental elaboration during reminiscence influences children's independent memory for past events only in the late preschool years. However, a few studies suggested that parents' level of elaboration when reminiscing could influence some other memory abilities earlier in development. In Langley et al.'s (2017) study, in which children were given an episodic memory task (which required the memorization of a series of objects), 36-month-old children of high-elaborative parents spontaneously used more encoding strategies (e.g., naming the objects), which led to better memory performance than in children of low-elaborative parents. In the same vein, a recent study showed that parental reminiscing style was also related to preschoolers' discrimination abilities on a recognition task (based on a story previously read by an experimenter; Léonard, Blause et al., 2023). In view of these data, it can be assumed that parental reminiscing could constitute the breeding ground for the acquisition of strategies (for a similar reasoning, see Ornstein et al., 2013; Rudek & Haden, 2005; Waters et al., 2019). Consistent with this

assumption, Léonard, Billet et al. (2023) found parental reminiscing to be linked to preschoolers' ability to metacognitively evaluate the quality of their memory traces, a process that is involved in memory performance from a very early age (Geurten & Willems, 2016).

The influence of parental elaboration during reminiscence on children's independent memory skills is, however, not supported by all studies. For instance, studies assessing children's independent memory performance with the AMT-PV (Autobiographical Memory Test – Preschool Version; a test that requires the retrieval of specific personal memories in response to cue words and the development of a verbal response) have shown that children's performance was not significantly related to their parent's level of elaboration (Jobson et al., 2018; Valentino et al., 2014). Currently, studies in the field present considerable methodological disparities concerning the assessment of children's memory, particularly in terms of material to be remembered (e.g., naturalistic events that children jointly experienced with their parents vs. staged events that children experienced without their parents vs. newly deliberately memorized information). Indeed, while parental elaborations have been widely linked to the richness and coherence of preschoolers' recounting of their memories during parental reminiscences (Waters et al., 2019; Wu & Jobson, 2019), the results regarding their effect on children's independent memory performance are mixed, especially when the material to be remembered concerns memories of personal experiences (e.g., Cleveland & Reese, 2005; Valentino et al., 2014). However, a few isolated studies, in which children's ability to memorize new information was assessed, have suggested that parental reminiscing may exert a broad influence on preschoolers' memory (e.g., Langley et al., 2017; Léonard, Blause et al., 2023). Given the disparity of results and of methodology, which makes it difficult to reach firm conclusions, further research is needed to understand the processes involved in the reminiscence effect (i.e., memory consolidation or other processes such as the acquisition of strategies).

This study

The overall goal of this study was to explore whether parental reminiscing is associated with preschoolers' independent memory abilities (i.e., outside the context of parent-child reminiscences) and whether the effect of parental style extends beyond the consolidation of the events discussed in memory.

For this purpose, parental reminiscing style was assessed through parent-child discussions about a prior standardized event (i.e., a visit to an aquarium). We opted for this standardization (as in Leichtman et al., 2000) rather than the usual method of letting the parents choose the events to reminisce about (e.g., Langley et al., 2017) in order to reduce possible interindividual variability regarding the length, memorability, or intrinsic richness of the events. These discussions were coded to compute a parental elaboration score (based on Reese & Fivush, 1993). Then, as in several studies in the field (e.g., Cleveland & Reese, 2005; Cook et al., 2023; Harley & Reese, 1999; Langley et al., 2017; Lewis, 1999; Peterson et al., 2007; Principe et al., 2013; Principe et al., 2017), we performed a median split on this score to distinguish lower vs. higher elaborative parents. In the past, this procedure had successfully led to differences in children's recounting of their memories (e.g., Cleveland & Reese, 2005) as well as in their performance on an episodic memory task (Cook et al., 2023; Langley et al., 2017).

The experimenter administered various tasks in the absence of the parent to assess children's independent memory skills. Some of those tasks targeted children's autobiographical memory by assessing their memories of two prior standardized events (the visit to an aquarium and a testing session) via a free recall task followed by a recognition task. If parental reminiscing truly influences children's independent autobiographical memory skills, we expected children of higher elaborative parents to perform better on these tasks than children of lower elaborative parents.

