THE SOCIALIZATION OF CHILDREN'S MEMORY: A LONGITUDINAL EXAMINATION OF MATERNAL ELABORATIVE CONVERSATIONAL STYLE, CHILDREN'S AUTOBIOGRAPHICAL MEMORY, AND CHILDREN'S DELIBERATE MEMORY PERFROMANCE

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ABSTRACT

Hillary Anne Langley: The Socialization of Children's Memory: A Longitudinal Examination of Maternal Elaborative Conversational Style, Children's Autobiographical Memory, and Children's Deliberate Memory Performance
(Under the direction of Peter A. Ornstein)

Previous research confirms the existence of marked age differences in aspects of memory performance that include the ability to recount details of past experiences and the use of effective strategies when deliberately working to remember and then later recall information. Variations in the development of autobiographical memory skills in children have been linked to differences in the ways in which mothers reminisce with their young children about jointly experienced events, such that children of high elaborative mothers contribute more memory information in conversations about the past with their mothers and with other conversational partners than do their peers with low elaborative mothers (Fivush, Haden, & Reese, 2006).

Associations among the development of different memory skills are suspected, but it is not yet fully understood how children's abilities to talk about their past are linked to their use of deliberate strategies to remember information (Haden, Ornstein, Eckerman, & Didow, 2001). It has been argued that it seems likely that the fundamental skills needed to talk about past experiences set the stage for later accomplishments within the domain of deliberate memory, as similar underlying processes are involved in both types of memory; indeed, talking about the past may help to prepare for future assessments of memory because such

conversations provide opportunities to practice searching memory and reporting what is retrieved (Fivush et al., 2006; Haden et al., 2001).

This study utilizes data from a large-scale, longitudinal research study with an ethnically and socioeconomically diverse sample to explore the impact of maternal conversational style on children's autobiographical and deliberate memory development when children are 3 to 6 years old. Results reveal concurrent and longitudinal linkages between maternal conversational style in a mother-child reminiscing task and children's autobiographical memory in reminiscing. No associations between maternal style and children's independent narratives were found; however, significant correlations between children's performance in reminiscing and their autobiographical memories in the independent narrative task were present. Maternal conversational style in reminiscing was significantly related to children's strategic behaviors and recall in two deliberate memory tasks, concurrently and longitudinally. Results from this examination replicate and extend what we know about the linkages between maternal conversational style, children's abilities to talk about previous experiences, and children's deliberate memory skills as they transition from the preschool to early elementary school years.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

I. INTRODUCTION

Within the past several decades, there has been a dramatic increase in research related to children's abilities to remember. A substantial amount of work now verifies the existence of significant age differences in aspects of memory performance that include the ability to narrate details of past experiences (e.g., Haden, Haine, & Fivush, 1997) and the use of effective strategies when "working to remember" and then later recall information (e.g., Baker-Ward, Ornstein, & Holden, 1984).

Variations in the development of autobiographical memory skills in children (i.e., their ability to recall and produce narratives of past events) have been linked to differences in the ways in which mothers reminisce with their young children about jointly experienced events. In contrast to mothers who adopt a "low elaborative" conversational style, "high elaborative" mothers generally pose more *Wh*- (e.g., who, what, when, why, where) questions, make more associations between the event being discussed and other experiences, follow-in more frequently on comments made by their children, and routinely positively evaluate their children's contributions during the conversation. Moreover, children of high elaborative mothers contribute more memory information in conversations with their mothers than do their peers with low elaborative mothers (Fivush, Haden, & Reese, 2006). It has been hypothesized that exposure to early supportive and scaffolded conversations with highly elaborative mothers may "set the stage" for children's later autobiographical memory skills in reminiscing conversations as well as in children's independent (and unscaffolded)

narratives about previous experiences. Thus, children of high elaborative mothers are thought to become increasingly better skilled in recalling past experiences and in using the narrative conventions of the culture to organize their reports.

Although associations among the development of different memory skills are suspected, it is not yet fully understood how children's abilities to talk about their past are linked to their use of deliberate techniques to remember (Haden, Ornstein, Eckerman, & Didow, 2001). Memory for events (i.e., autobiographical memory) and deliberate/strategic memory (i.e., the use of specific mnemonic techniques, such as rehearsal and organization, to intentionally prepare for a future assessment of memory) are generally treated in fairly distinct literatures. Some researchers have argued that it seems likely that the essential skills needed to talk about past experiences set the stage for later accomplishments within the domain of deliberate memory. In fact, the underlying processes of encoding information, storing information, retrieving information from memory, and reporting what is recalled seem to operate in a similar fashion in children's memory for specific events that are typically experienced without intent to remember, as well as in their deliberate memory for materials that are encoded with the expectation of a subsequent memory assessment. Similarly, talking about the past may help to prepare for future assessments of memory, because such conversations provide opportunities to practice searching memory and reporting what is retrieved (Fivush et al., 2006; Haden et al., 2001).

This study utilizes data from a large-scale, longitudinal research study with an ethnically and socioeconomically diverse sample: the Durham Child Health and Development Study. The first part of this project is designed to examine the impact of early maternal conversational style (when the children are 3 years old, or 36-months) on children's

developing autobiographical memory skills (when the children are 3, 5, and 6 years old, or 36-, 60-, and 72-months). Results from this examination replicate and extend what we know about the linkages between maternal conversational style and children's abilities to talk about previous experiences, both in conversations with their mothers and in independent narrative contexts.

In addition to focusing on the linkages between early maternal elaborative conversational style and children's later autobiographical memory skills, this project is designed to also explore potential associations between early maternal conversational style, children's autobiographical memory skills, and children's deliberate memory skills, both concurrently and longitudinally. Results from this examination add to the very limited literature in this domain, thus extending what we know about the linkages between maternal conversational style, children's abilities to talk about previous experiences, and children's strategic memory performance as children transition from the preschool to elementary school years.

1.1 Socialization of Cognition

Previous research on the socialization of cognition has attempted to pinpoint some of the underlying mechanisms driving the development of autobiographical and deliberate memory. This work highlights the importance of the social context for the emergence and consolidation of children's memory. In fact, for many years researchers have discussed the impact of adult scaffolding when children are attempting to learn a new skill, and have argued that assistance leads to later independent competence for children (Vygotsky, 1978; Cox, Ornstein, & Valsiner, 1991).

Vygotsky is well-known for his argument that most developmental skills first begin on the "interpersonal plane," in interactions between parents (or other more able members of society, such as older children or teachers) and young children who have not yet mastered a particular skill (Fivush et al., 2006). Essentially, as children begin to participate in social activities that are somewhat beyond their capabilities, adults scaffold children's performance by offering the necessary structure for accomplishing the task (Haden et al., 1997). As children participate in adult-guided activities over time (such as jointly discussing events from the past, or talking about ways to remember sets of words or objects), they begin to incorporate the skills that were first exhibited by others and are then able to add them to their own inventory of skills without needing assistance any longer (Vygotsky, 1978).

Tasks that a child can perform with this assistance are said to be in the "zone of proximal development" (Vygotsky, 1978; Cox, et al., 1991). As children's skills further develop, a "transfer of responsibility" occurs from adult to child (Rogoff, 1990). In the end, Vygotsky and Rogoff argue that children directly learn and internalize all the component skills through interactions with adults, such that they come to be able to perform these tasks unscaffolded (Haden et al., 1997).

According to this view, social interaction, particularly language interaction, acts as a tremendously important mechanism underlying development (Fivush, et al., 2006). Although some aspects of development are thought to be universal (e.g., all typically developing individuals are capable of remembering specific events from their past), the extent to which different memory-related activities are encouraged and utilized without a doubt influences the amount and quality of developmental change in children (Fivush et al., 2006).

1.2 Autobiographical Memory Development

Autobiographical memory is defined as an explicit, episodic memory of an event that occurred in a specific time and place in one's personal past (Bauer & Fivush, 2010). The memories contained within this system allow for us to tell others about our life story and are an essential part of who we consider ourselves to be (Farrant & Reese, 2000); however, some autobiographical memories are more important and defining for an individual than are others (Schneider & Pressley, 1997). There are many hypothesized impacts on the development of autobiographical memory and the ability to successfully narrate one's personal past, many of which are believed to come together during the preschool years.

Research has shown that children begin talking about the past almost as soon as they begin talking, by about 18 months of age (Reese, 1999). In these early conversations, adults provide much of the structure and content, as children's early verbal reports usually consist of only two-word associations at most (Reese, 2002). However, over the next few years, children's ability to provide narratives of their early experiences improves dramatically (Ornstein & Haden, 2001). In fact, by the time they are 3.5 years old, children are capable of telling fairly coherent stories about past experiences with little prompting from adults (Reese, 2002).

The corpus of literature on autobiographical memory in children indicates age-related differences and supports the notion that this skill emerges gradually across the preschool years, through processes of social interaction and cognitive developments (Reese, Haden, & Fivush, 1993; Fivush, et al., 2006; Haden et al., 1997). There are many factors that are hypothesized to contribute to the emergence of autobiographical memory, including basic

memory systems, the acquisition and mastery of language, narrative comprehension and production, memory talk with parents and others, representation of self, theory of mind, gender, parent-child attachment status, cultural norms and expectations, and more (Nelson & Fivush, 2004; Fivush, et al., 2006). As such, autobiographical memory is believed to be a "uniquely human form of memory that develops in social and cultural contexts and that helps define identity and relationships over time" (Bauer & Fivush, 2010, p. 303).

Today we know a great deal about children's abilities to remember their personal experiences. Research has suggested that adults, and parents in particular, play a role in facilitating children's remembering as well as understanding of events, in part by focusing children's attention to the important aspects of events (Ornstein et al., 2008). However, there is still work to be done in order to better understand how all of the influencing factors "come together to influence the establishment, maintenance, and modification of representations in memory" (Ornstein et al., 2008, p. 726).

1.2.1 Maternal Elaborative Conversational Style

Telling stories of our past experiences is an important part of social interaction, particularly talking about events with others who shared these experiences with us. This kind of joint remembering, or reminiscing, allows us to form interpersonal bonds based on a sense of shared history (Farrant & Reese, 2000). Through this process, we create a common understanding and representation of our world and the ways in which our lives are connected (Fivush, Haden, & Reese, 1996).

Research indicates that reminiscing begins fairly early in development, almost as soon as children begin talking (Nelson, 1988; Reese, 1999). In fact, personal narratives are

the earliest stories that children participate in telling (Miller & Sperry, 1988). Because reminiscing is a fundamental process for establishing our sense of self and our relationships with others, the ways in which parents and children reminisce are critical for children's developing understanding of their past and themselves (Fivush & Reese, 1992; Fivush et al., 1996).

As discussed above, when parents and children first begin to reminisce, it is the parents who provide much of the structure and content of conversations, as children do not yet have the verbal abilities to participate more fully. Many times, in early mother-child reminiscing conversations, mothers generally tell the entire story of what happened while children simply confirm or repeat what the mothers say. Over time, however, children begin to participate more fully in these conversations, and are able to provide specific information about what happened during the experience. By the time children are three to four years old, they are fairly active participants in these conversations about the past; although, clearly over time they become more skilled as their memory and narrative abilities develop (Fivush et al., 1996).

Fivush and her colleagues (1996) note that reminiscing is a linguistically based task. Language provides new ways to structure and understand past experiences; thus, a major function of language in personal memories is organizational. An important aspect of the development of autobiographical memory is learning the culturally appropriate methods for narrating stories of the past. Children learn these narrative forms and come to understand and organize their past experiences in new ways as a result of early adult-guided conversations (Fivush, et al., 1996; Nelson, 1993). As children become able to talk about their past experiences to others in ways that are more coherent, they also begin to represent their past

experiences to themselves in more coherent ways. Thus, language and memory can be thought of as intricately connected in experiencing, remembering, and telling the narratives of past events (Fivush et al., 1996).

While many theorists would agree that language is remarkably influential in the development of autobiographical memory, it is not generally believed that language is the only means of influence on children's developing autobiographical memories. Rather, as previously suggested, it makes sense to take a Vygotskian approach to understand how language and memory are intertwined during the learning process. The organizational and communicative functions of language are modeled and subsequently learned in social interaction with parents or more able peers. Through this, children learn the skills needed to be successful at remembering and reminiscing (Fivush et al., 1996).

When considering the role of language in children's developing autobiographical memories, it is important to note that mothers exhibit a great deal of variability in the way that they structure conversations about the past (Fivush et al., 2006; McCabe & Peterson, 1991; Hudson, 1990). Some parents provide a vast amount of information about the event by adding lots of details with each conversational turn, regardless of whether their children are recalling any information, while other parents are more likely to encourage children's independent remembering by repeating questions about the event and providing empty memory prompts to their children (Fivush et al., 1996).

Many studies have dichotomized mothers into one of two conversational styles with various labels: "high elaborative" verses "low elaborative" (Hudson, 1990; Fivush et al., 2006), "elaborative" verses "repetitive" (Fivush & Fromhoff, 1988), and "topic-extending"

verses “topic-switching” (McCabe & Peterson, 1991). Although researchers have tended to dichotomize mothers’ conversational style in their analyses, most would agree that conversational styles could be conceived of as a continuous skill. To be sure, most mothers are at least somewhat elaborative; as children remember details of an experience, it is difficult for parents not to add new information to the conversation. However, some parents are more elaborative relative to others when children are not contributing much to the conversation about the past (Fivush et al., 1996).

When thinking about what “makes” a mother more or less elaborative, there are several factors to take into account. In contrast to mothers who make use of a “low elaborative” or “repetitive” conversational style, mothers who are considered to have a “high elaborative” conversational style generally make use of *Wh-* (e.g., who, what, when, why, where) questions, make associations between past and present features, follow in on comments made by their children, and positively evaluate their children’s verbal and nonverbal contributions to the interactions (Fivush et al., 2006).

Reese et al. (1993) suggest that high and low elaborative mothers may be interpreting the function of conversations about the past differently. High elaborative mothers seem to view this task as a way to get closer to their children through collaboratively recreating shared experiences, whereas mothers that are considered to have a low elaborative conversational style may see the purpose of the conversation as a way to examine their children’s memory performance. These mothers frequently adopt a testing, prompting mode to obtain maximum independent remembering from their children (Reese et al., 1993).

Mothers who make use of a high-eliciting style of reminiscing that is characterized by many open-ended *Wh*-questions are thought to help their young children learn the skills necessary for joint reminiscing and also encourage them to practice these skills (Haden, Ornstein, Rudek, & Cameron, 2009). The particular importance of open-ended elaborative questions for children's autobiographical memory is through emphasizing the social nature and functions of reminiscing. Using this conversational technique, mothers actively invite their children to co-construct their personal past, and to work together to create a shared history. By reminiscing with their mothers in a supportive context of co-construction, children may be preparing themselves to create and report their own narratives in the context of conversations with unfamiliar adults (Larkina & Bauer, 2010).

Research has shown that children of highly elaborative mothers, in turn, come to tell more detailed, more elaborated, and more coherent narratives of their personal past than do children of less elaborative mothers, both concurrently and longitudinally (Fivush & Fromhoff, 1988; Hudson, 1990; Reese & Fivush, 1993; Fivush et al., 1996; Fivush et al., 2006). That is, the more elaborative mothers are, the more their children recall within that same conversation (Reese et al., 1993); and, the more elaborative mothers are during the early preschool years, the more their children provide in memory conversations at later points in time. For example, maternal elaboration during conversations about the past with 40-month-olds is positively associated with children's memory reports in conversations with their mothers 1.5 and 2.5 years later, when the children are 58- and 70-months of age (Reese et al., 1993). Indeed, the style of scaffolding that highly elaborative mothers make use of in conversations has been shown to encourage the development of sophisticated

autobiographical memory skills in children (Fivush et al., 2006; Hedrick, Haden, & Ornstein, 2009a; Haden et al., 2001).

The majority of the researchers in this field focus on the "structure" of mothers' reminiscing by examining mothers' use of elaborative and repetitive questions and statements in addition to the evaluation confirmations they provide to their children during conversations about the past. This component of reminiscing is generally very strongly related to children's autobiographical memory development. A number of researchers (such as Reese, Cleveland, and Grolnick), however, also examine the way that mothers deliver this structure, either in an autonomy-supportive or controlling way. They conceptualize mothers' autonomy support as their willingness to maintain the child's perspective in the conversation, as opposed to negating the child's perspective or moving the conversation in a new direction (Levya, Reese, Grolnick, & Price, 2013). These researchers have argued that it is important to study both structure (i.e., the traditional maternal elaborativeness measure) and autonomy support in reminiscing, because these two components have been independently yet steadily linked to children's memory and narrative skills, in both middle-class samples (Cleveland & Reese, 2005; Cleveland, Reese, & Grolnick, 2007) and low-income samples (Levya et al., 2013).

Cleveland & Reese (2005) posit that the self-determination theory might offer a useful framework for understanding the multitude of ways that maternal reminiscing style may be affecting children's memory. Self-determination theorists argue that children have three basic needs: autonomy, competence, and relatedness. Parents (and other adults) can, theoretically, help children fulfill these independent basic needs by being supportive of

children's autonomy, by providing children with appropriate levels of structure, and by relating to children in a warm and affectionate manner.

Autonomy support is hypothesized to affect children's motivation towards activities, such that children with parents who provide more autonomy support are expected to be more interested in reminiscing for its own sake. Parents who provide children with new information through the use of open-ended questions and who carefully scaffold conversations about the past likely provide their children with the appropriate level of structure so that they can succeed in the task. Maternal warmth (in the form of physical closeness and tone of voice) has also been hypothesized to be important in mother-child reminiscing, at least in one study (see Fivush & Vasudeva, 2002), but these authors did not find evidence to support the linkage between maternal warmth and children's memory contributions. It should be noted, however, that there is a growing literature to suggest that parent-child attachment status is related to children's remembering, with securely attached children and their mothers having richer, more in-depth conversations about the past, particularly when talking about emotional experiences (Cleveland & Reese, 2005; Laible & Thompson, 2000; Reese & Farrant, 2003).

Cleveland & Reese (2005) report that children whose mothers demonstrated both high structure (i.e., high elaborative) and high autonomy support during conversations about the past provided the most memory details in these conversations, while children whose mothers were low on both of those dimensions provided the fewest memory details. This finding was restricted to conversations about shared events (i.e., reminiscing), though. Significant longitudinal linkages between maternal elaborative style and autonomy support

when children were 40-months and children's later independent narratives when they were 65-months were not found (Cleveland & Reese, 2005).

In a novel experimental study, Cleveland, Reese, & Grolnick (2007) utilized two experimental conditions to orient mothers (white, middle-class) toward either autonomy support or control when reminiscing about a zoo event with their preschoolers. They found that maternal autonomy support was linked to children's engagement in reminiscing with a researcher. No differences in children's independent memory or engagement (their intrinsic interest in reminiscing for its own sake) with a researcher as a function of experimental condition were found. They did, however, find linkages between maternal elaboration and children's independent memory and their narrative coherence (Cleveland et al., 2007).

All in all, a reminiscing style that is both highly elaborative and autonomy supportive appears to be the most effective at eliciting children's autobiographical narratives in studies that examine both elaborativeness and autonomy support. However, there have been mixed results when considering the effect of maternal elaboration and autonomy support in children's autobiographical memories in conversations with their mother's (i.e., in reminiscing) as opposed to in conversations with someone who did not participate in the event under discussion (i.e., in independent narratives).

Individual variation in the ways in which parents structure conversations about the past with their young children suggests that individual children may be learning different skills for reminiscing in these early conversations about the past, based on the types of questions and structure their mothers emphasize in these conversations. For example, Peterson and McCabe (1992) studied two children of highly elaborative mothers over a

period of a year and a half (when the children were 27-44 months of age). The child with the mother that emphasized context, or *Wh*- questions, came to incorporate a great deal of contextual information into her *independent* narratives, whereas the child with the mother that attempted to elicit more temporally ordered descriptions from the experience had narratives that were well organized structurally, but that included less contextual details than the other child's narratives (Peterson et al., 1992).

Similarly, Fivush (1991) examined the kinds of narrative structures that mothers displayed in conversations with their 30- to 35-month-old children (e.g., mothers' provision of orienting, referential, and evaluative information), and then assessed the children's independent narrative skills 13-months later. Mothers who provided a great deal of contextual and orienting information for their children during the earlier conversations had children who provided a great deal of orienting information in their later unscaffolded, independent narratives; and, mothers who expressed more evaluative and emotional information about past events had children who included more of this kind of information in their later independent narratives (Fivush, 1991). Haden et al. (1997) demonstrated that mothers' provision of evaluations in past event narratives (intensifiers, emotional and mental state terms) with children at 40-months predicted children's independent past event narratives at 70-months, even after controlling for children's earlier narrative skill.

Larkina & Bauer (2010) studied the impact of different aspects of maternal support (verbal, affective, and behavioral) in relation to their children's autobiographical memory in reminiscing as well as in their independent narratives when children were 4-years-old. They found that in collaborative recall with their mothers (i.e., reminiscing), children's narrative behavior was best predicted by maternal use of specific elaborative components, such as

affirmations. In contrast, affective and behavioral qualities of maternal support in reminiscing were related to children's recall in independent narratives with a researcher, without any significant relations found between maternal elaborative components and children's remembering in independent narratives. These findings suggest that different aspects of maternal behavior may facilitate different aspects of children's narrative skills, which children might apply differently depending on the demands of the autobiographical memory conversation (Larkina & Bauer, 2010).

In the first experimental investigation of maternal reminiscing style, Peterson, Jesso, & McCabe (1999) trained mothers to talk about past events in an elaborative manner with their 3.5 year old children. A year later, children from the training group showed higher vocabulary scores compared to children from a control group, and by 5.5 years old, children from the training group gave more detailed past event narratives with an experimenter than children in the control group.

In addition to Peterson et al. (1999), Reese and Newcombe (2007) also completed an experimental investigation on maternal reminiscing style. This longitudinal intervention was the first large-scale experimental examination of a maternal elaborative reminiscing style on children's autobiographical memory and narrative development. In this study, they trained a group of mothers in an elaborative conversational style over the course of five training / intervention visits when children were between 1.5 and 2.5 years old. They found that at both the short term post-test (2.5 months after the last intervention session) and the long term post-test (15 months after last intervention session), trained mothers were more elaborative in their reminiscing than untrained mothers, and children of trained mothers provided more detailed memories than children of untrained mothers. In addition, children of trained mothers also

produced more accurate memories with researchers, but only if they had high initial levels of self-awareness (Reese & Newcombe, 2007). This demonstrates that mothers can be successfully trained to become more elaborative in their reminiscing styles and that there are long-term benefits of an elaborative reminiscing style for the completeness and narrative quality of children's memory reports when reminiscing with their mothers and when producing independent narratives of past experiences.

The finding that mothers who engage in highly elaborative reminiscing have children who develop better autobiographical memory skills has been replicated both in the United States and cross-culturally, as well as for different types of past events. There is no doubt that maternal reminiscing style is a stable characteristic over time (Fivush et al., 2006; Nelson & Fivush, 2004), and across children in the same family (Haden, 1988). Indeed, in Fivush et al. (1996), the mothers who showed higher levels of elaboration early in their children's development continued to show higher levels of elaboration later in development. While they note that all mothers do generally increase in their levels of elaboration, more highly elaborative mothers still continue to show higher levels of elaboration over time than less elaborative mothers. Thus, although it seems reasonable that all mothers may adapt to children's increased skills over time, some mothers are consistently more elaborative in relation to other mothers across the preschool years (Fivush et al., 1996; Farrant & Reese, 2000; Fivush et al., 2006; Haden et al., 2009).

It is clear that mothers who are highly elaborative early in development have children who participate more fully and in more detail in conversations about past events later in development. However, it has been less clear in the literature whether the children or the mothers are driving these results. Fivush and her colleagues (1996, 2006) note that children

play an important role in their own development and inevitably influence their parents to some extent, but the data suggest that the direction of influence is more from mother to child, particularly during the early periods in the development of reminiscing. Children show little consistency in their participation in these conversations over time, whereas mothers are quite consistent in their level of elaboration during the same period of development. This indicates that maternal style is not just a response to what children are doing (Fivush et al., 1996; Fivush et al., 2006).

Researchers in this field recognize that mother-child reminiscing is a language-based task, so both maternal and child language skills may be related to reminiscing style. However, research indicates that maternal elaborative style when reminiscing is not a measure of "talkativeness." Mothers take different conversational approaches when reminiscing than when playing (Fivush et al., 1996), reading, or taking care of their children (Fivush et al., 2006). Accordingly, the research suggests that maternal reminiscing style is a stable characteristic of the mother, but that it is likely specific to a memory context (Reese, 2002).

Switching gears to children's language abilities, it has been suggested that children who have more advanced verbal skills may be better able to participate in mother-child reminiscing, which may in turn lead to higher levels of maternal elaboration. Some studies have found mothers to be more elaborative with young preschoolers who have higher language skills (Farrant & Reese, 2000); however, this link has not been found in studies conducted with older preschool children (Reese et al., 1993). Thus, it is possible that once children reach a certain threshold, child language skills may no longer be as important a factor in maternal reminiscing style (Fivush et al., 2006).

An increasing amount of research has indicated that race and social class may influence mother-child interactions, as well as mother-child reminiscing. Although most research has focused on middle-class European-American children, there is growing evidence that this generalization applies to children from diverse sociocultural traditions as well (e.g., Melzi, 2000; Levya et al., 2013). However, class differences have been understudied, and socioeconomic status and family income have not often been assessed directly in relation to mother-child reminiscing (Fivush et al., 2006).

The literature that does exist suggests that maternal education (which is highly correlated with socioeconomic status) is not associated with maternal conversational style when reminiscing (Fivush et al., 2006). While not focusing on reminiscing per se, it has been reported that within Western dyads, those from lower socioeconomic backgrounds talk about the past more often, but have narratives that tend to be shorter and less complex (Flannagan, Baker-Ward, & Graham, 1995; Hicks, 1991). Working-class parents also tend to be more directive when talking with their children about the past, whereas middle-class parents often grant their children more autonomy and may indulge their children more often (Wiley, Rose, Burger, & Miller, 1998). In addition, research has shown that children from working-class families talk more about serious negative events and include more negative emotion in their narratives than those from middle-class families (Burger & Miller, 1999), whereas other research has revealed that higher socioeconomic status dyads talk more about emotion than lower socioeconomic status dyads (Flannagan & Perese, 1998). Unfortunately, in many of these studies, the issues of race / ethnicity and socioeconomic status are confounded such that the lower-income families are often members of a minority group and the higher-income families are often Caucasian.

1.2.2 Conclusions

The bulk of the research in this domain supports the claim that maternal elaborative conversational style is influential in the development of children's autobiographical memory skills, particularly in the context of mother-child reminiscing conversations. That is, children with high elaborative mothers recall more in reminiscing conversations than their peers with low elaborative mothers. There has also been a good amount of research designed to examine the impact of maternal style during reminiscing on children's autobiographical memory skills in other contexts besides reminiscing, such as in unscaffolded independent narrative tasks. The results from these studies have been mixed, with only particular aspects of maternal behavior linked to children's autobiographical memory performance in independent narrative tasks.

1.3 Deliberate Memory Development

Deliberate, or strategic, memory is defined as the use of specific mnemonic techniques in order to intentionally prepare for a future assessment of memory (Ornstein et al., 2008; Ornstein & Light, 2010). In addition to children's increasing proficiency in talking about the past are significant age-related changes in the use of deliberate strategies for remembering information. In contrast to the typically incidental nature of autobiographical memory (people do not generally experience events with the explicit intent to remember all of the details of the experience at a later date), the use of specific mnemonic techniques requires that children behave intentionally as they work to remember information (Ornstein, Haden, & Elischberger, 2006; Ornstein et al., 2008).

During the past several decades, a large literature has formed in support of age-related changes in the use of memory strategies (Schneider & Bjorklund, 1998; Ornstein, Coffman, Grammer, San Souci, & McCall, 2009b; Baker-Ward et al., 1984; Schneider & Pressley, 1997). That is, as children grow older, research reveals that they become more skilled in the ability to spontaneously generate strategies (or plans) for the storage or retrieval of information, as well as more efficient in the use of such strategies across different situations.

Even with the considerable evidence supporting age-related changes in the use of memory strategies, however, important issues regarding the development of these skills remain primarily unknown (Ornstein, Baker-Ward, & Naus, 1988; Ornstein & Light, 2010). To be sure, little is known about the factors associated with the emergence of strategies, the process by which these skills are mastered, and the ways in which they come to be employed successfully in different task settings (Ornstein, Baker-Ward, & Naus, 1988).

1.3.1 Strategy Development

Over the past four decades, researchers have thoroughly studied memory strategies, as they are considered to be a necessary agent for memory development (Kron-Sperl, Schneider, & Hasselhorm, 2008). Most cognitive researchers today would agree that there is a developmental progression in skillful strategy use from preschool to the elementary school years (Bjorklund, 2005; Flavell, Miller, & Miller, 1993; Schneider, Kron, Hunnerkopf, & Krajewski, 2004); however, this view has not always been as prevalent. Indeed, young children are much more strategic in their efforts to remember than was previously hypothesized. Decades ago, it was generally believed that children were “astrategic” before the elementary school years; however, today we know that this is not the case (Ornstein &

Haden, 2001). Preschoolers are capable of and make use of strategies when they are given the goal to "work to remember" a set of objects or a list of words, but they do not generally make use of the rehearsal and organizational types of strategies that are present in the middle elementary school years. Instead, they make use of somewhat less sophisticated strategies (Schneider & Pressley, 1997).

Ornstein & Light (2010) suggest that there are many elements involved in the deployment of memory strategies, the most fundamental of which, they argue, is metacognitive in nature; that is, an understanding that one needs to do *something* in order to prepare for a future memory test (Folds, Footo, Guttentag, & Ornstein, 1990). During the preschool years, children appear to begin to understand that something should be done in order to help them remember (Ornstein et al., 2008). This is seen in the behaviors, both verbal and nonverbal, that preschool-aged children use when "working to remember" information (Baker-Ward et al., 1984).

Children as young as 18-months of age have exhibited a variety of strategy-like behaviors (e.g., naming, pointing) towards objects or hiding locations of objects when told that they would need to remember where the items were hidden (DeLoache, Cassidy, & Brown, 1985). While the use of these behaviors is not generally related to recall at this age, their use suggests that the young children have a basic understanding that they should do *something* as they work to remember items. However, these behaviors appear to emerge in an unplanned manner, in familiar environments, and during common activities (Ornstein & Light, 2010; Ornstein et al., 2008).

Without doubt, older preschoolers have a clearer understanding that they need to do something in order to prepare for a future memory assessment when compared with younger preschoolers who are just beginning to display this awareness; however, older preschoolers' strategic behaviors may not be any more helpful in terms of recall (Ornstein & Light, 2010; Ornstein et al., 2008; Kron-Sperl et al., 2008). For example, in Baker-Ward et al.'s (1984) experiment, 4-, 5-, and 6-year-olds were randomly assigned to one of three experimental conditions (target remember, target play, and free play) that determined the type of directions the children were given prior to a deliberate memory task (the object memory task). The children in the target remember group were told that they could play with all of the objects, but that they should particularly try to remember a subset of the objects (the target objects). The children in the target play group were given instructions that did not mention remembering but instead stressed playing with the target items. And, the children in the free play group served as the control subjects, as they were given general play directions (Baker-Ward et al., 1984).

After detailed coding of the two-minute task period that children in each of the three conditions were given to study or play with the objects, it was evident that even 4-year-olds who were instructed to remember (target remember condition) behaved differently than those who were given general play directions (free play condition). This suggests that even 4-year-olds are capable of utilizing deliberate study-like behaviors when given explicit instructions to work to remember. In addition, 4-, 5-, and 6-year-old children in the target remember condition spontaneously labeled (or named) the objects, engaged in more visual examination of the objects, and played less than children in the other two conditions. This provides support for the notion that the instructions to work to remember elicited a strategic approach

to the task among all of the children, regardless of age. However, it should be noted that the use of these strategic behaviors was only related to higher levels of recall among the 6-year-olds (Baker-Ward et al., 1984).

The finding that the younger children's strategic behaviors did not relate to remembering when similar behaviors in the 6-year-olds was associated with better recall in Baker-Ward et al.'s (1984) study raises questions for understanding the relation between strategy use and subsequent recall. It highlights the fact that intentionality is only one aspect of strategic behavior. Two others, consistency and effectiveness, should be examined as well (Ornstein et al., 2008). Indeed, children who are just beginning to implement strategic behaviors typically have just a few behaviors that they use and their use is often characterized by "context specificity" (Ornstein et al., 2006, p. 152). Furthermore, when young children are able to demonstrate effective strategy use, it is typically only in highly supportive and salient settings (Ornstein et al., 1988; Ornstein & Myers, 1996). In contrast, by the middle school years, children are generally fairly skilled in their use of strategies and display an extensive array of strategic behaviors that they can utilize in a variety of situations (e.g., rehearsal, organization). Thus, with age and experience, strategies become more effective behaviors (Ornstein et al., 1988; Bjorklund, Dukes, & Brown, 2009).

As implied above, the deliberate use of strategies typically undergoes a passive-to-active progression (Ornstein & Light, 2010; Ornstein et al., 2008). Two commonly reported encoding strategies that are believed to undergo this transformation during development are rehearsal (e.g., Ornstein & Naus, 1978; Ornstein, Naus, & Liberty, 1975) and organization (e.g., Mandler, 1967; Bjorklund, Ornstein, & Haig, 1977). Ornstein and colleagues report that with increases in age, rehearsal becomes more active such that older children are more likely

to intermix task items as they study (for example: “pillow, shoe, pencil; pillow, shoe, pencil; pillow, shoe, pencil;” as opposed to “pillow, pillow, pillow; shoe, shoe, shoe; pencil, pencil, pencil”). With this more active rehearsal comes substantially improved recall (Ornstein et al., 1975; Bjorklund et al., 1977).

In addition, there is a similar pattern of passive-to-active development in the use of organizational techniques, both when children sort items into meaningful groups as they study them (at encoding) and when they cluster items as they remember them (at retrieval). When considering children’s organizational attempts when they are instructed to study the materials for a future memory assessment, older children (e.g., middle school and above) consistently sort items on the basis of meaning, even when the directions they are given only specify to work to remember the items (i.e., there are no indications they should form semantically-based groups) (Bjorklund et al., 1977; Corsale & Ornstein, 1980). These older children appear to have the metacognitive understanding that the younger children do not: that meaning-based organization will aid in recall (Ornstein & Light, 2010).

Consistent with the findings regarding the effectiveness of rehearsal strategies, the age differences in semantic organization at encoding (i.e., sorting) are associated with similar differences in recall (Kron-Sperl et al., 2008). Bjorklund, Ornstein, & Haig (1977) note that younger children’s failure to use this strategy does not mean that they do not understand the semantic associations among the items; to be sure, they can easily sort even low-associated items on the basis of meaning when they are explicitly told to do so. Thus, the evident failure of young children to spontaneously sort items on the basis of meaning does not reveal a lack of knowledge of organizational structures; instead, it indicates a failure to apply this knowledge in a strategic way (e.g., see Corsale & Ornstein, 1980).

Ornstein and colleagues emphasize that an important feature of young children's use of memory strategies is the context specificity that characterizes many facets of their performance (Ornstein & Myers, 1996; Ornstein et al., 2006). Specifically, measures of children's cognitive skills will differ greatly as a result of particular features of the context, such as manipulating the instructions that children are exposed to prior to working to remember the items. When children are explicitly told to sort items into groups on the basis of meaning (e.g., Corsale & Ornstein, 1980) or to rehearse the study items in a more active manner, recall performance is generally enhanced as a result (e.g., Naus, Ornstein, & Aivano, 1977).

1.3.2 Deficiencies in Strategy Use

As with most skills that develop in childhood, strategies for remembering generally develop over-time with experience; however, sometimes there are difficulties along the way. Within the strategy literature, issues related to the use of and effectiveness of mnemonic techniques were first written about by Flavell and his colleagues (e.g., Flavell, 1970; Flavell, Beach, & Chinsky, 1966) who proposed two different types of potential problems in performance; they called these problems production deficiencies and mediation deficiencies. Production deficiencies occur when mediators (or strategies) are not spontaneously used by children and mediation deficiencies occur when a relevant strategy (or strategies) is employed by children but it does not mediate performance (i.e., it does not help remembering) (Ornstein & Light, 2010). Researchers have argued that mediation deficiencies in young children's memory strategies (e.g., organizational sorting) are fairly uncommon, with most problems being characterized as production deficiencies. In other words, the majority of problems that young children face when working to remember information is an

initial failure to spontaneously utilize appropriate strategies (Flavell, 1970; Brown & DeLoache, 1978).

Years after Flavell wrote about production and mediation deficiencies, Miller (1990) went on to identify a third type of deficiency that she called utilization deficiency. This occurs when young children can spontaneously employ a strategy in response to a demand for remembering, but the strategy either does not work or it does but is not as effective as when used by an equally strategic older child. According to Miller (1990), utilization deficiency occurs during the early stages of strategy acquisition when children spontaneously produce an appropriate strategy but do not benefit from the use of it. Although the concept of the utilization deficiency has been generally well received, some questions about its usefulness have been raised given its excessively broad description that encompasses the concept of the mediation deficiency (e.g., Waters, 2000; Kron-Sperl et al., 2008).

1.3.3 Metamemory

Metamemory is defined as children's understanding of the process of the memory system and the demands of various memory tasks. As expected, with increases in age, there are marked improvements in children's metamemory (Schneider, 1985). Over the years, the literature has been inconsistent in documenting the supposed linkages between metamemory and strategy use and effectiveness; however, metamemory is still generally conceived of as vital for strategic growth (Ornstein et al., 2006).

Paris, Newman, & McVey (1982) conducted a training study that included metacognitive information along with strategy instruction. The results from this study provided empirical support for the "metamemory-memory development linkage" (Ornstein et

al., 2006, p. 155). In addition, Schlagmuller & Schneider (2002) conducted a study involving more advanced methods of assessing young children's understanding, and they, too, had results that supported the metamemory-memory development relation.

1.3.4 Contextual Influences

In addition to the belief that age-related changes in children's cognitive capacities may underlie the development of children's strategy use and effectiveness, influences in the home and classroom context are also thought to be influential in the development of deliberate memory and metacognitive skills in children (Kurtz, Schneider, Carr, Borkowski, & Rellinger, 1990). For example, it has been reported that parents in different Western cultures seem to provide different amounts of support for use of memory strategies. Carr, Kurtz, Schneider, Turner, and Borkowski (1989) conducted an influential study that revealed differences in parental encouragement of memory strategies; these differences were related to children's different approaches to memory as a result of culture. In particular, they reported that German parents reported more instruction of memory strategies at home than did American parents. As a result, the German children were more likely to spontaneously employ memory strategies (such as categorical sorting) than their American counterparts (Carr et al., 1989).