In addition, some methodological features were introduced to investigate the potential mechanisms underlying the relation between parental reminiscing and children's memory. First, to ensure that the better performance of children of higher elaborative parents truly results from parental style during reminiscence rather than their style as the events unfolded, we controlled for the initial encoding conditions of the two events (as in Leichtman et al., 2000). Specifically, for the testing session, the parents were absent, while for the aquarium visit, half of the children visited it with their parent and the other half with the experimenter, who interacted with them only minimally – a manipulation that would allow us to quantify the possible impact of parental interactions during the visit vs. during the reminiscence. Then, to explore whether the effect of parental reminiscing extends beyond memory consolidation, one of the events – the aquarium visit – was previously discussed by parent-child dyads, while the other – the testing session – was not discussed. If parental reminiscing truly promotes processes other than memory consolidation, we expected to see an effect of parental elaboration on children's memory of both types of events.

To further verify that parental reminiscing enhances children's ability to memorize new information, we included an episodic memory task (the House Test; Picard et al., 2012) which required children to memorize a series of items and to retrieve them after a delay. We expected the children of higher elaborative parents to perform better on this task than children of lower elaborative parents. Such results would be consistent with those of Langley et al. (2017) and would suggest that the role of parental reminiscing exceeds the consolidation of discussed memories and would have an effect on the development of strategies.

Methods

Participants

Given that a priori power calculation for mixed models could only have been computed through simulations based on pilot data that were not available here, our sample size was thus

determined through a priori power analyses for linear fixed effects regression to reach a predicted power of .80 for effects of medium size ($f^2 = .20$), estimated based on previous studies with similar methodologies to the current one (i.e., studies exploring the effect of parental reminiscing on preschoolers' independent memory skills; Léonard, Billet, et al., 2023; Léonard, Blause, et al., 2023). This calculation led to a required sample size of 42 participants to which we added around 15% of the participants to anticipate participation problems such as drop-outs between the first and second sessions. As generalized mixed models are generally more powerful analyses than linear regressions, we expected our sample size to be adequate even though the use of the median-split method could have slightly reduced the statistical power of our analyses.

The recruitment was done by word of mouth and in kindergartens in the province of Liège, Belgium. It resulted in a sample of 50 typically developing French-speaking preschoolers (25 males and 25 females; $M_{\text{months}} = 52.12$, $SD_{\text{months}} = 10.68$) and the parent with whom each one talked the most (6 males and 44 females; $M_{\text{years}} = 35.02$ years, $SD_{\text{years}} = 3.44$). Roughly 75% of the parents had a postsecondary degree, and 39% of them had a master's degree (number of completed years of education: $M = 15.22$, $SD = 2.70$). Finally, 86% of the parents were employed (number of hours per week, $M = 33.45$, $SD = 10.32$).

Materials and procedure

This research was approved by the local ethics committee of the University of Liège (protocol number: 1819-55). To avoid bias in data collection (e.g., social desirability), the study's purpose was not initially revealed to the parents, who believed that they were enrolled in research about the impact of parental interactions on children's perception of the

environment. The true goal was disclosed by the end of the first session and new written and verbal consents were obtained from parents and children, respectively.

Participants attended two sessions (each lasting approximately 60 minutes; see Figure 1) from two to five days apart. The first session included three main phases. First, all children participated in a visit to an aquarium; half of them were accompanied by their parent and the other half by an experimenter. Immediately afterward, each parent-child dyad discussed this standardized event for the assessment of parental reminiscing style. Third, children performed different actions and tasks (about 25 minutes in duration) in the following order: (a) color a picture of a banana purple; (b) complete a task assessing receptive language skills; (c) answer a question assessing explicit knowledge of metacognitive strategies (retrieved from Geurten, Catale, et al., 2015); (d) complete a task assessing future self-projection (adapted from Suddendorf, 2010); and (e) receive a chocolate as a reward. During this third phase, the parents were in another room completing a questionnaire (assessing their explicit knowledge of parental reminiscing). At the end, the parents were asked not to discuss the first session with their children (including the aquarium visit) until the next session. If their children spontaneously talked about some elements, they were instructed to record them in a booklet and merely to respond without adding new elements or making corrections.

The second session was designed to assess children's independent memory skills (i.e., outside of the context of parental reminiscence). Specifically, children completed autobiographical memory tasks to assess their memory of an event they had discussed (the aquarium visit) and an event they had not discussed (the third phase of the first session). They were also given an episodic memory task that required the memorization of new information. Parents' receptive language skills and ability to memorize new information were also evaluated to explore their associations with parental reminiscing style.

--- Insert Figure 1 ---

The aquarium visit. For the purpose of standardization (i.e., so that all participants experienced the same event), each child visited the Liège aquarium following a specific 10-step itinerary with a duration of around 25 minutes ($M = 26.67$, $SD = 6.44$). At each step, they had to answer a question (e.g., “In aquarium number 19, spot the fish with a bump on its head!”). The tour was the same for all children, but they completed it either with their parent ($n = 24$) or the experimenter ($n = 26$). As a reminder, this manipulation was conducted to quantify the possible impact of parental interactions during the visit vs. during the reminiscence. Children were randomly assigned to one of the conditions according to their sex (parent condition: 13 females; experimenter condition: 12 females) and age (parent condition: $M = 51.54$ months, $SD = 10.74$; experimenter condition: $M = 52.65$, $SD = 10.81$). In the parent condition, each parent-child dyad freely completed the aquarium tour in the absence of the experimenter. In the experimenter condition, each parent followed the experimenter-child dyad during their visit, standing back and not interacting, so that they had access to the same information for the reminiscence task as the parents who had visited with their child. In this condition, the experimenter limited her comments to general encouragements without elaborating on children’s speech to standardize the initial encoding conditions.

Parental reminiscing. Immediately after the visit, all parent-child dyads discussed it as naturally as possible, without time limits and in the absence of the experimenter. The conversation was audio-recorded for later transcription and analysis with independent utterances as coding units. As is frequently the case in the field of parental reminiscing, we wanted to create a score reflecting parents’ level of elaboration. Based on Reese and Fivush’s (1993) work, this composite score corresponded to the sum of parental concretizations and evaluations divided by the total number of parental utterances. Specifically, concretizations

were units that went into more detail on a specific element of the discussed event (in the form of a statement, an open question, or a closed question), including all the occurrences when parents followed their child's contributions. Evaluations were units that provided feedback to children by confirming or invalidating their reports. Each occurrence of these components increased the score by 1. We focused on these reminiscing behaviors because they appear in the literature to be crucial components of parental style. Indeed, while parental concretizations were shown to be associated with preschoolers' independent memory skills in several studies (Léonard, Billet, et al., 2023; Léonard, Blause, et al., 2023), parental evaluations were linked to the richness of children's recall of past experiences when reminiscing with their parent (for a meta-analysis, see Wu & Jobson, 2019). In the computation of our composite score, we considered the total number of parental utterances, as a same frequency on the reminiscing behaviors could reflect different realities (e.g., 10 evaluations out of 30 vs. 60 utterances) and could therefore influence children's outcomes differently (for a similar reasoning, see Léonard, Billet, et al., 2023). Thus, regardless of the total amount of language produced by the parents, our score captured their propensity to use the latter two reminiscing behaviors. In our opinion, this approach is important given that the elaborative reminiscing style does not simply consist of more talkativeness but is rather characterized by the use of specific behaviors favoring the co-construction of memories (Waters et al., 2019). As in several studies in the field (e.g., Cleveland & Reese, 2005; Langley et al., 2017), we performed a median split on this score to distinguish lower vs. higher elaborative parents.

Two raters independently coded 20% of the transcripts for interrater reliability (other codes than concretizations and evaluations were inventoried but not considered in this study; see supplementary material, Table S1). Calculation of Cohen's Kappa (Cohen, 1960) resulted in an average interrater correlation of 0.98. After that, one of the raters coded all the remaining transcripts.

Memory of the discussed event. Children's autobiographical memory skills were assessed based on the aquarium visit, which was discussed by each parent-child dyad. The experimenter administered a free recall task during which children were asked to provide as much information as possible about the aquarium visit. To reduce the influence of children's narrative skills on their memory performance, a true-false recognition task was then administered on 14 items (i.e., 7 fish they had seen and 7 fish they had not seen). Specifically, children were presented with black-and-white images in a randomly predetermined order; for each one, they were asked if they had seen that fish during the visit or not. The data were encoded on an item-by-item basis, with correct responses coded 1 and incorrect responses coded 0. During this recognition task, for each correctly recognized fish, children also answered additional recall questions about (a) its color, (b) its size, (c) whether or not it was in the aquarium alone, and (d) whether it was seen at the beginning of the visit or at the end. This allowed us to assess children's richness of memory, with data again encoded on an item-by-item basis (correct responses coded 1 and incorrect responses coded 0). When a fish was not recognized, the additional questions were not asked, automatically resulting in a score of 0.