In addition to differences in strategy support in the home context, children are also exposed to differing degrees of strategic instruction in the classroom. This is an important factor to consider, as children's abilities to plan deliberately for later assessments of memory are vital to successful school performance (Ornstein, Coffman, & Grammer, 2009c). A large mass of literature stresses the potential influence of the formal school context on the

development of memory strategies. For example, the comparative-cultural research in Morocco (Wagner, 1978), Liberia (Scribner & Cole, 1978), and Mexico (Rogoff, 1981) reveals that children who have been in formal schooling show more proficiency in the use of mnemonic techniques when assessed by Western scientists (Ornstein, Grammer, & Coffman, 2009a).

Rogoff (1981) reports that children who have not been in formal school do not use organizational techniques when working to remember unrelated items; thus, she concludes that school seems to be essential for the attainment of these skills. Indeed, some of the strategies that have garnered the most attention seem to be ones that are the most sensitive to schooling effects. These strategies do not appear to develop universally, but rather are observed more in "schooled societies than in nonschooled societies" (Schneider & Pressley, 1997, p. 190). As a result, it is important to consider the role of children's cultural environment (e.g., the nature of schooling, family life) in shaping children's memory development (Schneider & Pressley, 1997).

Morrison and his colleagues have evidence to support the notion that the first grade context may be particularly important in the development of children's memory skills. In a project comparing children who were the same age but who were in two different grades based on a birthdate-mandated school entry date (i.e., a "young" first grade group who just made the date for entry into first grade and an "old" kindergarten group who just missed the date) (Ornstein et al., 2009a), Morrison, Smith, and Dow-Ehrensberger (1995) report substantial differences in memorization skills between the two groups of children. This highlights the importance of the formal first grade context in the development of memory skills during the 1990s.

The evidence above suggests that the formal schooling context may significantly influence children's deliberate memory development (Ornstein et al., 2006; 2008). As a result, there have been several investigations of the classroom context in order to better understand the behaviors that teachers may use to facilitate children's strategic memory development. To be sure, just as parent talk can influence developing abilities to talk about past events, teacher talk may also be an important influence in the emergence and refinement of memory skills (Coffman, Ornstein, McCall, & Curran, 2008).

Kurtz and her colleagues conducted a study in response to previous research that demonstrated that German children were more strategic on sort-recall memory tasks than their American peers. Kurtz et al. (1990) wanted to determine if those differences were due to systematic differences in the strategy instruction and attributional beliefs of German and American teachers, and to examine metacognitive instructional practices in the two countries. Their results indicate that German teachers reported more instruction of task-specific strategies, and American teachers showed more effort-related attributions. The types of strategies that were instructed and the types of learning problems most often described differed across the two countries, as well (Kurtz et al., 1990).

Consistent with what Kurtz et al. (1990) found regarding the scarcity of strategy-relevant instruction in American classrooms, Moely, Hart, Leal, et al. (1992) report that it is relatively rare to observe explicit instruction in mnemonic techniques by teachers throughout the elementary school years. To some extent, Ornstein and his colleagues have found similar results in their line of research designed to examine the classroom context in relation to children's deliberate memory development. In Coffman et al. (2008), they report that first

grade teachers rarely informed students that remembering was an explicit goal, even though they frequently seemed to require the active use of memory.

However, Coffman et al. (2008) found that a number of first grade teachers did engage in several memory-relevant behaviors during whole-class instruction such as indirect requests for deliberate remembering, strategy suggestions, and metacognitive questions to their students. They found that children in first grade classes with teachers who used more of this memory-relevant talk (i.e., "high mnemonic" teachers) showed a greater ability to make use of strategy training than children who had teachers who used less of this memory-relevant language (i.e., "low mnemonic" teachers). These differences were particularly distinct in the generalization of training in sorting and clustering strategies in a sort-recall task (e.g., Moely et al., 1992) over the course of the first grade year, and in a composite strategy measure in the object memory task (e.g., Baker-Ward et al., 1984).

In addition, teachers' mnemonic style in the first grade was associated with children's organized sorting patterns on a sort-recall task with low-associated items three years later. That is, children in fourth grade who had been taught by a high mnemonic teacher in the first grade sorted low-associated cards more semantically than their peers who had been taught by a low mnemonic teacher in first grade (Ornstein et al., 2008). This demonstrates that teachers' mnemonic style is associated with children's memory performance and provides evidence for the notion that children's memory skills are, in part, developed and honed in the classroom (Coffman et al., 2008).

1.3.5 Conclusions

In sum, with increases in age come increases in strategy use and effectiveness. Mnemonic techniques such as rehearsal and organizational sorting are believed to influence the encoding of information, whereas other strategies such as clustering at recall are believed to influence retrieval and reporting. Even young preschoolers have proven to be capable strategy users, although their use of strategies is not always associated with gains in remembering. However, with age and experience, children come to develop a repertoire of memory strategies that they can use effectively in a variety of situations (Ornstein et al., 2009b).

1.4 Linkages between Autobiographical and Deliberate Memory

As is evidenced above, a large amount of research over the years has accumulated related to children's abilities to remember. We know that there are considerable age differences in aspects of memory performance that include the ability to talk about past experiences (e.g., Haden et al., 1997) and the ability to use mnemonic strategies for the storage and retrieval of information (e.g., Baker-Ward et al., 1984). While associations among the development of different memory skills are assumed, it is not yet fully understood how children's abilities to narrate their past experiences are linked to their use of deliberate techniques to remember when there is the expectation of a future memory evaluation, or how maternal behavior during reminiscing might provide a basis not only for children's construction of autobiographical memory skills, but also for children's memory development more broadly.

Despite the fact that what is published about the development of autobiographical memory and the development of deliberate memory is primarily treated separately in the literature, Ornstein, Haden, and colleagues have recently argued that perhaps these two areas of memory development are not as distinct as they may seem. Ornstein et al. (2006) argue that skills in both talking about the past and utilizing memory strategies may exist on different ends of a developmental continuum; that is, evolving skills in talking about the past may pave the way for later capabilities in deliberate memory. Indeed, they propose that the underlying processes of "encoding, storage, retrieval, and reporting" appear to function in a similar fashion in both types of memory (Haden et al., 2001; Fivush, et al., 2006; Ornstein et al., 2006).

Ornstein et al. (2006) argue that attentional focus, which can be influenced by a number of factors, draws attention to features of an event or to materials being studied for a memory test. As a result, this attentional focus works to assist in encoding and in the establishment of representations within the memory system. When memory requests are made, details from these representations must then be retrieved and reported; this is influenced "by both the deployment of effective search routines and the knowledge of appropriate narrative conventions" (Ornstein et al., 2006, p. 144). Thus, factors that are effective at "input" and lead to understanding and organization should be of great importance to later remembering because these factors are seen as influencing the underlying representation (Haden et al., 2001, p. 1029). As such, talking about the past throughout the preschool years may help to prepare children for future memory assessments, because such conversations provide opportunities to practice searching memory and vocalizing what is retrieved (Haden et al., 2001; Ornstein et al., 2006).

It has been noted that it is possible to view autobiographical memory as a blend of incidental and deliberate memory. Indeed, encoding appears to be incidental in that events are typically experienced without the intent to remember, while searching one's memory for the details of that experience in order to talk about it clearly entails explicit processes (Ornstein et al., 2006). Strategic memory, on the other hand, seems to be primarily deliberate, but with automatic influences as a result of prior knowledge. Regardless of how one conceptualizes these two types of memory, though, both autobiographical and deliberate memory seem to require processes that are under children's control, such as specific and targeted memory searches, the creation of narrative reports, and strategies to aid in remembering. Furthermore, each of these skills appear to be greatly influenced by social interaction in general, and mother-child reminiscing in particular (Fivush et al., 2006).

Despite the intuitive nature of the perspective that autobiographical and deliberate memory are related or that deliberate memory skills build upon earlier autobiographical memory skills, very few researchers have attempted to address the question of whether children who remember more about personal experiences also demonstrate superior performance in other memory tasks, such as those that become important in the school context. However, results from several recent investigations by Ornstein, Haden, and colleagues have provided empirical support for this relation.

In the context of a study designed to investigate mother-child conversations as events unfold and linkages to subsequent remembering, Haden et al. (2001) found important associations between 42-month-old children's recall of objects in the object memory task (see Baker-Ward et al., 1984) and their memory for features of mother-child jointly experienced events as much as a year earlier, at 30 months of age. The percentage of objects

recalled at 42-months was positively correlated with the children's open-ended recall of present features in three jointly experienced events at 30-, 36-, and 42-months of age. In addition, associations between the event and object memory were also apparent in the correlations between the total number of extra event comments provided by the children and the percentage of objects they recalled. Further analyses explored correlations between aspects of mother-child interaction during the three events at each time point (30-, 36-, 42-months) and recall of objects in the object memory task at 42-months; however, no consistent patterns emerged. Using the same sample, Rudek & Haden (2005) reported that mothers who used more mental terms (e.g., talk about the process of remembering) in their reminiscing conversations when the children were 30-months had children who at 42-months engaged in more strategic behaviors in the object memory task.

Rudek (2004) went on to further explore mother-child reminiscing and children's deliberate memory at 42-, 54-, and 60-months. He found that maternal elaborativeness during reminiscing was concurrently and longitudinally associated with children's strategic behaviors and recall of objects in a deliberate memory task (the object memory task). Specifically, he reported that mothers' use of statement elaborations at 54-months was related to children's recall both concurrently at 54-months and 6 months later at 60-months in the object memory task. In addition, several notable concurrent correlations were present between aspects of maternal elaborativeness in the mother-child reminiscing task and the children's strategic behaviors in the object memory task over the three time points. At 42-months, mothers' memory question elaborations were concurrently related to children's total strategy use in the object memory task. At 54-months, maternal statement elaborations were positively associated with 54-month total strategy use, and the individual naming strategy. At

60-months, statement elaborations were associated with pointing at 60-months. In addition, several longitudinal associations were found between maternal elaborations and individual strategies. Mothers' total elaborations at 42-months were correlated positively with children's pointing and negatively associated with manipulating a year and a half later. Mothers' statement elaborations at 54-months were positively correlated with children's pointing and marginally related to children's naming six months later (Rudek, 2004).

In recent analyses using data from the Durham Child Health and Development Study, we have found additional support for the link between autobiographical and deliberate memory in children. In these analyses, using data from the 60-month time point, we found that children's use of associative talk when reminiscing with their mothers was significantly correlated with their use of associations, a verbal deliberate strategy, in the object memory task (Langley, Bohanek, Coffman, Mugno, Lee, Hedrick, Baker-Ward, & Ornstein, 2011a).

In addition to the results supporting concurrent linkages between autobiographical and deliberate memory measures, we also recently reported longitudinal associations. Mothers' use of open-ended questions in reminiscing when their children were 36-months was significantly associated with children's use of a deliberate verbal strategy (association) two years later (at 60-months) and with children's recall three years later (at 72-months) in the object memory task. In addition, mothers' use of associative talk in early mother-child reminiscing (at 36-months) was significantly correlated with their children's use of deliberate verbal behaviors in the object memory task two and three years later (at 60- and 72-months). A similar pattern emerged when examining children's use of associative talk in reminiscing at 36-months and their later strategic performance on the object memory task at 60- and 72-months. These results provide preliminary evidence for linkages between early maternal

conversational style and children's later independent strategic behaviors. This suggests that mothers who make use of particular techniques (e.g., elaborations, associations) when talking about the past have children who utilize more of this type of talk both when talking with their mothers about the past and when independently working to remember (Langley, Coffman, Hedrick, Bohanek, Baker-Ward, & Ornstein, 2011b).

In another recent study, the Classroom Memory Study, Coffman and her colleagues reported that at the beginning of Kindergarten, mothers' metamemory talk in the mother-child reminiscing task was significantly correlated with their children's spontaneous use of strategic sorting in a free-recall with organizational training task (e.g., Moely et al., 1992) in the fall of Kindergarten (Coffman, Mugno, Zimmerman, Langley, Howlett, Grammer, & Ornstein, 2011). This indicates that the maternal reminiscing context prior to schooling is important for the development of early strategic memory, and sets the stage for future explorations of the joint effects of mothers' and teachers' memory-relevant language on the development of children's memory skills.

1.4.1 Conclusions

Traditionally, the research related to autobiographical and deliberate memory development in children has been treated separately in the literature. Within the last decade, however, several researchers have begun to argue that perhaps these two areas of memory development may be related in terms of the underlying mechanisms influencing developmental growth. Ornstein, Haden, and their colleagues have presented some preliminary results indicating linkages between children's autobiographical and deliberate memory skills, as well as between maternal style in reminiscing and children's deliberate

memory performance. However, we still have a lot to learn about how these two areas of memory may be related as children progress from the preschool to elementary school years.

1.5 Dissertation Project

This study has two main aims: 1) to examine the linkages between maternal conversational style and children's autobiographical memory performance, concurrently and longitudinally; 2) to explore the concurrent and longitudinal linkages between maternal conversational style / children's autobiographical memory skills and children's deliberate memory performance. In other words, this is an investigation of the associations, both concurrent and longitudinal, between maternal conversational style and children's autobiographical and deliberate memory performance. The primary focus of this project is to examine if early scaffolding by mothers during conversations about the past relates to or predicts children's later independent competence in autobiographical and deliberate memory skills.

1.5.1 Aim I

The overarching goal of this aim is to examine if having an elaborative mother predicts better autobiographical memory performance in children in terms of memory details contributed during conversations with their mothers about jointly-experienced events *as well as* when conversing with an experimenter about a personally experienced event. Indeed, does early scaffolding by mothers in conversations about the past predict better later autobiographical memory competence for children? Do children's growth trajectories in autobiographical memory performance vary as a function of maternal elaborative conversational style in reminiscing?

Research Question 1. The first question in aim 1 of the project is to explore how children's autobiographical memory performance in a mother-child reminiscing task when the children are 36-, 60-, and 72-months varies as a function of (or is predicted by) maternal conversational style (when their children are 36-, 60-, and 72-months). In other words, what are the linkages between maternal conversational style and children's autobiographical memory performance in the context of a scaffolded mother-child reminiscing conversation, concurrently and longitudinally?

Hypotheses. Previous literature suggests that high elaborative mothers, who provide lots of open-ended questions and highly scaffold conversations through the use of associations and positive evaluations, have children who recall more unique pieces of memory-related information (i.e., memory elaborations) in concurrent conversations about the past than their peers with low elaborative mothers (e.g., Fivush et al., 2006). Thus, it is expected that in the mother-child reminiscing task, children with high elaborative mothers at the 36-, 60-, and 72-month time points will display better autobiographical memory performance than their peers with low elaborative mothers at that same time point (i.e., concurrent linkages at each of the 3 time points are predicted).

In addition, based on previous research that indicates the long-term benefits of having a highly elaborative mother early on in life (e.g., Fivush et al., 2006), it is anticipated that children with mothers classified as highly elaborative in the context of the mother-child reminiscing task at 36-months will display better autobiographical memory skills in the mother-child reminiscing task at 60- and 72-months than their peers with low elaborative mothers. Additionally, children with mothers classified as highly elaborative in the reminiscing task at 60-months are expected to display better autobiographical memory skills

in the mother-child reminiscing task at 72-months than their peers with low elaborative mothers (i.e., longitudinal linkages between maternal style and children's autobiographical memory performance in reminiscing are predicted).

Research Question 2. The second part of the first aim of this project is to also identify if there are any linkages between maternal elaborative conversational style in reminiscing and children's *independent* autobiographical memory skills in an independent narrative task. That is, what are the linkages between maternal conversational style in reminiscing (when children are 36-, 60-, and 72-months) and children's autobiographical memory performance in the context of an unscaffolded, child-driven independent narrative task (when children are 72-months)? In addition, is children's performance in the reminiscing task at each of the 3 time points related to their performance in the child independent narrative task when they are 72-months?

Hypotheses. It is hypothesized that children whose mothers are higher on the elaborativeness scale when reminiscing (and who scaffold these conversations with their children early on in life) display better autobiographical memory performance in independent narratives about the past with experimenters than their peers with mothers with lower elaborative scores during reminiscing. This is based on previous research that does support the notion that exposure to highly elaborative mothers is related to later competence in children's abilities to independently narrate stories of their personal past (e.g., Haden et al., 1997). It is also expected that children's performance in the reminiscing task at each of the 3 time points will be related to their performance in the independent narrative task when they are 72-months.

1.5.2 Aim II

The primary goal of this aim is to examine the linkages between children's autobiographical and deliberate memory performance, both concurrently and longitudinally. In addition, the ways in which maternal elaborative conversational style in reminiscing relates to or predicts children's deliberate memory performance is explored. Specifically, does early maternal elaborative conversational style "set the stage" for children's later deliberate memory performance? Do children's growth trajectories in deliberate memory performance (strategic behaviors and/or recall) vary as a function of maternal elaborative conversational style in reminiscing?

Research Question 1. The first part of aim 2 is to explore the concurrent and longitudinal linkages between children's autobiographical and deliberate memory skills. Linkages between children's autobiographical memory as measured using the mother-child reminiscing task (at 36-, 60-, and 72-months) and the child independent narrative task (at 72-months) will be explored in relation to children's deliberate memory performance (in terms of strategic behaviors and recall) in the object memory task (at 36-, 60-, and 72-months) and the free recall with training task (at 72-months).

Hypotheses. It is predicted that children who display higher numbers of memory elaborations in the mother-child reminiscing task (i.e., those that display better autobiographical memory skills) will exhibit more advanced deliberate memory skills (in terms of strategy use and recall) at the same time point, and at later time points (e.g., Haden et al., 2001; Rudek, 2004).

Research Question 2. The second part of aim 2 focuses on exploring concurrent and

longitudinal linkages between maternal elaborative conversational style in reminiscing and children's deliberate memory performance. Associations between maternal style in reminiscing (when their children are 36-, 60-, and 72-months) and children's deliberate memory performance (in terms of strategic behaviors and recall) in the object memory task (at 36-, 60-, and 72-months) and the free recall with training task (at 72-months) will be examined.

Hypotheses. It is expected that children with mothers with high elaborativeness scores in reminiscing will perform better than their peers with lower elaborative mothers on deliberate memory tasks (strategic behaviors and recall) at the same time point, and at later time point (e.g., Haden et al., 2001; Rudek, 2004; Langley et al., 2011b; Coffman et al., 2011).

II. METHODS

2.1 Sample Size and Participants (Subjects)

The sample utilized for this project is drawn from a unique and diverse longitudinal sample: the Durham Child Health and Development Study (DCHDS). Children and their families were recruited at birth (n = 206) during the years of 2002 - 2003, and data collection was completed in 2011. At study entry, the sample was comprised of equal numbers of male (n = 106) and female child participants (n = 100); about half of the families were classified as European-American (n = 89) and half of the families were classified as African-American (n = 117); and, about half of the families were from above-poverty income groups (200% above poverty; n = 100) and about half were from below-poverty income groups (200% below poverty; n = 106), as determined by income-to-needs ratio scores. The children and their families were seen every six months from 3-months of age to 36-months of age (at 3-, 6-, 12-, 18-, 24-, 30-, and 36- months). The sample was then followed again as children transitioned into the formal schooling context. Participants were seen once a year when the children were enrolled in Kindergarten (60-months), First Grade (72-months), and Second Grade (84-months).