Memory of the non-discussed event. To explore whether the effect of parental reminiscing goes beyond the consolidation of discussed memories, children's autobiographical memory of the previous testing session was assessed. As with the assessment of the discussed event, children first completed a free recall task during which they had to provide as much information as possible about what they did during the testing session. To reduce the influence of their narrative skills, they also performed a true-false recognition task on 14 statements (i.e., 7 true statements and 7 lures) about elements of the previous testing session (e.g., "I asked you to color a fruit in the wrong color."). Two versions of this task were created: for each event, we created a true statement – e.g., "During the exercises, I was sitting in front of you." – and a false statement – e.g., "During the exercises, I was sitting next to you."; when a true statement was

presented in version 1, the corresponding false statement was presented in version 2, and vice versa. The data were encoded on an item-by-item basis, with correct responses coded 1 and incorrect responses coded 0.

For the free recall of both the aquarium visit and the testing session, the data were analyzed using a coding scheme from Folville et al. (2020) (for categories, see Table 1). The data were encoded on an item-by-item basis, with each category covered by the child coded 1 and each category not covered coded 0. To establish interrater reliability, 20% of the data were coded by two raters and the calculation of Cohen's Kappa (Cohen, 1960) resulted in a mean value of .92. After that, one of the raters coded all the remaining transcripts.

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Episodic memory learning task. To explore whether parental reminiscing favors children's memorization of new information, we administered the House Test (Picard et al., 2012). In this task, children had to memorize and recall 9 activities, each corresponding to the association of 3 specific elements (for a total of 27 elements): factual information linked to temporal and spatial information (e.g., "After they woke up, they poured water into the aquarium in the kitchen"). This task consisted in three phases: (a) the encoding (elements were repeated as often as necessary to allow the child to recall it immediately); (b) a free recall task (after a 10-minute delay); and (c) a forced-choice recognition task (requiring children to recognize a hit presented with two lures that represent information on other activities). For the encoding, we assessed children's learning curve by encoding on an item-by-item basis the number of times each specific element had to be repeated before it was encoded correctly (a low score reflected a better encoding performance). For the free recall task, the data were also encoded on an item-by-item basis, with each specific element that was correctly recalled coded

1 and all wrong or missing elements coded 0. Then, each specific element that had been correctly recalled in the free recall task was automatically coded 1 in the recognition phase. For the remaining elements, each correctly recognized element was coded 1 while incorrect responses were coded 0.

Control variables

Receptive language ability. Both children and parents completed the Peabody Picture Vocabulary Test – Revised (PPVT-R, Form A, French version; Dunn et al., 1993) to measure their receptive language ability. The PPVT-R was scored in the standard manner, with a higher score indicating a better performance.

Explicit knowledge about parental reminiscing. A 10-item questionnaire was administered to the parents to assess their explicit knowledge of how to reminisce effectively with their child (see supplementary material, Table S2; retrieved from Léonard, Billet, et al., 2023). Each question consisted of a scenario for which parents had to select the best way to interact with their child from among several options (e.g., Imagine that you want your child to remember what she/he ate for lunch. What do you think you could say to him/her? A. “You ate pasta with Bolognese sauce for lunch! Was it good?” B. “What did you eat for lunch?” C. “Did you eat pasta for lunch?”). Three parallel versions of this questionnaire were created and counterbalanced between participants to make sure that there was no impact of the scenarios. Scores ranged from 0 to 10. With this measure, we were interested in exploring whether parents’ explicit knowledge could be related to higher levels of elaboration when reminiscing with their child.

Parents’ memory learning task. The parents were asked to listen carefully to a story retrieved from the Logical Memory Subtest of the WMS-III (a brief story including 25 logically

organized elements) (Wechsler, 1997). After a 10-minute delay, they performed a free recall task and obtained a score ranging from 0 to 25 (i.e., 1 point per correctly recalled element).

Analysis plan

All data are publicly available at [stable URL¹] and we used JASP version 0.15 for the analyses. First, we executed a median split on parents' level of elaboration to classify them as lower or higher elaborative in comparison with each other. Although this method could slightly reduce the statistical power of our analyses, one of its advantages lies in its parsimony (Iacobucci et al., 2015). Then, we ensured that these two groups differed significantly on their level of elaboration and possibly in its components (i.e., concretizations, evaluations and the total number of parental utterances). We also controlled whether these two groups differed on certain variables related to the parents (i.e., sociodemographic variables, explicit knowledge about reminiscing, language and memory skills) and the children (i.e., sociodemographic variables and language skills). Then, generalized linear mixed-effect models were carried out to explore the relations between parental reminiscing and children's outcomes (i.e., memories of the discussed and non-discussed events as well as ability to memorize new information). A key advantage of this statistical method is that it considers intrasubject variability by introducing participants as a random effect (i.e., random intercepts for subjects and by-subject random slopes). In each model, the group variable (lower vs. higher elaborative parents) was introduced as a nominal fixed effect. For the analyses of children's memory of the discussed event, we also introduced the visiting condition (i.e., whether children had visited the aquarium with their parent or with the experimenter) as a nominal fixed effect to control the effect of the initial encoding.