The DCHDS was designed with a developmental science framework in that the investigators were interested in examining cognitive, social, and emotional development over-time, using multiple levels of analysis (e.g., genetic, environmental, behavioral, physiological). The focus of this project is on cognitive development as children transition

from the preschool to early elementary school years. Behavioral measures of cognition (namely, memory) from the 36-month (n = 159), Kindergarten / 60-month (n = 127), and First Grade / 72-month (n = 115) time points are included in analyses.

2.2 Procedure / Tasks

There are four main tasks of interest in this study: the Mother-Child Reminiscing task (MRM), the Child Independent Narrative task (CIN), the Object Memory task (OBJ), and the Free Recall with Organizational Training task (FRT). At the 36-month time point, the MRM and OBJ tasks were administered; at the Kindergarten / 60-month time point, the MRM and OBJ tasks were administered; and, at the First Grade / 72-month time point, the MRM, CIN, OBJ, and FRT tasks were administered.

2.2.1 Mother-Child Reminiscing Task (MRM)

The MRM task was administered at the 36-month, Kindergarten / 60-month, and First Grade / 72-month time points as a measure of children's autobiographical memory and of mothers' elaborative conversational style. The task was designed to allow for the examination of how mothers and children talk about previously experienced events. The components of the task were modeled after procedures described by Haden (1998) and Reese, Haden, and Fivush (1993). Prior to the administration of the task, the mother was asked to nominate three target events to discuss with her child at a later point in the visit. This event selection period was guided by a researcher, and was completed without the child present.

Each of the three target events chosen needed to meet the following criteria in order to be deemed acceptable: 1) novel (or one-time) events, 2) mother-child shared experiences,

and 3) events that had occurred in the past month or so. Indeed, it was important that the events that the mother and child discussed were mutually-experienced, non-routine, novel events in the children's lives (e.g., flying on an airplane, watching fireworks on the Fourth of July, going to the circus for the first time). Events to be excluded from discussion were routine events (i.e., those for which the child might have a script or generic representation of what typically happens, such as birthday parties, trips to a restaurant, grocery shopping), events that lasted longer than one day, or events that had a story line (e.g., watching a movie).

Following event selection, mothers were then asked to talk about each of the three events with their children in whatever way felt natural for them, for as long as they would like. They were informed that they would be given about 10 minutes for the task, but were told that if they got done before that, they could end the task at that point. The conversations were audio and videotaped for later transcription and coding.

Data processing. After the completion of each assessment, the audio and video files for each participant were uploaded to a secure media server based at the Center for Developmental Science. Undergraduate research assistants were individually trained using a specialized transcription program, the CLAN module (Computerized Language Analysis) in the CHILDES program (Child Language Data Exchange System), to use for transcribing these conversations. The CLAN program was chosen as the transcription program because it allows researchers to perform a variety of automatic analyses on transcript data (such as frequency counts, word searches, mean length of utterance counts, etc.).

Research assistants were instructed to transcribe these conversations verbatim into

CLAN from video recordings. Each utterance (or independent clause, with a subject and a predicate) was parsed such that there was only one utterance (or independent clause) per line in the transcript. For example, if a mother asked three back-to-back questions (without allowing time for her child to answer), those three questions would be typed on three separate lines. This was done so that we could accurately calculate the mean length of utterance for mothers and children, and to help make subsequent coding easier, as coders code each utterance separately in the transcripts.

The use of video was particularly important for transcription (and subsequent coding) as it enabled transcribers and coders to capture verbal and non-verbal communication during the course of the conversation, in order to better understand the structure and function of conversational exchanges by mothers and children. Each transcript was then checked, from start to finish, by a second trained research as a means of "double-checking" that each transcription was complete, correct, and ready for coding. Please see appendix A for transcription manual.

Coding. The coding scheme for the MRM task was adapted from Haden (1998) and Reese, Haden, and Fivush (1993). It is classified as a structural / functional coding system, as it takes into account context in order to determine the function of conversational exchanges. For example, a young child may say something such as "yes" while actively attending to his/her mother's speech (an evaluation confirmation), while it is also possible for a child to say "yes" while doing or saying something completely irrelevant to the conversation (off talk). Although exactly the same in *structure*, they have different *functions* in the conversation, and this coding scheme attempts to account for these functional differences in speech.

Independent clauses were the coding units for most codes. Maternal memory conversational codes were elaborations and repetitions (in the context of general memory questions, yes-no questions, and statements), remember prompts, fill-in-the-blanks, evaluations (confirmations and negations), placeholders, clarifications, metamemory talk, associative talk (6 sub-types), off talk, off regulatory talk (6 sub-types), and unclassifiable talk. Child memory conversational codes were elaborations, repetitions, evaluations (confirmations and negations), memory questions, placeholders, clarifications, metamemory talk, associative talk (6 sub-types), off talk, off regulatory talk (3 sub-types), no response, and unclassifiable talk. Primary codes of interest for both maternal and child talk were elaborations, repetitions, evaluations, metamemory talk, and associations. Please see appendix B for coding manual.

Two coders independently coded 25% of the transcripts at each time point (36-months, Kindergarten / 60-months, and First Grade / 72-months) and established an inter-rater reliability averaging greater than 85%, with no single reliability estimate less than 80% (using percent agreement). After reliability was established, one of the coders completed the remainder of the files.

2.2.2 Child Independent Narrative Task (CIN)

The CIN task was administered at the First Grade / 72-month time point as a measure of children's autobiographical memory. The task was designed to assess the amount and type of information children can remember about events they have experienced when asked to describe what happened to an experimenter that was not present during the event under discussion. The task consisted of an experimenter prompting a child to talk about a past

positive event that his/her mother nominated, a past negative event that his/her mother nominated, and an event from school that the child was asked to self-nominate. Prior to the administration of the CIN, the mother was asked to nominate two events (one positive and one negative event) for her child to discuss with an experimenter later in the visit. This event selection period was guided by a researcher, and was completed without the child present.

Both the positive and negative emotionally valenced events that the mother nominated for discussion needed to be novel (or one-time) events (nothing routine, that lasted longer than a day, or with a storyline), and should have happened within the past month or so. In contrast to the MRM task, the mother did not have to be present during the events that she nominated for her child to discuss with the experimenter, but she needed to know approximately what happened so that she could provide prompts for the experimenter to ask about when s/he questioned the child about those experiences. In addition to the conversation about the positive and negative experiences the mothers' nominated for discussion between the experimenter and the child, the experimenter also asked the child to self-nominate an experience that occurred during the past week in school. These events needed to also be novel, one-time events.

At a later point in the visit, an experimenter then administered the CIN to the child, without the mother present. The experimenter followed a script and asked only very general open-ended questions about each of the three events discussed during the task. For the positive and negative events the mother nominated for discussion, the experimenter began with prompts asking generally what the child remembered from the event as a whole. After follow-up prompts, the experimenter then asked about one cue from the event that the mother had noted. After follow-up open-ended questions about cue 1, the experimenter then asked

what the child remembered about a second cue that the mother nominated. After follow-up prompts about cue 2, the experimenter then asked one final general open-ended question asking if the child remembered anything else about the event in general. During the conversation, the experimenter asked only general, open-ended questions and did not provide any specific questions or scaffold the conversation.

For the self-nominated school event, the experimented explained that s/he knew that the child was in the First Grade, and noted that lots of things happen in school, some fun and some not so fun. The experimenter went on to ask the child to choose one event from the past week in school to talk about with him/her. If the child had trouble choosing a one-time experience, the experimenter attempted to help the child choose a novel event (events of any emotional valence were appropriate for this component). Again, only very general, open-ended questions were asked of the child, and the child structured the conversation without scaffolding from the experimenter. The conversations were audio and videotaped for later transcription and coding.

Data processing. After the completion of each assessment, the audio and video files for each participant were uploaded to a secure media server based at the Center for Developmental Science. Undergraduate research assistants were individually trained using a specialized transcription program, the CLAN module (Computerized Language Analysis) in the CHILDES program (Child Language Data Exchange System), to use for transcribing these conversations. The CLAN program was chosen as the transcription program because it allows researchers to perform a variety of automatic analyses on transcript data (such as frequency counts, word searches, mean length of utterance counts, etc.).

Research assistants were instructed to transcribe these conversations verbatim into CLAN from video recordings. Each utterance (or independent clause, with a subject and a predicate) was parsed such that there was only one utterance (or independent clause) per line in the transcript. For example, if a child provides three back-to-back sentences with details (without allowing time for the experimenter to ask any questions), those three sentences would be typed on three separate lines. This was done so that we could accurately calculate the mean length of utterance for children, and to help make subsequent coding easier, as coders code each utterance separately in the transcripts.

The use of video was particularly important for transcription (and subsequent coding) as it enabled transcribers and coders to capture verbal and non-verbal communication during the course of the conversation, in order to better understand the structure and function of conversational exchanges by the experimenters and children. Each transcript was then checked, from start to finish, by a second trained research as a means of "double-checking" that each transcription was complete, correct, and ready for coding. Please see appendix A (mother-child reminiscing transcription protocol) for a similar transcription manual.

Coding. The coding scheme for this task involved two main components. First, the child's speech from each narrative (the positive event, the negative event, and the school narrative) was separated (or parsed) into utterances (or independent clauses, with a subject and a predicate), as a way of quantifying the number of details the children provided for each narrative. The number of prompts asked by the experimenter during each event was also noted. This was modeled after procedures described in Buckner and Fivush (1998), and Fivush, Marin, Crawford, Reynolds, and Brewin (2007). Next, a coding scheme similar to the one used in the MRM task was used to characterize the type of information the children were

providing. Each utterance (or detail) that was identified in the first round of coding was later assigned a specific code from an adapted structural / functional coding scheme that was used when coding the MRM task (which was modeled after Haden (1998) and Reese, Haden, and Fivush (1993)). Possible child memory conversational codes in this coding scheme were elaborations, repetitions, metamemory talk, associative talk (6 sub-types), and off talk. Please see appendix C for CIN coding manual.

Only children's speech was coded in this task. No questions or comments from the experimenters were coded, as they were instructed to follow a script and provided only very general, open-ended questions. Indeed, the purpose of this task was to elicit children's narratives of their autobiographical memories of these events with little to no scaffolding. Thus, these are not true *conversations* as is the case in MRM when each conversational partner takes turns sharing information and both partners' speech is coded; rather, these are child-guided independent narratives of past experiences with sporadic prompting from the experimenter.

After several rounds of coding, it became clear that many of the children at this age had significant problems nominating a specific, one-time event from school (the third event to discuss in the CIN). As a result, the school narrative was excluded from coding and analyses for this project, and only the positive and negative emotionally valenced events were considered.

Coding for the two components of the scheme were completed separately. For each component (1. parsing the narratives into utterances or number of details, and 2. classifying each detail identified), two coders independently coded 25% of the transcripts at each time

point and established an inter-rater reliability averaging greater than 85%, with no single reliability estimate less than 80% (percent agreement). After reliability was established, one of the coders completed the remainder of the files.

2.2.3 Object Memory task (OBJ)

The OBJ task was completed at the 36-month, Kindergarten / 60-month, and First Grade / 72-month time points as a measure of children's deliberate, or strategic, memory performance. The task assesses children's behavioral and linguistic strategies during a study period, as well as children's recall. The procedure for this task is based on research described in Baker-Ward, Ornstein, and Holden (1984).

At each time point, children were seated at a small table upon which there were a number of small, unrelated items (e.g., toy car, comb, mini football, paintbrush) hidden underneath a blanket. The number of items hidden varied by time point: 10 items at 36 month, 12 items at Kindergarten / 60 months, and 15 items at First Grade / 72 months. Children were told that the cloth covering the items would be lifted and that their job was to do anything that they could to help them remember the objects. They were given two minutes to study and work to remember the objects, after which the cloth was used to cover up the objects. Children were then asked to remember as many objects as they could. After recall, the objects were uncovered and the child was asked to name or label each item to ensure that the experimenter understood that child's label of each object. The task was audio and videotaped for later coding. After the completion of each assessment, the audio and video files for each participant were uploaded to a secure media server based at the Center for Developmental Science.

Coding. The coding scheme for this task was designed to capture physical interactions with the stimuli (e.g., playing, manipulation), visual inspection of the objects, and language used during the study period in the task (e.g., naming, association), in addition to recall of the objects. The primary focus was on children's task approaches, rather than the effectiveness of varying types of interactions on the recall of particular objects. As a result, time-sampling was used to capture children's behavior as they worked to remember the items in this task. For coding, the two-minute study period was divided into 24 five-second intervals. Each of those intervals was then coded separately for the occurrence of both verbal and non-verbal behaviors.

A distinction between verbal (e.g., naming, object talk) and non-verbal (e.g., pointing, manipulation) task approaches was made, as well as between deliberate and non-deliberate behaviors. The distinction between deliberate and non-deliberate behavior was established based on work by Baker-Ward, Ornstein, and Holden (1984). Behaviors that have been shown to characterize deliberate memory are task approaches that are expressions of memorization in that they occurred to a significantly greater extent when children were given instructions to "remember" rather than to "play" in the OBJ task.

For all non-verbal task approaches (deliberate or non-deliberate) and non-deliberate verbal task approaches, a distinction between present or absent was made (i.e., not the duration of the behavior or the number of times the behavior occurred) for each 5-second interval. For deliberate verbal behaviors, the number of times that behavior occurred during each 5-second interval was noted. Each interval was coded for the predominate non-verbal and predominate verbal task approaches, as well. If two verbal behaviors were present in one interval, the one on which the child spent the most time would be considered the predominate

verbal behavior. A final classification was then made for each interval such that each interval was classified as either predominately deliberate or non-deliberate in nature. This was based on the predominate non-verbal and predominate verbal codes; if there was a "mismatch" between the predominate verbal and non-verbal codes (e.g., the predominate verbal code was deliberate in nature but the predominate non-verbal code was non-deliberate in nature), the interval will be coded non-deliberate, but if both predominate verbal and non-verbal codes were deliberate in nature, then the interval would get a final classification of predominately deliberate.

At the completion of the study period, the objects were put away and the children were asked to recall as many objects as they could. Coders noted the number of unique (and correct) items recalled. Please see appendix D for OBJ coding manual.

Two coders independently coded 25% of the transcripts at each time point (36-months, Kindergarten / 60-months, and First Grade / 72-months) and were required to obtain at least 80% agreement on each file. Percent agreement and kappa scores were both calculated for the non-verbal behavior section, the verbal behavior section, and the recall portion of the task (separately) for each file. Percent agreement scores needed to be at least 80% and kappas needed to be at least 0.7 in order to be deemed "reliable" for each section of coding. After reliability was established, one of the coders completed the remainder of the records.

2.2.4 Free Recall with Organizational Training task (FRT)

The FRT task, used first by Moely et al. (1969) was administered at the First Grade / 72-month time point as a measure of deliberate, or strategic memory. It was designed to

examine the effects of organizational training on children's deliberate memory performance. Each child was administered three trials of a free-recall task, each consisting of the presentation of 16 note cards containing line drawings of easy-to-label objects that were taken from four conceptual categories. This allowed for the assessment of organizational strategies during both the study (or input) period (e.g., sorting) and the recall (or output) period (e.g., clustering based on semantically linked groups).

Trial 1 was a pretest or baseline trial, trial 2 was a training trial (in organizational strategies such as sorting and clustering), and trial 3 occurred after a 15-minute delay and was considered a posttest or generalization trial. Trials 1 and 2 utilized 16 cards with line drawings that could be grouped into four conceptual, or semantically linked, categories. Trial 3 utilized 16 new cards that could be grouped into 4 different conceptual groups. Similar items have been used in other studies investigating recall in elementary school children (Black and Rollins, 1982; Moely et al., 1969), and in these studies, children were able to group categorically.

In the first trial (baseline), cards were presented in a random order and standard free-recall instructions were given (e.g., "I'm going to show you some pictures and your job is to do whatever you can to remember the pictures. If you use words to help you remember, say them out loud so that I can hear them too."). The purpose of this initial (baseline, or pretest) trial was to assess child's spontaneous use of organization and other study strategies. Recall for these items was assessed immediately following the study period. During the second trial (training), children were given instructions on how to use categorization for study and retrieval, and were told that category organization would aid his or her remembering, (e.g., "We're going to play with these pictures again. This time, I'm going to show you a way to

group the pictures both when you study them and when you tell me what they were. This may help you remember better."). After the training session in which the experimenter aided the child in sorting the cards into the four categories, the children were asked to recall these items again. The final (posttest or generalization) trial was given after a delay of 15 minutes that was filled with another task. The goal of the final trial was to assess the child's application of the strategy training to a new stimuli list without any instructions to use those strategies.

On each trial, the child was permitted to study the items until he or she indicated readiness to recall them. At the end of the study period, the experimenter recorded the items recalled, the order in which the items were recalled, and rated the extent to which the child categorized those items during study. Following each trial, the experimenter asked the child about the procedures he/she used in study and recall.

Scoring. The protocol that was utilized to score these data was designed to examine the children's sorting and clustering of items (at study and recall, respectively). Behaviors present during trials 1 (baseline) and 3 (generalization) were examined specifically (and not behaviors in trial 2, as the experimenter aided the child in teaching them sorting and clustering strategies).

In regards to sorting during the study period in trials 1 (baseline) and 3 (generalization), researchers noted: if the child did any sorting (none, partial sort, or full sort) in each trial, the number of semantic categories represented by the child's sorting in each trial, the number of items sorted in each trial, and the Adjusted Ratio of Clustering (ARC) score for each trial (Roenker, Thompson, & Brown, 1971). The ARC score was calculated to

characterize the children's sorting during the study period and could range between -1 (below chance organization) to 0 (chance) to 1 (complete categorization). In regards to clustering in recall in trials 1 and 3 (again, examined separately), researchers noted: the number of items recalled in each trial, the number of categories represented in recall in each trial, the number of correctly ordered pairs in ordered recall in each trial, the number of items recalled from each of the four conceptual categories in each trial, and the Adjusted Ratio of Clustering (ARC) score for each trial (Roenker et al., 1971). The ARC score in this context was calculated to characterize the children's clustering in recall and could range from -1 (below chance clustering) to 0 (chance) to 1 (complete clustering in recall). Please see Appendix E for scoring and variable information and Appendix F for ARC score calculation information.

Two coders independently scored all records. Any discrepancies were resolved through examination of the original videotapes.

III. RESULTS

In this section, the way in which the primary variables in this investigation were calculated is described, including the measure of maternal elaborative conversational style developed for this project. Then, descriptive statistics for all relevant variables are reported before the results from aim 1 and aim 2 of the project are revealed.

3.1 Variable Creation

3.1.1 Mother-Child Reminiscing Task (MRM)

The mother-child reminiscing task is included as a measure of mothers' elaborative conversational style as well as an indicator of children's autobiographical memory skills. The task was administered at all three time points, and generally three events were discussed by mothers and children in each reminiscing conversation at each time point. Every utterance from each transcript was coded, and then the codes assigned to each event discussed by each mother-child dyad were tallied separately so that there were totals of each possible code per event discussed. To illustrate, there were separate sums/totals for the number of memory elaborations each child provided during the discussions about event 1, event 2, and event 3. Mean frequencies across events were then calculated and included in all subsequent analyses. Mean frequencies of codes were included rather than the total number of codes across events because it is important to be able to generalize the findings across different events and conversations (Reese et al., 1993). As an example, if a mother-child dyad talked about three

events in the reminiscing task, in order to get the average yes-no elaboration questions value for the mother, the frequency of yes-no elaborative questions from events 1, 2, and 3 would be added, and the resulting sum would then be divided by 3 (the number of events discussed by that dyad) in order to get an average number of yes-no elaborative questions across events. This process was completed for each individual code so that there are average scores for all codes of interest for both mothers and children (e.g., maternal codes: open-ended elaborative questions, yes-no elaborative questions, statement elaborations, associative general talk, associative event talk, metamemory talk, evaluation confirmations, etc.; child codes: memory elaborations, associative general talk, associative event talk, metamemory talk, evaluation confirmations, etc.).