¹ The URL will be added after acceptance of the manuscript because our institutional open-access repository only includes data files associated with accepted manuscripts.

Results

Participants' characteristics and descriptive statistics for parental reminiscing are reported in Table 2. The two groups of parents (lower vs. higher elaborative) differed significantly in their level of elaboration, Welch's t -test = -7.9 , $p < .01$. Moreover, significant group differences were found for the use of concretizations, $U = 139$, $p < .01$, and evaluations, $U = 201.5$, $p = .03$, but not for the total number of utterances, $U = 223.5$, $p = .09$. Lower and higher elaborative parents did not differ in terms of sociodemographic characteristics (age: $t = -0.70$, $p = .49$; gender: $\chi^2 = 0.76$, $p = .38$; education: $U = 383$, $p = .17$), explicit knowledge about parental reminiscing, $t = 0.13$, $p = .90$, receptive language ability, $U = 337$, $p = .64$, or memory performance, $t = -0.97$, $p = .34$. Besides, note that parents' level of elaboration during the reminiscence about the aquarium did not appear to be influenced by its visiting condition (i.e., with the parent vs. with the experimenter), $t = 0.12$, $p = .91$. Children of lower and higher elaborative parents did not differ regarding age, $t = -1.79$, $p = .08$, gender, $\chi^2 = 0.72$, $p = .40$, or receptive language ability, $t = -1.38$, $p = .17$.

Descriptive statistics for all children's outcomes are presented in Table 3. Preschoolers' performance on the different memory tasks appeared significantly correlated with their age (all r 's > 0.38 and p 's $< .006$) and their receptive language ability (all r 's > 0.29 and p 's $< .05$). Since these two variables were found to be strongly correlated with each other ($r = 0.72$; $p < .001$); and given that additional analyses indicated that most of the effect of children's PPVT on their memory performance was explained by their age), we decided to explore whether the effect of parental reminiscing style on children's independent memory skills varied as a function of children's age (see below; for a similar reasoning, see Léonard, Billet, et al., 2023; Léonard, Blause, et al., 2023). Note also that children's memory performance did not significantly vary according to their gender (all U 's < 397.5 and p 's $> .09$), parents' education (all r 's < 0.21 and p 's $> .14$), or parents' memory performance (all r 's < 0.27 and p 's $> .06$).

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Parental reminiscing and autobiographical memory skills

Memory of the discussed event. First, we observed no significant effects of the visiting condition of the aquarium (i.e., with the parent vs. with experimenter) on children's later memory performance about this event (free recall, $t = 1.28$, $p = .20$, recognition, $t = -1.66$, $p = .10$, memory richness, $t = 1.01$, $p = .31$) or significant interactions with parents' level of elaboration when reminiscing. In this study, it therefore appears that the parent's interactions during the initial encoding did not influence the child's memory of the visit. As for parental reminiscing style, we found no effect of group (lower vs. higher elaborative) on children's memory of the visit to the aquarium on free recall, recognition, or memory richness (see Table 4).

Memory of the non-discussed event. Regarding the group effect (lower vs. higher elaborative), we observed a significant effect on children's recognition performance about the previous testing session but not on their free recall (see Table 4). Specifically, for each item, children of higher elaborative parents were 25% more likely to respond correctly to the true-false recognition task ($Estimate = 0.25$, $SE = 0.11$) than children of lower elaborative parents. In this line, additional analyses with the level of parental elaboration as a metric variable (corresponding, as a reminder, to the sum of parental concretizations and evaluations divided by the total number of parental utterances) also indicated a significant positive association with children's recognition performance (Spearman's $r = 0.31$, $p = .03$). Further exploratory analysis was carried out to explore whether this effect of parents' level of elaboration on children's recognition performance varied as a function of children's age (as the latter variable was significantly correlated with children's memory performance). The results showed no

significant interaction between parents' level of elaboration and children's age, $Estimate = 0.002$, $SE = 0.01$, $t = 0.21$, $p = .83$.

Parental reminiscing and ability to memorize new information

A significant effect of group (lower vs. higher elaborative) was found on children's recognition performance on the episodic memory task but not on their learning curve at encoding and free recall performance (see Table 4). Specifically, for each item, children of higher elaborative parents were 22% more likely to respond correctly ($Estimate = 0.22$, $SE = 0.10$) than children of lower elaborative parents. In this vein, additional analyses with the level of parental elaboration as a metric variable also showed a significant positive association with children's recognition performance (Spearman's $r = 0.30$, $p = .04$). When children's age was entered in the analysis, no significant interaction effect was found between this child variable and their parents' level of elaboration on their recognition performance, $Estimate = 0.01$, $SE = 0.01$, $t = 1.28$, $p = .20$.

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Discussion

This study explored the association between parental reminiscing and preschoolers' independent memory skills (i.e., outside the context of parental reminiscence) and the possible mechanisms underlying this relation. Since our hypothesis was that the effect of parental reminiscing would exceed memory consolidation alone, we expected a relation between parental reminiscing and children's memory not only with tasks assessing their memory of the discussed event (i.e., the aquarium visit) but also with tasks involving the non-discussed event

(i.e., the testing session) and the memorization of new information (i.e., the episodic memory task). For these purposes, the parents were classified in two groups (lower vs. higher elaborative) using the median-split method (e.g., as in Langley et al., 2017). These groups differed significantly in their level of elaboration and its components (use of concretizations and evaluations).

Our results showed that the children of higher elaborative parents performed better than the children of lower elaborative parents on two recognition tasks. The former showed better memory discrimination during the true-false recognition task about the non-discussed event (i.e., the testing session). They were also better at recognizing true information in the forced-choice recognition phase of the episodic memory task, reflecting a better ability to memorize new information. Interestingly, these results would support the idea that parental reminiscing does not solely support memory consolidation which has been well documented in the literature. Together with Langley et al.'s (2017) results, they suggest that parental reminiscing also favors children's development of strategies that may be applied in different contexts.

Based on these results, it is interesting to reflect on strategies that parental reminiscing could promote and that children could use during either the encoding or retrieval of memory information. A first possibility is that children of higher elaborative parents may learn to pay attention to details, process them in depth or even link information together. These encoding skills, which are known to develop during the preschool years (Picard et al., 2012), would allow children to create rich, coherent memory traces that in turn would facilitate the implementation of some retrieval processes. Given that the effect of reminiscing was specifically found on recognition tasks, these processes could be pattern completion (allowing the holistic recollection of an experience when presented with a cue about this experience) and pattern separation (allowing discrimination between similar experiences) (Ngo et al., 2020). In addition to the creation of stronger memory traces, a second possibility is that the better performance of

children of higher elaborative parents results from their acquisition of metacognitive strategies used at retrieval. Throughout the preschool years, children are known to develop their ability to evaluate (metacognitive monitoring) and strategically control their cognitive operations based on the monitoring results (metacognitive regulation; Geurten & Willems, 2016). Specifically, in recognition tasks, these abilities occur in the form of post-monitoring processes, such as the recall-to-reject strategy or the memorability heuristic. Through parental elaborations and evaluations (e.g., “You remember the trip well; you told me a lot of details.”), it is indeed possible that children learn to make their memory decisions based on what they objectively recall (as with the recall-to-reject strategy; Gallo, 2004) or expectations about what they should be able to recall (as with the memorability heuristic, Schacter et al., 1999). Children’s use of these strategies would then lead to better memory discrimination by decreasing the production of false recognitions (e.g., Geurten, Meulemans, et al., 2015). Interestingly, this is consistent with the results of Klemfuss et al. (2016), showing that parental elaborations during reminiscence were the best predictor of children’s resistance to false suggestions.

If parental reminiscing truly influences the acquisition of strategies, the lack of effect on children’s free recall performance – which usually involves the use of strategies – is quite surprising. It is, however, consistent with the results of Camilleri et al. (2021), who found that parental elaborations affected kindergarteners’ recognition performance but not their performance on free recall tasks. These findings could be explained by the complex nature of the strategies that are needed to improve free recall performance (e.g., organizational strategies), given that such strategies are highly dependent on executive functions, which develop more slowly (Picard et al., 2012). In the field of reminiscing, Langley et al. (2017) showed that 6-year-old children of high-elaborative parents were more successful at learning complex deliberate strategies (semantic organizational strategies) after a brief training session

than children of low-elaborative parents. Therefore, it may be that parental reminiscing influences complex strategies later in development, when executive functions are more mature.