In addition to calculating average scores for each individual code in the mother-child reminiscing coding scheme, a number of additional composite scores were calculated. For example, a total elaboration score for each mother was created; this was a sum of her average open-ended elaborative questions, her average yes-no elaborative questions, and her average statement elaborations. A total associative talk score for both mothers and children was also calculated; for this, the average scores for each of the six associative talk subtypes were summed.

It should be noted that in language data, proportions are sometimes used instead of frequencies to correct for "talkativeness." However, in the case of memory talk, supplying a greater amount of a particular type of information about an event may actually be a more effective strategy to elicit children's responding than supplying less information, and hence a correction for amount of talk may be inappropriate. Thus, in memory conversations, frequencies (or means calculated using frequencies across events) are more informative than

proportions, as they allow us to capture the sheer amount of different types of event information each mother and child is providing (Reese et al., 1993).

3.1.1.1 Measuring Maternal Elaborative Conversational Style

After the individual average scores and composite scores for variables within the reminiscing task were calculated (for both mother and child variables), a measure of maternal elaborative conversational style was developed to reflect the theoretical conceptualization of maternal reminiscing style that is persistent in the literature.

Generally, researchers in the mother-child reminiscing domain (e.g., Fivush, Haden, Reese) argue that "high elaborative" maternal speech is characterized by the use of many *Wh*- questions (who, what, when, why, where questions), making associations between the past and present, following in on what the child contributes to the conversation, and positively evaluating children's verbal and nonverbal responses in the conversation. Yet, many of these same researchers classify the mothers in their sample as high elaborative or low elaborative based on a total elaborative score (taking into account open-ended questions, yes-no questions, and statement elaborations) or a total elaborations to total repetitions ratio score. Thus, whereas they theoretically posit that highly elaborative make use of the four main components listed above, they generally only examine mothers' use of elaborations alone, or elaborations in relation to repetitions, in order to classify mothers' elaborative conversational style.

The measure of maternal style used in this study was developed by creating a composite variable that took into account four components of mothers' speech that were deemed important in eliciting children's autobiographical memory based on previous

research: 1. Total maternal elaborations (a sum of the average open-ended elaborative questions, average yes-no elaborative questions, and average statement elaborations); 2. Total maternal associative talk (a sum of the average scores for the six subtypes of associative talk); 3. Average evaluation confirmations (average score for the evaluation confirmations code across events); and, 4. Average metamemory talk (average score for the metamemory talk code across events). Because each of these four components had markedly different ranges, means, and standard deviations, each individual component was standardized using *z*-score conversions; as a result, each component could then be examined using the same metric or unit of measurement. The *z*-scores from each of the four components were then summed in order to calculate the final maternal elaborative conversational style variable.

It should be noted that the four components that are included in this measure of maternal style do not match up exactly with what is presented in the literature when describing high elaborative mothers. Three of the four traditional aspects of elaborative style (elaborations, associations, and positive evaluations) are included in this measure, but due to the nature of the coding scheme used, it was not possible to include a measure of the extent to which mothers followed in on what their children contributed to the conversations (i.e., autonomy support was not coded for in these narratives). Metamemory talk was included as the fourth component in this measure of maternal style because several recent studies have reported that maternal use of metamemory talk was related to children's autobiographical remembering in the reminiscing task, as well as to children's deliberate memory performance in strategic memory tasks (e.g., Coffman et al., 2011).

3.1.2 Child Independent Narrative Task (CIN)

This task is included as a second measure of children's autobiographical memory skills, in a different conversational context than that which characterized the mother-child reminiscing task. Not only was the child talking with an experimenter, as opposed to his or her mother, but this individual had not been present at the time of the events under discussion. In this independent narrative task at the 72-month time period, children were asked to talk with an experimenter about three past events: a positive event (nominated by the mother), a negative event (nominated by the mother), and an event from school (nominated by the child). Experimenters provided the children with minimal prompting during the conversations about the three events. Due to the difficulties that children displayed in choosing and talking about an event from school, only information from the positive and negative events discussed is included in analyses.

In order to calculate the variables of interest for this task, the same methodology that is described above in the mother-child reminiscing task section was employed. Thus, all analyses for the child independent narrative task are based on mean frequencies per event. As an example, children provided two narratives in this task (one about a positive event, and one about a negative event), and then the average scores for each code of interest (such as memory elaborations, metamemory talk, etc.) were calculated by adding the frequency of that code in event 1 to the frequency of that code in event 2 and then dividing by 2.

3.1.3 Object Memory Task (OBJ)

The object memory task is included at all three time points to measure children's strategic behaviors and recall performance when asked to deliberately remember materials.

The two main variables of interest included in the analyses are: 1. The number intervals viewed as predominately deliberate in nature (out of 24), as described above in the methods section (the primary measure of strategy use); and, 2. The number of items remembered at the end of the two-minute study period (the measure of recall).

3.1.4 Free Recall with Training Task (FRT)

The free recall with organizational training task is included at the 72-month time point as another measure of children's deliberate strategic behavior and recall abilities. The primary strategy variables in the free recall with training task are the sorting and clustering adjusted ratio of clustering (ARC) scores from trial 1 (baseline) and trial 3 (generalization); strategic behaviors in trial 2 are not examined because that is the trial during which the child receives explicit strategy instruction from the research assistant. These ARC scores are calculated using the methodology presented by Roenker, Thompson, & Brown (1971). Sorting ARC scores are equal to the number of cards sorted minus the number of categories from which the child sorted minus three, and then divided by 16 minus the number of categories from which the child sorted minus three. Clustering ARC scores are equal to the number of category pairs recalled minus the expected pairs, and then divided by the total number recalled minus the number of categories minus the expected pairs. ARC scores range from -1 to 1, with 1 indicating perfect sorting (during the study period) or clustering (during recall) of all 16 cards into 4 conceptually linked categories. Refer to appendices E and F for additional scoring information.

3.2 Descriptive Statistics

A number of descriptive statistics for each of the four tasks are presented below.

These analyses were conducted using SPSS Statistics Version 21. Please see Table 1 for additional information regarding descriptive statistics for the mother-child reminiscing and the child independent narrative tasks, and see Table 2 for additional information regarding descriptive statistics for the object memory and free recall with organizational training tasks.

Table 1. Descriptive Statistics from the Mother-Child Reminiscing (MRM) and the Child Independent Narrative (CIN) Tasks.

	36-months			60-months			72-months		
	Mean	*(SD)*	Range	Mean	*(SD)*	Range	Mean	*(SD)*	Range
MRM Variables									
Maternal Total Elaborations	13.69	*(7.78)*	0-38	16.58	*(10.55)*	2.5-74	17.12	*(9.43)*	4.33-47.50
Maternal Total Associative Talk	3.87	*(7.32)*	0-67	9.15	*(10.56)*	0-64	9.09	*(8.20)*	0-47
Maternal Evaluation Confirmations	5.46	*(4.11)*	0-21.33	7.29	*(6.19)*	0-35	7.27	*(4.91)*	0.67-22
Maternal Meta-memory Talk	0.16	*(.36)*	0-3	0.62	*(0.82)*	0-3.5	0.51	*(0.79)*	0-4.5
Maternal Composite (sum of averages)	23.17	*(13.05)*	2.67-76	33.63	*(18.57)*	6-119	33.99	*(17.46)*	9-94
Maternal Composite (sum of *z*-scores)	0.00	*(2.59)*	-3.71-14.26	0.00	*(2.55)*	-3.8-9.84	0.00	*(2.89)*	-4.0-10.25
Child Memory Elaborations	4.72	*(4.01)*	0-28	10.05	*(7.47)*	0-51	11.27	*(6.71)*	1-32.5
CIN Variables									
Child Memory Elaborations							25.42	*(16.00)*	0.50-101.5

3.2.1 Mother-Child Reminiscing Task

First, the means and ranges of the maternal elaborative style variables prior to *z*-score transformation are described to illustrate the variability in these composite scores at each of the three time points. When children were 36-, 60-, and 72-months of age, the composite measure of maternal elaborativeness was $M = 23.17$ (range = 2.67 – 76), $M = 33.63$ (range =

6 – 119), and *M* = 33.99 (range = 9 – 94), respectively. It should be noted that there was one mother at the 60-month time point (with a composite score of 119) who had an average elaboration score of 74; this individual was excluded from analyses to determine if it would change the mean significantly, but it did not, so the dyad was allowed to remain in the sample for all analyses. For individual values (means, standard deviations, and ranges) of each of the four component variables included in the measure of maternal elaborative conversational style, refer to Table 1. As can be seen, after *z*-score transformation of the four components included in the measure of maternal elaborative conversational style (and summation of the standardized variables), the new means for the measure were *M* = 0 (range = -3.71 – 14.26), *M* = 0 (range = -3.80 – 9.84), and *M* = 0 (range = -4.00 – 10.25) at 36-, 60-, and 72-months, respectively. In addition, the average number of children's memory elaborations present in the reminiscing conversations was *M* = 4.72 (range = 0 – 28), *M* = 10.05 (range = 0 – 51), and *M* = 11.27 (range = 1 – 32.50), respectively, at each of the three time points.

3.2.2 Child Independent Narrative Task

The average number of children's memory elaborations in the child independent narrative conversations when the children were 72-months was *M* = 25.42 (range = 0.50 – 101.50).

Table 2. Descriptive Statistics from the Object Memory (OBJ) and Free Recall with Training (FRT) Tasks.

	36-months			60-months			72-months		
	Mean	*(SD)*	Range	Mean	*(SD)*	Range	Mean	*(SD)*	Range
OBJ Variables									
# Deliberate Intervals	13.99	*(4.56)*	2-24	17.52	*(5.35)*	0-24	17.07	*(5.99)*	0-24
# Items Recalled	2.97	*(2.06)*	1-9	6.17	*(2.32)*	0-11	7.62	*(2.36)*	0-14
FRT Variables									
Sorting ARC (T1/Baseline)							-0.13	*(0.31)*	-0.23-1
Clustering ARC (T1/Baseline)							0.31	*(0.40)*	-1-1
Sorting ARC (T3/Generalization)							0.35	*(0.60)*	-0.23-1
Clustering ARC (T3/Generalization)							0.62	*(0.45)*	-0.67-1
# Items Recalled (T1/Baseline)							8.39	*(2.65)*	2-16
# Items Recalled (T3/Generalization)							9.10	*(3.11)*	2-16

3.2.3 Object Memory Task

The measure of children's strategic behavior utilized in the object memory task was the number of 5-second intervals during the 2-minute study period that were described as predominately deliberate in nature (out of 24). As can be seen in Table 2, at 36-, 60-, and 72-months, respectively, these values were $M = 13.99$ (range = 2 – 24), $M = 17.52$ (range = 0 – 24), and $M = 17.07$ (range = 0 – 24). In terms of recall, the number of items remembered at the end of the 2-minute study period, $M = 2.97$ (range = 0 – 9), $M = 6.17$ (range = 0 – 11), and $M = 7.62$ (range = 0 – 14), at each of the three time points, respectively.

3.2.4 Free Recall with Organizational Training Task

Displayed in Table 2 are the primary measures of strategic behavior in the free recall

with training task, the sorting and clustering ARC scores from trials 1 and 3. The sorting scores averaged -0.13 (range = -.23 – 1) at trial 1 (baseline) and .35 (range = -.23 – 1) at trial 3 (generalization). The values for the clustering scores were .31 (range = -1 – 1) at trial 1 (baseline) and .62 (range = -0.67 – 1) at trial 3 (generalization). In addition, the children's recall was $M = 8.39$ (range = 2 – 16) and $M = 9.10$ (range = 2 – 16) at trials 1 (baseline) and 3 (generalization).

3.3 Aim 1

The findings relevant to Aim 1, Research Question 1 and Aim 1, Research Question 2 are presented below. Correlational analyses and *t*-tests were conducted using SPSS Statistics Version 21, and the latent growth curve analyses were carried out using Mplus Version 7. Refer to Table 3 for correlations related to these analyses.

Table 3. Aim 1 Correlations between Maternal Elaborative Conversational Style in Reminiscing and Children's Autobiographical Memory Performance in Reminiscing and the Child Independent Narrative Task.

	MRM-36 Maternal Style	MRM-60 Maternal Style	MRM-72 Maternal Style	MRM-36 Child Memory Elaborations	MRM-60 Child Memory Elaborations	MRM-72 Child Memory Elaborations
MRM-36 Maternal Style	1					
MRM-60 Maternal Style	.43***	1				
MRM-72 Maternal Style	.34***	.35***	1			
MRM-36 Child Memory Elaborations	.80***	.41***	.41***	1		
MRM-60 Child Memory Elaborations	.38***	.68***	.38***	.45***	1	
MRM-72 Child Memory Elaborations	.31***	.24*	.66***	.42***	.47***	1

CIN-72 Child Memory Elaborations	.13	.09	.03	.24*	.15	.17+

+ p < .10, * $p < .05$, ** $p < .01$, *** $p < .001$

3.3.1 Aim 1, Research Question 1

3.3.1.1 Correlational Analyses. Correlations between maternal elaborative conversational style at the three time points were explored. Maternal style at each time point was significantly positively correlated with maternal style at the other time points, indicating that mothers were consistent in their degree of elaborativeness: from the 36- to 60-month time point, $r = .43$; from 36- to 72-months, $r = .34$; and, from 60-months to 72-months, $r = .35$. All correlations were significant at the $p < .001$ level.

Correlations between child autobiographical memory performance at the three time points were also examined. Child memory elaborations in reminiscing at each time point was significantly positively correlated with performance at the other time points, indicating that children were relatively consistent over time in their level of elaborations: from 36- to 60-months, $r = .45$; from 36- to 72-months, $r = .42$; and, from 60- to 72-months, $r = .47$. Again, all correlations were significant at the $p < .001$ level.

Next, correlations between maternal style and children's autobiographical memory performance in the reminiscing task were investigated. Concurrent correlations indicate significant and positive relations between maternal style and children's autobiographical memory: at 36-months, $r = .80$; at 60-months, $r = .68$; and, at 72-months, $r = .66$. All correlations were significant at the $p < .001$ level. Longitudinal correlations also suggest strong linkages between maternal style and children's performance in the reminiscing task over time: maternal style at 36-months and children's performance at 60-months was

correlated at $r = .38$ ($p < .001$); maternal style at 36-months and children's performance at 72-months was correlated at $r = .31$ ($p < .001$); and, maternal style at 60-months and children's performance at 72-months was correlated at $r = .24$ ($p < .05$). These results suggest that maternal elaborative conversational style is highly related to children's performance in the reminiscing task during the same conversation, and also during later conversations. Specifically, children with mothers who are highly elaborative in their reminiscing style provide more memory elaborations in the reminiscing conversation than their peers with lower elaborative mothers, in the same conversation as well as in later conversations.

All correlations presented were also run controlling for different aspects of children's language abilities (i.e., auditory comprehension, expressive language, and total language as measured in the Preschool Language Scale-4 at the 36-month time point). All correlations remained significant even when controlling for aspects of children's language skills. This indicates that what we observe is not simply due to children's verbal abilities when participating in the task; that is, it does not seem to be the case that children who perform better on this memory measure are simply more talkative or have better verbal skills. Because the results did not change when controlling for children's early language skills, the original correlations and not the partial correlations are presented.

3.3.1.2 Group Analyses

A median split was performed on the maternal elaborative style variable in order to classify the mothers in this sample as high elaborative or low elaborative relative to the other mothers. Mothers who were ranked in the bottom 50% of the sample as a result of their score

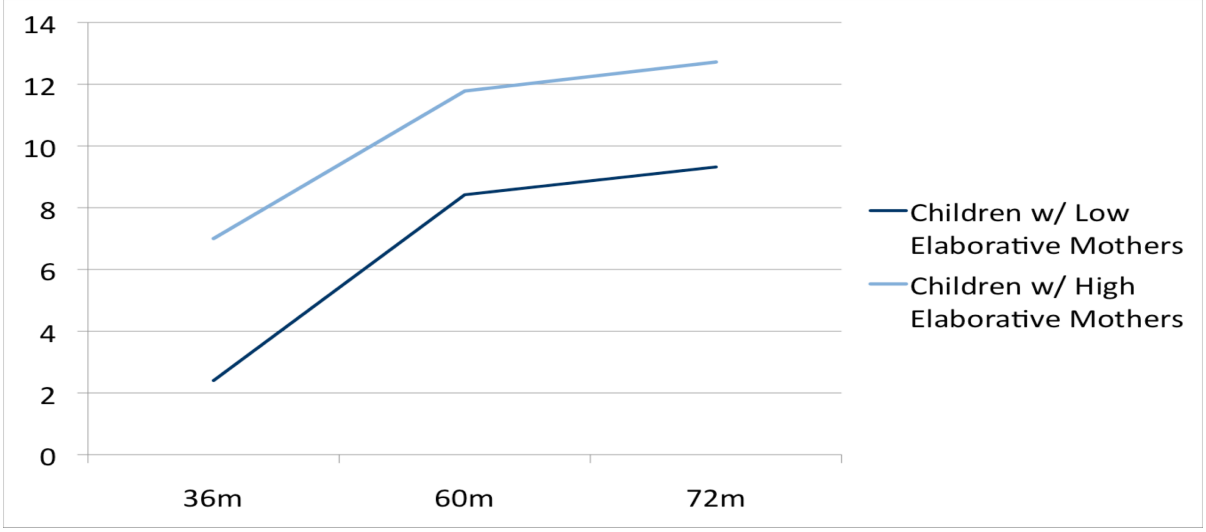
on the *z*-score composite sum variable of maternal style were considered to have a low elaborative reminiscing style, whereas the mothers in the top 50% of the sample were considered to have a high elaborative reminiscing style. Between-groups *t*-tests were then conducted to test if children's performance in reminiscing at each of the three time points varied significantly as a function of maternal elaborative style at the first time point (when the children were 36-months).

Results indicated significant group differences in children's memory elaborations at each of the time points as a function of maternal conversational style at 36-months. Specifically, as can be seen in Table 4, children with mothers who were classified as highly elaborative when their children were 36-months of age contributed significantly more memory elaborations in the reminiscing conversations at all three time points than their peers with low elaborative mothers. These findings are also displayed in Figure 1. At 36-months, the mean difference in memory elaborations between the groups of children with high elaborative mothers versus children with low elaborative mothers was 4.60, t (157) = -8.82, $p < .001$; at 60-months, the mean difference in memory elaborations between groups was 3.36, t (113) = -2.42, $p < .05$; and, at 72-months, the mean difference in memory elaborations between groups was 3.40, t (104) = -2.72, $p < .01$.

Table 4. Group Differences in Children's Mean Number of Memory Elaborations in the Reminiscing Task as a Function of Maternal Elaborative Conversational Style in Reminiscing at 36-months.

	MRM-36 Maternal Elaborative Style				
	Low	High	*df*	*t*	*p*
MRM-36 Child Memory Elaborations	2.40	7.00	157	-8.82	< .001
MRM-60 Child Memory Elaborations	8.42	11.78	113	-2.42	< .05
MRM-72 Child Memory Elaborations	9.32	12.72	104	-2.72	< .01

Figure 1. Children's Mean Number of Memory Elaborations in the Reminiscing Task as a Function of Maternal Elaborative Conversational Style in Reminiscing at 36-months.