Furthermore, if parental reminiscing actually influences the acquisition of strategies young children can use in recognition tasks, the lack of effect on children's recognition of the discussed event (the aquarium visit) is surprising. However, this result is difficult to interpret because we observed a ceiling effect in the recognition task for this event (6 out of 7 hits were correctly recognized by at least 80% of children), probably because the aquarium visit was more memorable than the testing session (the non-discussed event). Moreover, this ceiling effect could also result from memory consolidation due to parental reminiscence regardless of whether the parent was higher or lower elaborative (or because all parents were at least minimally elaborative). Consequently, the variability of children's performance was probably be too small to show a specific effect of parental elaboration.

Conclusions, limits and future perspectives for research

Although correlational in nature, the results of this study provided crucial evidence in favor of the assumption that the effect of parental reminiscing extends beyond the consolidation of discussed memories. A strength of our design was the use of standardized events to assess parental reminiscing style and children's autobiographical memory skills. For parental style, this allowed us to reduce the possible interindividual variability that could arise when the choice of the discussed events is left up to the parent (e.g., in terms of length, memorability, or intrinsic richness of the events). For children's autobiographical skills, the method allowed us to evaluate the accuracy of children's memories. The flip side, however, is that the tasks do not concern events that are significant to children's personal life stories. It would be interesting for future studies to replicate our results with tasks assessing the retrieval of more personally relevant memories. Future research that explores the influence of parental reminiscing on children's memories of events that are or are not discussed should also use events of a more equivalent

nature (in terms of memorability and personal relevance). Finally, future studies with more heterogeneous samples (e.g., various socio-economic status) are needed to explore the generalizability of our findings.

Importantly, by showing that parental reminiscing is not limited to children's memory consolidation, our findings suggested that parental reminiscing could favor children's acquisition of strategies that develop during the preschool years. In this paper, we made several assumptions about the nature of these strategies (e.g., pattern completion and pattern separation) that future studies should attempt to directly link with parental reminiscing using tasks designed to assess their use (e.g., Ngo et al., 2021, for laboratory tasks). To address these hypotheses, longitudinal studies would be ideally suited to identify the mechanisms by which parental reminiscences affects the acquisition of these strategies. In addition, because one assumption is that parental reminiscing could influence the acquisition of complex strategies (e.g., organizational strategies) later in development, such designs would allow exploring age-related changes in memory performance (especially in free recall) as a function of early parental reminiscing style. Indeed, clarifying the early and late processes that could be enhanced by parental reminiscences would deepen our understanding of the influence of parental reminiscing on memory development. Then, to confirm the causal role of parental style in the acquisition of these processes, experimental studies in which parental reminiscing style is manipulated are needed (Haden & Ornstein, 2009; Léonard, Geurten, et al., 2023). Finally, it would be interesting for future studies to explore parental reminiscing style at a more specific level (in terms of reminiscing behaviors rather than a global score) to identify which parental behaviors really support early memory development and thus better understand how these parent-child conversations about the past exert their broad influence (Fivush et al., 2006; Léonard, Billet, et al., 2023; Léonard, Blause, et al., 2023). For this purpose, it would be necessary to analyze both the structure of parental interactions (as in the current study) but also

the content addressed by parents (e.g., metamemory comments and associative talk, Langley et al., 2017).

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Disclosure of interest

The authors report no conflict of interest.

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Table 1.

Coding scheme for the free recall of the discussed and non-discussed events

Categories	Examples
Actions	"I <i>found</i> the sharks." "I <i>colored</i> ."
Objects	"There was a <i>starfish</i> ." "There were <i>pencils</i> ."
People	" <i>Mommy</i> made the visit with me." "I did the exercises <i>with you</i> ."
Place	"The turtles were <i>next to the stairs</i> ." "We were <i>in the back of the room</i> ."
Time	" <i>First</i> I saw the turtles." " <i>At the end</i> , you gave me a chocolate."
Perceptual details	"Nemo was <i>orange</i> ." "I colored the banana <i>purple</i> ."
Emotions	"I was <i>afraid</i> of the sharks." "I was <i>happy</i> about the chocolate."
Evaluations	"I <i>loved</i> the visit!" "The exercises were <i>difficult</i> ."
Internal states	" <i>I thought it was fun</i> to see the sharks." " <i>I thought</i> a purple banana was <i>weird</i> ."
Personal semantics	" <i>I had never visited an aquarium before</i> ." " <i>Grandma often gives me chocolate</i> ."
General knowledge	" <i>Fish live in the sea</i> ." " <i>Bananas are usually yellow</i> ."

Table 2.