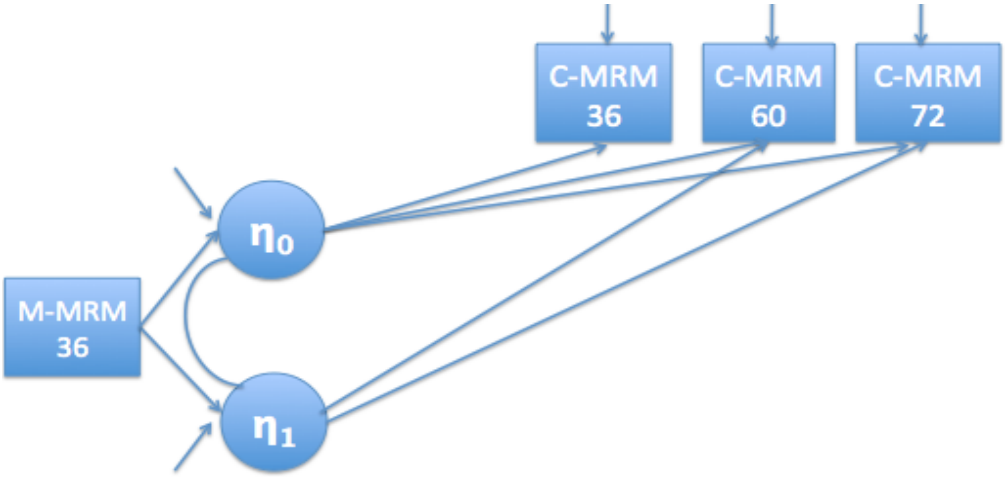
3.3.1.3 Latent Growth Curve Analysis

Latent growth curve modeling was employed to examine the differential starting points in children's autobiographical memory performance in the reminiscing task at 36-months, as a function of maternal elaborative style (i.e., intercept differences in reminiscing performance between groups of children with high and low elaborative mothers), and to also investigate the rates of growth in autobiographical remembering from 3 to 6 years of age for these two groups of children (i.e., slope differences in the growth trajectories of children with high versus low elaborative mothers). Latent growth curve modeling was employed as it allows for statistical modeling of change over time in regards to particular skills, but it has rarely, if ever, been used to model children's developmental trajectories of autobiographical memory skills.

Maximum likelihood parameter estimates for all models were obtained using Mplus

Version 7 under the assumption that all missing data were missing at random. Two latent growth curve models, one in which maternal elaborative conversational style was treated as a continuous variable and one in which the maternal style variable was dichotomized into two groups (high versus low elaborative style) were tested in response to this research question. Both models were extremely good fits for the data, so the model with maternal style as a dichotomous variable is presented for the ease of interpretation. Figure 2 illustrates the path model for this latent growth curve analysis of children's memory elaborations.

Figure 2. Latent Growth Curve Analysis of Children's Memory Elaborations in the Reminiscing Task as a Function of Maternal Conversational Style at 36-months.



Tests of model fit were first examined. One measure of model fit is the chi-square test of the joint null hypothesis that the population covariance and mean structures are equal to the model-implied covariance and mean structures. A significant *t*-statistic indicates that it is improbable that a test statistic of this value or larger would be found if the null hypothesis were true; thus, one would reject the null and reject the hypothesized model. On the other hand, a non-significant *t*-statistic indicates that it is probable that we would have observed a test statistic of this value or larger if the null hypothesis were true; thus, one would fail to reject the null and fail to reject the hypothesized model. So, the goal is to have a non-

significant chi-square test statistic, because this would be indicative of a model that fits the data reasonably well. In this case, the chi-square test statistic is 3.11, which is not more than two-times the expected model degrees of freedom (2 x 2, which would be 4), which is loosely performed to measure model fit. This chi-square statistic is not statistically significant (p = .21), which indicates that the model is a good fit for the data.

In addition to the chi-square test statistic as a measure of model fit, there are also several other indices to examine in order to get a better understanding of model fit. To illustrate, there are a number of "relative goodness-of-fit indices" that characterize the improvement in fit of the hypothesized model relative to some baseline model (which generally says that all variables are uncorrelated). The Tucker-Lewis Index (TLI) and the Comparative Fit Index (CFI) are two examples of such indices. In this model, the TLI is equal to 0.97 (which indicates a very good model fit) and the CFI is equal to 0.99 (which also indicates an excellent model fit); values greater than 0.95 are believed to indicate a good model fit. However, although the "relative goodness-of-fit indices" are informative, there is concern about them, because they measure improvement in fit of the hypothesized model relative to an extremely restricted baseline model. Accordingly, another class of measures that do not rely on an arbitrary baseline model are "absolute goodness-of-fit indices." The most widely used of these is the RMSEA (root mean squared error of approximation). In this model, the RMSEA value is 0.059; generally, values below 0.06 indicate a strong model fit. The SRMR (standardized root mean residual) is another "absolute goodness-of-fit" index; a good model should have an SRMR value less than 0.05, and the value in this model is 0.041, again indicating that this model fits the data well. In sum, all fit indicates indicate a strong fitting model. Thus, the obtained parameter estimates can be interpreted with confidence.

In terms of the parameter estimates of interest (using the Mplus output and parameter estimates), the value of the intercept for children with low elaborative mothers was 2.38; in other words, the number of memory elaborations in reminiscing at the first time point (36-months) for children with low elaborative mothers was 2.38. The intercept for children with high elaborative mothers equals the value of the intercept for children with low elaborative mothers (2.38) plus 4.61, or 6.99; that is, children with high elaborative mothers provided 4.61 more memory elaborations at 36-months than their peers with low elaborative mothers, with an average memory elaboration value of 6.99 at the 36-month time point. The difference between groups in terms of their intercepts (or scores at the first time point at 36-months) was statistically significant, indicating that children with high elaborative mothers provided significantly more memory elaborations in reminiscing at the 36-month time point than their peers with low elaborative mothers. This is consistent with the information displayed in Table 4 and Figure 1.

In terms of the slope values, or growth trajectories over time (from 36-months to 72-months), children with low elaborative mothers displayed a slope of 2.42, meaning that on average, children with low elaborative mothers contributed 2.42 more memory elaborations in reminiscing conversations each year. Children with high elaborative mothers had a smaller (or less steep) slope, meaning that they did not increase in their use of memory elaborations at the same rate as children with low elaborative mothers. The number of memory elaborations that children of high elaborative mothers increased each year was 0.47 memory elaborations less than children with low elaborative mothers, which equaled a 1.95 memory elaboration increase each year (in contrast to the 2.42 memory elaboration increase that children with low elaborative mothers exhibited, on average). This difference in slopes

between the children with low elaborative and high elaborative mothers was not statistically significant, however, indicating that whereas children in the two groups did display slightly different slopes or rates of growth over time, there was not a statistically significant difference between these rates of change over the three year period. Again, this is consistent with the graph displayed in Figure 1.

All in all, children with high elaborative mothers (as classified when children were 36-months) provided significantly more memory elaborations in reminiscing than their peers with low elaborative mothers at the first measured time point. The rate of growth in memory elaborations in reminiscing, however, did not differ significantly, indicating that children with high elaborative and low elaborative mothers did not have significantly different growth trajectories in their use of memory elaborations in reminiscing over time.

3.3.2 Aim 1, Research Question 2

3.3.2.1 Correlational Analyses

For this research question, the linkages between maternal style in reminiscing at each of the three time points and children's performance (average number of memory elaborations) in the child independent narrative task were explored. As can be seen in Table 3, maternal style at 36-, 60-, and 72-months was not related to children's performance in the CIN task (at 72-months).

Associations between children's performance (average number of memory elaborations) in the mother-child reminiscing task at each of the three time points and their performance in the independent narrative task when they were 72-months were also examined. Results revealed a statistically significant correlation between children's

reminiscing performance when they were 36-months and their performance in the CIN task three years later, $r = .24$ ($p < .05$). The relation between children's performance in reminiscing at 60-months and the independent narrative task at 72-months was not significant, whereas the correlation between their performance in reminiscing at 72-months and in the CIN task at 72-months approached significance, $r = .17$ ($p = .078$).

3.3.2.2 Group Analyses

A between-groups *t*-test was conducted to test if children's performance in the child independent narrative task varied significantly as a function of maternal elaborative conversational style at the first time point (when the children were 36-months). For this test, the median split measure of maternal style that classified each mother as high elaborative or low elaborative was utilized. Results indicated no significant group differences in CIN performance as a function of early maternal elaborative style.

3.4 Aim 2

Results relevant to Aim 2, Research Question 1 and Aim 2, Research Question 2 are presented below. Correlational analyses and *t*-tests were conducted using SPSS Statistics Version 21, and the latent growth curve analyses were carried out using Mplus Version 7. Correlations related to these analyses are presented in Table 5.

Table 5. Aim 2 Correlations between Children's Autobiographical Memory Performance, Maternal Conversational Style, and Children's Deliberate Memory Performance (Strategic Behaviors and Recall) in the Object Memory (OBJ) and Free Recall with Training (FRT) Tasks.

	MRM-36 Child Memory Elaborations	MRM-60 Child Memory Elaborations	MRM-72 Child Memory Elaborations	CIN-72 Child Memory Elaborations	MRM-36 Maternal Style	MRM-60 Maternal Style	MRM-72 Maternal Style
OBJ-36 Deliberate Intervals	.23**	.04	.00	.08	.17*	.04	.13
OBJ-36 Items Recalled	.47***	.23*	.25*	.07	.40***	.32***	.29**
OBJ-60 Deliberate Intervals	-.20	-.11	-.06	-.10	-.11	-.01	-.02
OBJ-60 Items Recalled	.03	-.05	.04	.06	.06	-.11	-.05
OBJ-72 Deliberate Intervals	-.11	-.15	-.03	.06	-.11	-.21	.02
OBJ-72 Items Recalled	.13	.00	.14	.13	.11	.07	.10
FRT-72 Sorting ARC T1/Baseline	-.05	-.12	-.13	-.08	-.08	-.03	.01
FRT-72 Clustering ARC T1/Baseline	.04	.03	.19*	.04	.00	-.07	.03
FRT-72 Recall T1/Baseline	.06	.07	.14	.18+	.05	.07	.09
FRT-72 Sorting ARC T3/General.	.06	.14	.12	.00	.00	.00	.19+
FRT-72 Clustering ARC T3/General.	.10	.13	.22*	-.06	.11	.14	.14
FRT-72 Recall T3/General.	.12	.17+	.33***	.05	.10	.12	.34***

+ p < .10, * $p < .05$, ** $p < .01$, *** $p < .001$

3.4.1 Aim 2, Research Question 1

3.4.1.1 Correlational Analyses

Correlations between children's autobiographical memory performance (in the reminiscing and child independent narrative tasks) and their performance in deliberate memory tasks (both in terms of strategic behavior and recall) were explored in response to this research question. First, however, the within-task correlations between strategic behavior and recall performance in the object memory and free recall with organizational training tasks are examined. In the OBJ task, at each of the three time points, the number of intervals predominately deliberate in nature (measure of strategic behavior) was significantly correlated with the number of items recalled at that same time point: at 36-months, $r = .27$ ($p < .001$); at 60-months, $r = .20$ ($p < .05$); and, at 72-months, $r = .38$ ($p < .001$). Longitudinal associations between strategic behaviors within the OBJ task were also present: the correlation between the number of intervals predominately deliberate in nature at 60- and 72-months was significant, $r = .23$ ($p < .05$). Longitudinal linkages between recall performance were also present: the number of items recalled at 36- and 72-months was significantly correlated, $r = .22$ ($p < .05$), along with the number of items recalled at 60- and 72-months, $r = .27$ ($p < .01$).

In the FRT task, sorting and clustering ARC scores were significantly correlated: in trial 1 (baseline), $r = .27$ ($p < .01$) and in trial 3 (generalization), $r = .50$ ($p < .001$). Sorting and clustering ARC scores were also significantly correlated with recall in trials 1 (baseline) and 3 (generalization). In trial 1 (baseline), recall was significantly correlated with sorting ARC scores, $r = .30$ ($p < .001$) and with clustering ARC scores, $r = .18$ ($p < .05$). In trial 3

(generalization), recall was significantly correlated with sorting ARC scores, $r = .50$ ($p < .001$), and with clustering ARC scores, $r = .36$ ($p < .001$). Across trials, sorting ARC scores at trials 1 and 3 were significantly correlated, $r = .31$ ($p < .001$). Recall in trials 1 and 3 was also significantly correlated: $r = .47$ ($p < .001$). These results suggest that children who display more strategic behaviors also remember more in the context of that task, and that children who use more strategic behaviors or who remember more items at one time point also tend to display more strategic behaviors or remember more items at later time points.

After within-task correlations were explored for the two deliberate memory tasks (OBJ and FRT), linkages between children's remembering in the mother-child reminiscing task and child independent narrative task and aspects of their strategic behavior in the OBJ and FRT tasks were examined. Children's performance in the reminiscing task (average number of memory elaborations) at 36-months was significantly correlated with their strategic behavior (number of intervals predominately deliberate in nature in the OBJ task) at that same time point, $r = .25$ ($p < .01$). No other significant correlations were present between children's performance in the reminiscing task at 36-months or 60-months and their performance on the deliberate memory tasks (the object memory or free recall with training tasks) in terms of strategic behaviors. When children were 72-months, their use of memory elaborations in the reminiscing task was significantly correlated with clustering ARC scores in trial 1 (baseline) and trial 3 (generalization), rs = .19 and .22, respectively ($p < .05$ for both) at that same time point in the FRT task. No other significant correlations were present between children's autobiographical memory performance at 72-months (in reminiscing or the independent narrative task) and their strategic behaviors in the object memory and free recall with training tasks, also at 72-months.

Next, correlations between children's autobiographical memory and their recall in the deliberate memory tasks were explored. Children's performance in the reminiscing task (average number of memory elaborations) at 36-months was significantly correlated with the number of items recalled in the object memory task at the same time point, $r = .47$ ($p < .001$). No other significant correlations were present between children's performance in the reminiscing task at 36-months and their performance on the deliberate memory tasks (the object memory or free recall with training tasks) in terms of their recall. Children's recall in the OBJ task at 36-months was significantly correlated with their performance in the reminiscing task at 60- and 72-months as well, rs = .23 and .25 respectively ($p < .05$ for both). Children's remembering in reminiscing at 60-months was moderately correlated with their recall in trial 3 (generalization) of the free recall with training task at 72-months, $r = .17$ ($p = .08$). Children's performance in reminiscing at 72-months was significantly correlated with their recall in trial 3 (generalization) of the FRT task, also at 72-months, $r = .33$ ($p < .001$). Children's autobiographical memory performance in the independent narrative task at 72-months was moderately correlated with their recall in trial 1 (baseline) of the FRT task, also at 72-months, $r = .18$ ($p = .066$). No other significant correlations between children's autobiographical and deliberate memory performance were present.

3.4.2 Aim 2, Research Question 2

3.4.2.1 Correlational Analyses

Correlations between maternal elaborative conversational style and children's deliberate memory skills (both in terms of strategic behaviors and recall) were then explored. First, the associations between maternal style in reminiscing and aspects of children's

strategic behaviors in the OBJ and FRT tasks are presented. Maternal conversational style in reminiscing at 36-months was significantly correlated with the number of intervals predominately deliberate in nature in the object memory task at that same time point, $r = .17$ ($p < .05$). Maternal conversational style in reminiscing at 72-months was moderately correlated with children's sorting ARC scores in trial 3 (generalization) of the FRT task, $r = .19$ ($p = .06$). No other correlations between maternal style in reminiscing at 36-, 60-, or 72-months and children's strategic behavior performance in the OBJ and FRT tasks were found.

Next, linkages between maternal style in reminiscing and children's recall in the deliberate memory tasks are explored. Maternal style in reminiscing at 36-months was significantly correlated with the number of items recalled in the OBJ task at that same time point, $r = .40$ ($p < .001$). Maternal style in reminiscing at 60- and 72-months was also significantly correlated with the number of items recalled in OBJ when the children were 36-months, rs = .32 and .30 (ps < .001 and .01), respectively. In addition, maternal style at 72-months was significantly correlated with recall in trial 3 (generalization) of the FRT task, also at 72-months, $r = .34$ ($p < .001$).

3.4.2.2 Group Analyses

A between-groups *t*-test was conducted to test if children's performance in the deliberate memory tasks (in terms of strategic behaviors and recall) varied significantly as a function of maternal elaborative conversational style at the first time point (when the children were 36-months). For this test, the median split measure of maternal style that classified each mother as high elaborative or low elaborative was employed. When examining group differences in children's performance in strategic behaviors in the deliberate memory tasks as

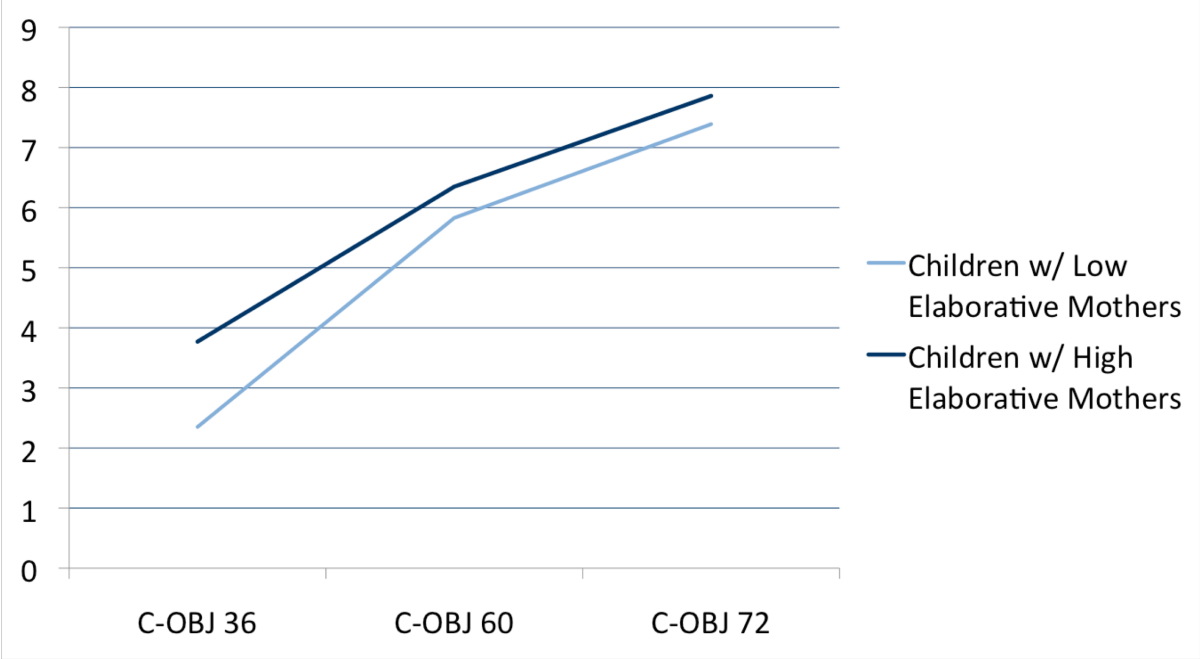
a function of maternal style at 36-months, results indicated a significant difference in children's clustering ARC score in trial 3 (generalization) at 72-months as a function of maternal elaborative style in reminiscing at 36-months. The mean difference in trial 3 clustering ARC scores between the group of children with high elaborative mothers verses those with low elaborative mothers was $M = 0.19$, $t\ (118) = -2.38$, $p < .05$. In other words, children with high elaborative mothers had a significantly higher clustering ARC score in the generalization trial in FRT than their peers with low elaborative mothers.