Participants' characteristics and descriptive statistics for parental reminiscing

Variables		Full sample (n= 50)	Lower elaborative parents (n= 25)	Higher elaborative parents (n= 25)	
Parents' characteristics	Age (years)	35.02 (3.44) Range: 28–42	34.68 (3.50) Range: 28–41	35.36 (3.41) Range: 29–42	
	Gender	Female	44 (88%)	23 (92%)	21 (84%)
		Male	6 (12%)	2 (8%)	4 (16%)
	Years of education completed	15.22 (2.70) Range: 7–21	15.76 (2.44) Range: 10–21	14.68 (2.88) Range: 7–20	
	Receptive language ability	154.88 (11.15) Range: 112–166	156.56 (7.39) Range: 137–165	153.2 (13.9) Range: 112–166	
	Memory ability	14.2 (3.80) Range: 6–22	13.68 (3.57) Range: 7–19	14.72 (4.02) Range: 6–22	
	Children's characteristics	Age (months)	52.12 (10.68) Range: 36–71	49.48 (10.70) Range: 36–71	54.76 (10.20) Range: 36–68
Gender		Female	25 (50%)	11 (44%)	14 (56%)
		Male	25 (50%)	14 (56%)	11 (44%)
Receptive language ability		47.80 (21.91) Range: 11–96	43.6 (23.02) Range: 11–96	52.04 (20.32) Range: 19–95	
Parental reminiscing	Level of elaboration	0.62 (0.12) Range: 0.27–0.82	0.53 (0.10) ** Range: 0.27–0.63	0.71 (0.06) ** Range: 0.64–0.82	
	Concretizations	21.88 (14.04) Range: 5–80	16.08 (10.46) ** Range: 5–46	27.68 (14.92) ** Range: 10–80	
	Evaluations	11.02 (8.02) Range: 0–32	8.24 (6.01) * Range: 0–20	13.8 (8.89) * Range: 4–32	
	Total number of parental utterances	51.46 (27.68) Range: 14–148	44.64 (24.51) Range: 14–110	58.28 (29.44) Range: 22–148	
	Explicit knowledge about parental reminiscing	6.04 (1.19) Range: 3.38–8.63	6.07 (1.37) Range: 3.38–8.63	6.02 (1) Range: 4.13–7.75	

Notes. Statistically significant differences: * < .05, ** < .01

Table 3.

Descriptive statistics for children's outcomes

Variables		Full sample (n= 50)	Lower elaborative parents (n= 25)	Higher elaborative parents (n= 25)
Autobiographical	Memory of the discussed event			
memory skills	Free recall	5.46 (3.70) Range: 0–15	5.16 (3.84) Range: 0–15	5.76 (3.61) Range: 0–14
	Recognition	11.2 (1.74) Range: 7–14	11.36 (1.93) Range: 7–14	11.04 (1.54) Range: 8–13
	Memory richness	15.40 (4.80) Range: 2–25	14.87 (4.53) Range: 5–23.25	15.93 (5.09) Range: 2–25
	Memory of the non-discussed event			
	Free recall	1.9 (2.57) Range: 0–11	1.56 (2.73) Range: 0–11	2.24 (2.42) Range: 0–8
	Recognition	11.42 (1.73) Range: 8–14	10.88 (1.79) Range: 8–14	11.96 (1.51) Range: 9–14
Ability to	Learning curve	30.54 (3.86) Range: 27–49	31.76 (4.52) Range: 27–49	29.32 (2.61) Range: 27–35
memorize new				
information	Free recall	2.22 (3.41) Range: 0–15	2.20 (4.3) Range: 0–15	2.24 (2.28) Range: 0–8
	Recognition	16.36 (4.4) Range: 9–25	14.84 (4.83) Range: 9–25	17.88 (3.38) Range: 11–23

Table 4.

Generalized linear mixed-effect models on the relations between parental reminiscing and children's outcomes

Variables		Group		
		(Lower vs Higher elaborative)		
		Estimate	t	p
Autobiographical	Memory of the discussed event [†]			
memory skills	Free recall	0.07	0.62	.54
	Recognition	-0.08	-0.71	.48
	Richness of the memory	0.08	0.8	.42
	Memory of the non-discussed event			
	Free recall	0.26	1.27	.20
	Recognition	0.25	2.28	.02
Ability to	Learning Curve	-0.04	-1.56	.12
memorize new	Free recall	0.55	1.63	.10
information	Recognition	0.22	2.26	.02

Notes. [†]In the analyses on the memory of the aquarium visit, the visiting condition was also introduced as a nominal fixed effect.

Figure 1.

Representation of the procedure