Next, group differences in children's recall in the OBJ and FRT tasks as a function of maternal reminiscing style at 36-months are presented (refer to Table 6 and Figure 3). Results revealed a significant difference between the groups of children with high versus low elaborative mothers (at 36-months) in terms of the number of items recalled in the OBJ task, also at 36-months; the mean difference in recall between groups was $M = 1.43$, $t\ (144) = -4.49$, $p < .001$. That is, children with high elaborative mothers remembered significantly more objects in the OBJ task at 36-months than their peers with low elaborative mothers. No other group differences in terms of strategic behavior or recall performance in deliberate memory tasks as a function of maternal elaborative style in reminiscing were found. Table 6 presents information regarding group differences in children's recall in the object memory and free recall with training tasks as a function of maternal conversational style (as characterized at the 36-month time point). In addition, Figure 3 illustrates graphically the mean number of items recalled in the object memory task (at each of the three time points) for children with low and high elaborative mothers in reminiscing at 36-months.

Table 6. Group Differences in Children's Mean Number of Items Recalled in the OBJ and FRT Tasks as a Function of Maternal Elaborative Conversational Style in Reminiscing at 36-months.

	MRM-36 Maternal Elaborative Style				
	Low	High	*df*	*t*	*p*
OBJ-36 Recall	2.35	3.77	144	-4.49	< .001
OBJ-60 Recall	5.83	6.35	123	-1.26	> .05
OBJ-72 Recall	7.39	7.86	109	-1.09	> .05
FRT-72, T1/Baseline Recall	8.22	8.55	119	-.68	> .05
FRT-72, T3/Generalization Recall	8.71	9.48	118	-1.35	> .05

Figure 3. Children's Mean Number Items Recalled in the Object Memory Task as a Function of Maternal Elaborative Conversational Style in Reminiscing at 36-months.



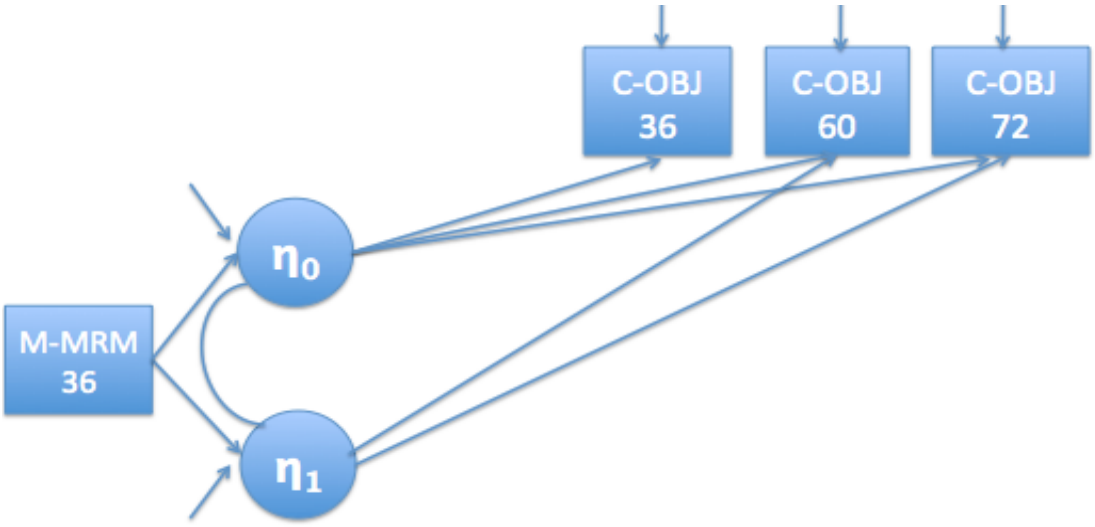
3.4.2.3 Latent Growth Curve Analysis

Latent growth curve modeling was employed to examine the differential starting points in children's deliberate memory performance in terms of recall in the object memory (OBJ) task at 36-months, as a function of maternal elaborative style at that time point, and to

also investigate the rates of growth in deliberate remembering from 3 to 6 years of age as a function of having a high or low elaborative mother early in life.

Maximum likelihood parameter estimates for all models were obtained using Mplus Version 7 under the assumption that all missing data were missing at random. Two latent growth curve models, one in which maternal elaborative conversational style was treated as a continuous variable and one in which the maternal style variable was dichotomized into two groups (high versus low elaborative style) were tested in response to this research question. Both models were extremely good fits for these data, so the model in which maternal style is treated as a dichotomous variable is presented for the ease of interpretation. Figure 4 illustrates the path model for this latent growth curve analysis of children's number of items recalled in the object memory task as a function of maternal elaborative conversational style in reminiscing at 36-months.

Figure 4. Latent Growth Curve Analysis of Children's Recall in the Object Memory Task as a Function of Maternal Elaborative Conversational Style in Reminiscing at 36-months.



Tests of model fit were first examined. One measure of model fit is the chi-square test statistic. As a reminder, a non-significant chi-square test statistic is the goal, as that is indicative of a model that fits the data reasonably well. In this case, the chi-square test statistic is 0.534, which is not more than two-times our expected model degrees of freedom (2 x 2, which would be 4), which is loosely performed to measure model fit. This chi-square statistic is not statistically significant ($p = 0.77$), which indicates that this model is a very good fit for the data.

Other measures of model fit were also examined. For this model, the TLI was equal to 1.14 (which indicates a very good model fit) and the CFI was equal to 1.00 (which also indicates an excellent model fit); values greater than 0.95 are believed to indicate a good model fit. The RMSEA value was 0.00; generally, values around or below 0.05 indicate a strong model fit. The SRMR value in this model was 0.02; a strong model should have an SRMR value less than 0.05. In sum, all fit indicates indicate a very strong fitting model. Thus, the obtained parameter estimates can be interpreted with confidence.

In terms of the parameter estimates of interest (using the Mplus output and parameter estimates), the value of the intercept for recall in OBJ for children with low elaborative mothers was 2.36; in other words, the number of items remembered in OBJ at the first time point (36-months) for children with low elaborative mothers was 2.36. The intercept for children with high elaborative mothers was the value of the intercept for children with low elaborative mothers (2.36) plus 1.40, or 3.76; that is, children with high elaborative mothers recalled 1.40 more items in OBJ at 36-months than their peers with low elaborative mothers, with an average memory elaboration value of 3.76 at the 36-month time point. The difference between groups in terms of their intercepts (or scores at the first time point at 36-months)

was statistically significant, indicating that children with high elaborative mothers remembered significantly more items in OBJ at the 36-month time point than their peers with low elaborative mothers.

In terms of the slope values, or growth trajectories over time (from 36- to 72-months), children with low elaborative mothers displayed a slope of 1.67, meaning that on average, children with low elaborative mothers remembered 1.67 more items in OBJ each year (than they did the previous year). Children with high elaborative mothers had a smaller (or less steep) slope, meaning that they did not increase in the number of items recalled in the OBJ task at the same rate as children with low elaborative mothers. The number of items that children of high elaborative mothers recalled increased each year, but was 0.32 items less than the number of items that children with low elaborative mothers increased each year; this equaled a 1.35 increase in number of items recalled in OBJ each year for children of high elaborative mothers (in contrast to a 1.67 increase in number of items recalled for children with low elaborative mothers). This difference in slopes between the children with low elaborative and high elaborative mothers was statistically significant, indicating that children in the two groups did display significantly different slopes or rates of growth over the three year period. Specifically, children with low elaborative mothers increased in the number of items recalled at a faster rate of growth than their peers with high elaborative mothers.

All in all, children with high elaborative mothers (as classified when children were 36-months) remembered significantly more items in the OBJ task than their peers with low elaborative mothers at the first measured time point (36-months). In addition, the rates of growth in the number of items recalled in OBJ differed significantly, indicating that children with low and high elaborative mothers had significantly different growth trajectories in recall

in OBJ over time, such that children with low elaborative mothers displayed a faster rate of growth than their peers with high elaborative mothers. So, children with high elaborative mothers started out with better recall in OBJ, but over time, their peers with low elaborative mothers increased in their number of items recalled in OBJ over time at a faster rate (or, they began to catch up with their peers with high elaborative mothers).

IV. DISCUSSION

This research represents one of the first examinations of the impact of maternal elaborative conversational style on children's autobiographical and deliberate memory development in an ethnically and socioeconomically diverse sample. Previous research has certainly indicated that maternal style in reminiscing influences children's autobiographical memory development (e.g., Fivush et al., 2006), but much less is known about the impact of maternal conversational techniques on children's developing deliberate memory skills, and even less is known about how maternal style in reminiscing may influence these two types of memory development in minority or low socioeconomic children. This project replicates what the literature suggests in terms of the importance of having an elaborative mother early on in life for children's autobiographical memory, and extends what we know about the relations between maternal conversational style, children's autobiographical memory, and children's deliberate memory.

These results support what is found in the literature that suggests that most mothers show an increase in elaborativeness over time (Fivush et al., 2006). As children become more competent participants in conversations about the past with their mothers, as indicated by their increase in elaborative memory responses over time, mothers show a simultaneous increase in elaborativeness as well (as indexed by their use of elaborations, associations, confirmations, and metamemory talk). This increase in maternal and child elaborativeness is especially true when comparing their performance from 36-months to 60-months. This

suggests that mother-child conversations about the past grow to be more and more co-constructed and collaborative over time, particularly as children transition from the preschool to elementary school years.

We also see that in addition to mothers generally increasing in their levels of elaborativeness as their children age, the associations between maternal style at different time points are highly correlated. That is, mothers that make use of a high elaborative style at one time point are also likely to make use of an elaborative style at other time points as well. It is the case that most mothers, regardless of elaborative style, elaborate following their children's memory responses, but high elaborative mothers are more likely to pose open-ended elaborative questions, for example, when their children are participating in the memory conversation but are not recalling any new information. This suggests that high elaborative mothers are particularly interested in engaging their children in talk about shared experiences. Although all mother-child pairs engage in joint reminiscing when the child recalls information, it is the high elaborative mothers who work to elicit and maintain this joint reminiscing even when their children are not providing additional information.

The pattern of correlations between maternal style and children's autobiographical remembering in reminiscing suggests that the more mothers elaborate, the more their children remember, both in the same conversation and also in later conversations. Indeed, in addition to generally all children recalling more details in reminiscing conversations over time, children of high elaborative mothers remember more details of past events than do children of low elaborative mothers.

One unique aspect of this project is the examination of children's growth trajectories

in autobiographical memory skills as a function of maternal elaborative conversational style when their children were 36-months. This type of model has rarely, if ever, been reported in the literature. When examining the growth trajectories of children's autobiographical memory skills from 3 to 6 years old as a function of maternal elaborative conversational style, children of high elaborative mothers started off with better autobiographical memory performance, but there were no differences in the speed with which children with high versus low elaborative mothers grew in their autobiographical memory skills. It may be the case that having a highly elaborative mother early on in life helps children develop advanced autobiographical memory earlier than children with low elaborative mothers, but once children enter the formal schooling context (i.e., Kindergarten), the classroom context may help some children "catch up" to their peers who have already developed advanced skills in autobiographical remembering. This may especially be the case if a child is enrolled in a classroom with a teacher who is classified as having a "high mnemonic" style, as this type of teacher style has been linked to children's growth in deliberate memory skills in the early elementary school years (Coffman et al., 2008).

In addition to linkages between maternal elaborative conversational style and children's autobiographical remembering in the context of the mother-child reminiscing task, moderate associations between children's autobiographical memory skills in the reminiscing and independent narrative contexts were found. No associations between maternal style in reminiscing and children's independent autobiographical narratives were found, however.

There are several potential explanations for this finding. First, it may be the case that the sheer amount of maternal elaborativeness in reminiscing is not the only mechanism through which children learn to describe their experiences to individuals that were not

present during the events under discussion. Perhaps other conversational techniques that mothers make use of in conversations with their children are better predictors of their children's abilities to independently recount past memories, that is, to provide autobiographical narratives without maternal scaffolding that is central to the reminiscing task. Previous research in this domain (e.g., Cleveland & Reese, 2005; Cleveland et al., 2007) has indicated that mothers' use of autonomy support in reminiscing (i.e., mothers' following in on what their children appear to be interested in during the conversations) is related to children's independent narratives, which was not a technique coded for in this sample. In addition, it may be the case that maternal elaborative style predicts children's narrative coherence in independent narratives (rather than simply the number of memory elaborations they provide), but again, narrative coherence was not coded for in this sample. These are certainly two techniques that should be explored in future investigations with these data.

The lack of significant associations between maternal elaborative conversational style in reminiscing and children's performance in the independent narrative task may also be due to the way in which children's speech was coded in the independent narrative task. For this project, children's utterances were coded using an adapted version of the same coding scheme that was used with the mother-child reminiscing conversations, so as to allow for direct comparisons between children's use of specific conversational codes, such as memory elaborations and associations, across the two tasks. In retrospect, however, perhaps this is not the best way to classify children's independent narrative reports. Anecdotally, the children who performed well on this task and thus could tell detailed and coherent stories were those who used of a variety of conversational techniques, not just memory elaborations. For

example, for a child to successfully narrate a story about the past to an individual who had not been present at the time of the event, s/he would likely need to contribute a number of additional details that may not be considered memory elaborations, such as explanations about the particular people who were present at the event (generally coded as associative general talk), or other referential information to help set the stage for the listener. Thus, an alternative coding scheme to characterize children's performance in the independent narrative task may prove to be a better indicator of children's autobiographical narratives in this context.

In addition to exploring linkages between aspects of the reminiscing and child independent narrative tasks, associations between maternal style and children's autobiographical memory performance, on the one hand, and children's deliberate memory performance (strategic behaviors and recall), were examined. First, performance on the two deliberate memory tasks was compared. As expected, there were increases in children's strategy use and recall performance from 36- to 72-months in the object memory task, and strategy use in the object memory task was correlated with the number of items recalled at all three time points, suggesting that strategic behavior may have aided in children's deliberate remembering in this task. In the free recall with organizational training task, strategic behavior was again correlated with recall in trials 1 (baseline) and 3 (generalization), and generally children performed better in terms of their strategy scores and recall in the generalization trial when compared to their performance in the baseline trial. This indicates that by 6 years of age, children appear to be capable of taking advantage of strategic training, and are able to generalize what they learn in terms of how to sort (at encoding) and cluster (at recall) to help their performance in a new trial with new cards to remember, even after a 15-

minute delay.

Linkages between children's autobiographical and deliberate memory performance were observed, particularly when examining children's autobiographical memory in the reminiscing task and recall in the object memory and free recall with training tasks. Linkages between children's autobiographical remembering and strategic behaviors in OBJ and FRT were also observed, but the associations were not as strong or consistent as were the links between children's performance in reminiscing and recall in OBJ and FRT.

Associations between maternal style in reminiscing (when the children were 36-months) and children's strategic behavior in OBJ at 36-months were observed. The more significant results were found when examining maternal style in reminiscing and children's recall in the OBJ and FRT tasks. Children's recall in OBJ at 36-months was significantly correlated with maternal style in reminiscing at 36-, 60-, and 72-months. In addition, maternal style in reminiscing at 72-months was associated with children's recall in trial 3 (generalization) of the FRT task, also at 72-months. Group differences between children with high elaborative versus low elaborative mothers (as classified when their children were 36-months) were found when examining children's strategic behavior in FRT (clustering ARC scores in trial 3) at 72-months and children's recall in OBJ at 36-months.

This raises the question of why children's autobiographical memory performance and maternal elaborative style might be more related to children's deliberate remembering (i.e., recall) than to children's strategic performance in the deliberate memory tasks. One hypothesis is that children who remember many details in the context of a reminiscing task are obviously skilled in their ability to search their memory and then report what they recall,

which are two key components involved in the recall process in deliberate memory tasks. In addition, children who remember many memory details in reminiscing are more likely to have highly elaborative mothers who have likely provided them with countless opportunities to search memory in the context of joint reminiscing, which may relate to their abilities to search memory and recall what they remember in the context of deliberate memory task.

When examining the growth trajectories of children's recall in the object memory task as a function of maternal elaborative style (at 36-months), children with high elaborative mothers remembered significantly more items in the object memory task than their peers with low elaborative mothers at the first measured time point. However, the rates of growth in the number of items recalled in the object memory task differed significantly, indicating that children with low and high elaborative mothers had significantly different growth trajectories in recall in OBJ over time. Contrary to what was expected, children with low elaborative mothers displayed a faster rate of growth in recall in the object memory task than their peers with high elaborative mothers. Thus, children with high elaborative mothers started out with better recall in OBJ, but over time, their peers with low elaborative mothers increased in the number of items recalled at a faster rate (or, they began to catch up with their peers with high elaborative mothers).

This difference in deliberate memory growth trajectories between children with low and high elaborative mothers may reflect several factors. First, it could be the case that maternal elaborative style is particularly useful in helping children to develop advanced deliberate memory skills earlier in development than would otherwise be observed, but that at a certain developmental period (due to cognitive developments that all typically-developing children undergo), children begin to "catch-up," regardless of their early

experiences. We know from previous research that there is something special about the formal schooling context that is especially influential in children's deliberate memory development (e.g., Morrison et al., 1995), and this may especially be the case for children who have not grown up with a highly elaborative mother. It could be, again, that high mnemonic teachers are providing a particularly rich environment for children with low elaborative mothers, which might explain their rapid rate of growth as they transition from the preschool to elementary school years.

4.1 Limitations and Future Directions

As with all studies, there are some limitations that should be noted. First, although great efforts were made to keep retention in the study high, approximately 40 participants were lost between the 36- and 72-month time points. Many of the below-poverty families moved considerably over the course of the study and, accordingly, it was a challenge to keep in touch with some of them. In addition, questions about the reliability and validity of the measures used may be raised. For example, did mothers talk with their children in the laboratory the same way that they talk with their children on a daily basis? There is an assumption that the reminiscing task is, in essence, a sampling of the kinds of conversations that go on routinely in the homes, but we do not know how frequent these conversations are. And, we have no way of knowing if the measure of mothers' conversational style in the reminiscing task is representative of the forms of conversation that take place routinely in the homes of the participating families. In addition, conversational data were obtained only from the mother and the target child in each family, but there are likely other adults or older children in the family who could, in principle, influence children's remembering. Ideally, it would be useful to collect information from fathers and other primary caregivers in order to

get a better understanding of the global influences on children's developing cognitive abilities.

When thinking about future research, there are certainly several suggestions that come to mind. As previously discussed, it would be interesting to examine the linkages between different maternal conversational techniques, such as mothers' level of autonomy support, and children's autobiographical remembering in both the mother-child reminiscing and child independent narrative contexts. It would also be prudent to examine the association between maternal elaborative style and children's narrative coherence, both in reminiscing and their independent narratives.

It would also be of interest to explore the ways in which mothers talk with their children about events that were not jointly experienced, so as to determine if the ways in which mothers elicit information from their children about the past are different for events that they were a part of as opposed to events during which they were not present. Perhaps the conversational techniques that mothers make use of in conversations about unshared events would be a better predictor of children's autobiographical remembering with an experimenter who was also not present during the event under discussion.

Another interesting consideration is the notion that perhaps a high elaborative conversational style may not always be the best conversational style for all children, especially when talking with children with developmental or language delays. Is it the case that different maternal reminiscing styles are adaptive for children who fall into different "classes" or "profiles"? Further research with developmentally-delayed children, for example, may shed some light on the question, and allow researchers to better understand the

differential ways that maternal reminiscing may be beneficial for autobiographical memory to develop in a wider range of children.

Boland, Haden, and Ornstein (2003) suggest that adult-child conversational interactions provide children with opportunities to learn to focus their attention on specific aspects of events, which, in turn, may lead to more organized representations of the relevant information. Moreover, just as mothers demonstrate a variety of behaviors in reminiscing that may differentially impact children's attentional focus and remembering, they may also differ in the behaviors they use to encourage deliberate remembering in their children (Larkina, Guler, Kleinknecht, & Bauer, 2008). In future research, it would be interesting to examine the extent to which mothers differ in their approaches to helping their children succeed in a deliberate memory task, and to also examine if there are associations between the ways in which mothers reminisce with their children, on the one hand, and help their children deliberately work to remember items in a strategic memory task, on the other.

Additionally, research that examines aspects of children's home *and* school contexts would be most relevant to understanding the range of factors that contribute to the socialization of children's memory skills. To date, very little research has been conducted examining the combined effects of having an elaborative mother and a high mnemonic teacher. It would be ideal to determine if one particular combination of maternal reminiscing style and teacher mnemonic style is associated with enhanced memory skills, and also to determine if having a high elaborative mother would overshadow the effect of that child having a low mnemonic teacher, and vice versa. As it stands now, it appears that having a high elaborative mother early in life is particularly important for children's early success in autobiographical and deliberate memory, but that once children enter Kindergarten, the

differences between groups of children with high and low elaborative mothers becomes smaller. Gaining a better understanding of what happens in Kindergarten classrooms could shed some light on these findings, and could provide insights on how to facilitate the best possible learning environments for children at home and at school.

APPENDIX A: MOTHER-CHILD REMINISCING TRANSCRIPTION PROTOCOL

Mother-Child Reminiscing Transcription and Checking Instructions: DCHDS Data

General Process

- Each video file will first be transcribed using the notation and symbols that follow.
- To open the two necessary files (1 video file and 1 CLAN file) follow the steps below:
- To open CLAN, hit the CLAN icon on the desktop or find it amongst the applications. Open the program and select new file. Save the file according to the following "file names."
- To access the DCHDS data and open the video file:
  - Go to your shortcut located in a folder on the desktop called "DCHD Desktop Shortcuts"
  - Put in your password which will open a new network drive called "dchdvideo on DVD Archive Server"
  - Open up the "Kindergarten lab visit" folder
  - Find the appropriate ID and open up the DVD
  -When you are finished transcribing, right click on "dchdvideo on DVD Archive Server" and go to Disconnect
- Following initial transcription, each transcribed file will then be checked against the video to catch any inconsistencies or errors. After this second pass-through, the transcribed document is finalized and ready to code.

File Names

Given that each transcript will ultimately go through three iterations (initial transcript, checked transcript, coded transcript), the files are to be maintained and saved separately.

Please save the files in the appropriate folders with the following names:

Initial transcript – XXXXt
Checked transcript – XXXXch
Coded Transcript – XXXXco

Transcription Rules

Make sure to format everything just as you see it below (i.e. put the "@").

I. Start the file with the following header

@Begin

@Participants: CHI child, MOT mother
@ID: XXXX
@Activities: MC Reminiscing
@Transcriber: Your name
@Comment: transcribed XX-NOV-08
@Comment: any relevant note – for example, child whispers most of her responses, making her hard to understand.

If there is no final comment, then don't include @Comment followed by nothing – just end the header with the transcription date.

II. General Rules:

A. Each utterance needs to be parsed (by clause) and modified so that each line begins with the following:

*MOT: or *CHI:

For example:

If the mother said: "What did we do at the zoo? I remember there were lots of animals there and you really liked it a lot and also got a bit scared."

You would parse it as follows:

*MOT: What did we do at the zoo?
*MOT: I remember there were lots of animals there.
*MOT: And you really liked it a lot.
*MOT: And also got a bit scared.

Think of the clauses as units of speech that can stand on their own.

B. The spacing after each colon should be one tab.

C. Each line must end in a punctuation mark.

D. Unintelligible speech should be symbolized by "xx" for single words or "xxx" for a string of words. Note that unintelligible speech refers to utterances that you cannot understand. Nonsense words are to be written out accordingly.

E. Relevant mother and child action or checker comments should be included and marked by the following:

%com: relevant comment or nonverbal action – any comment that the transcriber finds important (e.g., child gets up and wanders around room, mother keeps interrupting child during conversation)

%act: actions relevant to the conversation (e.g., mother or child nods, shrugs shoulders, act out animal behaviors or noises)

F. When the mother asks an open-ended or yes-no question and pauses for 2 full seconds and the child does not respond, the following should be marked:

*CHI: 0. -note this is the numerical zero

G. If the child does not verbally respond, but nods or shakes his/her head, then the transcription should include a comment about this. For example:

*CHI: 0.
%act: nods head.

You can still put the numerical 0 if there has been a two-second pause after the mother has asked a question, but BE SURE to include the action if there is one following the two seconds.

H. Mark tag questions (e.g., those that end with "huh?") with a double comma:

*MOT: you forget,, huh?
*MOT: we did that,, remember?

- Tag questions are basically questions that have a single word added on at the end, such as "huh," "hmm," or "remember."

I. Mark trailing comments with the ending of "+…":

*MOT: we brought um +...

Note that trailing comments only occur when mother or child begin an utterance without finishing it – this does not include instances when either member of the dyad retraces or 'switches gears.'

J. Mark instances where the mother or child switches gears with the following notation: (/)

*MOT: We used the (/) hey what did Jane give you for your birthday?

*CHI: Some were (/) and the lady told us there was a cookie shark.

K. When the mother and child talk over each other – with overlapping speech – mark the overlapping speech with the following notation:

*MOT: Remember when we went <to the beach>?
*CHI: <To the store>?

NOTE: If the mother starts to talk, and the child interrupts (or vice versa), but

there is NO overlapping speech and no trailing off, put a period after the end of mom's utterance and then move on to what the child says:

*MOT: Remember when we went.
*CHI: To the beach!

L. For confirmation and negation of information, if the mother and child make the following noises, write them out like this:

Confirmations indicating yes:
- Uh-huh
- Mmm-hmm
- Yep or Yup

Negations indicating no:
- Nuh-uh
- Mm-mm
- Uh-uh

M. End transcript with the following header:
@End

III. Example

@Begin
@Participants: CHI child, MOT mother
@ID: XXXX
@Activities: MC Reminiscing
@Date: 14-NOV-2008
@Transcriber: John
@Comment: transcribed 11-APR-02
@Comment: child whispers most of her responses, making her hard to understand.

*MOT: remember that we went to a Valentines Day party?
*CHI: 0.
%act: nods head yes.
*MOT: do you remember that?
*MOT: whose house were we at for that party?
*MOT: for the Valentines Day party?
*CHI: I don't know.
*MOT: yeah.
*MOT: you forget,, huh?
*MOT: um we went to Chase's house.

*MOT: remember we went to Chase's house for the Valentines Day party?
*CHI: 0.
%act: nods head yes.
*MOT: remember?
*CHI: 0.
%act: nods head yes.
*MOT: and what did we bring with us when we went to Chase's house for Valentines Day?
*MOT: we brought um +...
*MOT: what are those things called +...
%com: mother is talking more to herself than to the child.
*MOT: remember the little cards that we gave all the kids?
*MOT: do you remember that?
*CHI: 0
%act: nods head yes.
*MOT: we gave all the kids little cards that said I love you on it.
*MOT: I think they were Winnie the Pooh cards.
*MOT: do you remember that?
*CHI: 0.
%act: nods head yes.
*MOT: Winnie the Pooh do you remember the Winnie the Pooh cards?
*CHI: 0
%act: nods head yes
*MOT: yeah.
*MOT: did you like those?
*CHI: yeah
%act: nods head and whispers.
@End

IV. End transcript with the following header:
@End

APPENDIX B: MOTHER-CHILD REMINISCING TASK CODING MANUAL

Mother-Child Reminiscing Structural/Functional Coding System

Durham Child Health and Development Study

Coding system adapted from: Haden (1998) and Reese, Haden & Fivush (1993) and the Developmental Pathways to Skilled Remembering (Ornstein and Haden)

Buckner and Fivush (1998), and Fivush, Marin, Crawford, Reynolds, and Brewin (2007)

Procedures: Using the CLAN module in the CHILDES program, the mother-child conversations will be transcribed verbatim from videotapes (behaviors will also be transcribed from the videotapes). The use of the video is particularly important for subsequent coding to enable us to code very young children's comments accurately through an examination of what was going on nonverbally when they occurred. For example, an 18 mo old child may say "mmm" while actively attending to her mother's talk. Alternatively, a child may say "mmm" while offering to her mother a toy that is irrelevant to the conversation. Although exactly the same in "structure," they have different functions. In the first example, the child's verbalization functions as a placeholder; the child is taking a conversational turn in a way that suggests interest. In the second instance, the child's utterance is off-topic, and does not indicate interest or attention to the conversation.

Prior to coding, parsing by utterance will be reviewed within the transcript, so that it will be possible to calculate Mean Length of Utterance accurately from these transcripts. In addition, the beginning and end of each event will be marked using the CLAN notation @BG: Event # and @EG: Event #. In this way, it will be possible to determine the frequency of each code by event.

Reliability: Pairs of coders will independently code 25% of the transcripts at each time point and establish an initial inter-rater reliability (reliability 1) averaging > 85%, with no single reliability estimate < 80% (percent agreement and kappa coefficient). At a later date, the master coder will code several additional transcripts (reliability 2), and then reassess reliability with each of the secondary coders to check for coder drift.

Reliability will be computed for each secondary coder in relation to the master coder.

Coding System:

Maternal coding categories ($MOT)

1. **:GMQ -** General Memory Questions - "Open-ended" questions asking the child to provide memory information about an event. Classified as either:

a. **:ELAB -** Elaborations - Memory questions that ask for new (e.g., not previously mentioned) memory information about an event.

b. **:REP -** Repetitions - Memory questions that repeat the same content or gist of information requested or provided in a previous statement or question.

Examples.
"What did we do at the zoo?"
"Do you remember what we did at the zoo?"
"Tell me about going to the circus."
"Do you remember anything else about the circus?"
"Do you remember doing anything special?"
"Do you remember who was with us at the circus?"
"Tell me what was your favorite thing to do there?"
"What else was fun about it?"
"What was the funniest thing about seeing Grandmaw Atkinson?"
"What did we do when we got to the mountains?"
"Do you remember any of the animals' names?"
"What kind of animals did we see?"
"Do you remember what kinds of animals we saw?"
"Who went with us?"
"How did that make you feel?"
"What did we eat for lunch?"
"Who was the bus driver?"
"What was the name of that little song?"
"What did I put it on top of?"
"What color was that hat?"
"We rode on the what?"
"Why did we have to do that?"
"Why?" "How?"
"What else have we done recently that's been exciting?"
"And who else?"

Note: If mom repeats question without a response from the child (but not in the same turn), then it's a rep.

Note: Question continuations are coded as:
MOT: *Remember what have we done recently?* -- GMQ:ELAB
MOT: *me and you and daddy and Zachary?* -- GMQ:ELAB

GMQ:ELAB

Note: If the mother asks the same question, but to get different information, it's a GMQ elab:

Child: We went to the zoo
Mother: What did we see at the zoo? GMQ:ELAB
Child: We saw the monkeys
Mother: Then what did we see? GMQ:ELAB
Child: We saw the elephants

*This is also true for questions such as: who else was at the zoo, what else did we see at the zoo, what happened at the zoo

2. **:YNQ -** Yes-No Questions -Questions that ask the child to confirm or deny a piece of memory information provided by the mother. Note that tag questions ("That was fun, wasn't it?") and forced choice questions (e.g., "Were there lots of people there, or not so many?") are coded as yes-no questions. Includes questions asked with the phrasing "Do you remember X", that can be answered simply with a yes or no response.

Classified as either:

a. **:ELAB** - Elaborations - Yes-No questions that ask the child to confirm or deny a new piece of memory information provided by the mother.

b. **:REP** - Repetitions - Yes-No questions that ask the child to confirm or deny the same information (exact content or gist) as given in a previous comment.

Examples. *"Do you like dancing?"*
"Was it hot or cold outside?"
"Were you wearing a hat?"
"You were going to give mommy her card, weren't you?"
"Were you happy?"
"Were you asleep or awake when you were riding on the mountains?" -- YNQ:ELAB YNQ:ELAB (C: *awake*. MREP)
"Did you get tired or not when you were hiking?" -- YNQ:ELAB YNQ:ELAB (C: *I was tired.* MREP)
"Did we have anything to eat?"
"Did we see something that had a big long trunk?"
"You don't remember holding granddaddy's hand?"
"You were at a house, do you remember?"
"You were cold, remember?"
"Remember your kindergarten registration?"
"Did you _____?" "Did we _____?"
"Do you remember when _____?"

Note: When mom asks a forced choice Y/N question, child's response is coded as mrep

3. **:RM** – Remember Prompt – Request that the child says more but does not contain content (e.g., "What else?" "Do you remember anything else?" "Tell me about it." "Then what?" "That's all you remember?" "What happened?" "Spill the beans." "What other stuff?" "Are you sure?" "And so what else?" "And?" "Hmmm?" "No?" "Oh yeah?" "Now keep going." "Really?")

MOT: *What was your favorite thing about going?* -- GMQ:ELAB
CHI: Nothing. -- PL
MOT: *hmm?* – RM

MOT: What did we do at the park?
CHI: Swing.
MOT: *What else?*- RM

Other common RMs: You don't remember (that)? (although "You don't remember *the rainbow*?" is a YN because it has CONTENT in it), You don't know (that)?, Is that all you can remember?

4. **:ST** - Statements - Any declarative comment made by mother that provides information about the event. Unlike questions, statements do not "demand" a response from the child.

Classified as either:

a. **:ELAB** - Elaborations - Statements that provide the child with new information about the event.

b. **:REP** - Repetitions - Statements that repeat (exact content or gist) information previously mentioned about the event. Oftentimes, Statement Repetitions are used to summarize what has already been recalled about the event.

Examples. *"It was about a month ago that we went."*
"You dressed up so pretty when we went there."
"I like that."
"Those books in there looked kinda neat."

5. **:FILL** – Fill-In-The-Blank – Statements that allow sthe child to complete the sentence (e.g., M: Who was there? -- GMQ-ELAB Grandma _____? -- FILL)

6. **:EV -** Evaluations - Comments that in some way confirm or deny information provided by the child. (There is one evaluation for each piece of information the mother is confirming or negating, not just how many times she says yes or no!)

a. **:CON** - Confirmations - Yes, uhhuh, yeah, right.

b. **:NEG** - Negations - No, uhuh, nope.

Examples. CHI: I was asleep on the mountains.
MOT: "*Yes, you were asleep on the mountains."* -- EV:CON

CHI: We went hiking.
MOT: *mmhm we went hiking* -- EV:CON

CHI: We didn't have one to take.
MOT: *no we didn't.* EV:CON
(NOTE: this is a good example of how these are coded to reflect how the evaluation is functioning in the conversation – a "no" can be a confirmation!)

7. **:PL** - Placeholders - Mother takes a conversational turn that is memory related, but provides no memory information ("That's all." "I don't know." "I can't remember." child shrugs "Wow…. Oh my goodness!" "Oh, wow" "What made you say that"). Only code a placeholder if it is the only applicable code in a turn; you cannot have placeholder and another code within the same turn!

   Note: Placeholder can also be used when mother or child is trying to get clarification (not acoustical!): CHI: 'Cause. MOT: 'Cause why?

8. **:CL** - Clarifications - Mother asks explicitly for acoustical clarification. This code does not apply to mother's request for semantic (meaning based) clarification.

Examples. CHI: I was happy.
MOT: *"what did you say?"* -- CL
CHI: I was happy. -- CL
MOT: you were happy – EV:CON

CHI: We went hiking.
MOT: *I can't hear you.* -- CL

But: CHI: We went hiking.
MOT: we went hiking. – EV:CON
MOT: *talk a little louder please.* -- OFF (not an explicit acoustical of the child's memory response)
MOT: Where did we go? -- GMQ:ELAB
CHI: hiking. -- MELAB
MOT: *We went where?* -- GMQ:REP (not explicit acoustical clarification)
CHI: hiking! -- MREP

9. **:MM** - Metamemory Talk -- Mother remarks about the process of remembering, or the child's memory performance. Needs to have "that."

Examples. "I hadn't remembered that." -- MM
"I can't remember that." -- MM (but, "I can't remember" -- PL).
"I forgot about that." -- MM (but, "I forget" -- PL)
"I remember that too."
"I don't remember that because it was so long ago."
"So, you still thinking about remembering…"
"Why would you make that up?"
"You know what I remember about that? I remember…."

But: "I remember when we went to the mountains." -- ST:ELAB

10. **:ASS** - Associative Talk - Statements or questions that are not about the particular event under discussion, but is related to the one under discussion in one of the following ways:

1. Event - Talk concerning another past event that is in some way comparable to the event under discussion (e.g., "We saw fireworks a different night, didn't we?"). By definition, this has to be in *past tense*.

2. General Knowledge - Comments about facts about the world related to the event under discussion (e.g., "Ponies are baby horses."). Also includes talk about the present state of an object or thing that was part of the past event (e.g., "Where is my big seashell now?" "This is the hat I got."), talk about pictures of the event, spelling of relevant words, etc. This has to be in *present tense*.

3. Fantasy - Talk concerning the event under discussion, but that is fantasy rather than factual. Must be fantasy related to event under discussion, or else it is off topic.

4. Future - Comments concerning the future occurrence of the particular event in question.

5. Demo – The mother and/or child act things out. This can be a request from the mother to have the child act out something they did, the mother acting out something to give the child a hint, a child's response is an action or noise instead of words, or any song singing by mom and kid (for singing, if the mother and child alternate lines to the song, they each get 1 code per turn, but if they sing a whole song together, that only counts as 1 code for each of them)

6. Scripted/prep talk – This is talk that can either refer to how we generally do things in the world or serves to prepare the child for these types of experiences (e.g. when we cross the street, we hold hands, look both ways, etc.). This is more than just a piece of information related to the past event (which would be coded as general knowledge) – there are several details provided.

Note: These are coded by turn, NOT necessarily by proposition

11. **:OFF** - Off - Within the event conversation, instances when the event is not the topic of discussion. In contrast to associative talk, off talk is not related at all to the event being discussed. Note that OFF is the default in bouts of off-topic when are trying to decide between OFF and Unclassifiable.

Off talk can simply be OFF, or if it relates to regulation of child behavior, it can be classified as OFF with one of the following tags:

OFF REG Behavior: Telling the child what to do – "come here" "sit down" stop that" "wait a minute" "come on"
OFF REG Attention: Includes calling the child's name, saying things like "Guess what?", "Hey?" "You know what?"
OFF REG Barter: "If you do this then we'll…", "If you don't do this then we won't get ice cream", "I'll tell you how to open the door in just a minute"
OFF REG Warning: "You're going to hurt yourself," "I'm not playing," "You better listen" "That's it!"
OFF REG Verbal: References to the verbal demands of the task – "We're talking," "Can you talk to me?"
OFF REG NOS (not otherwise specified): Turns that refer to the child's behavior but don't fit somewhere above – "You're a big girl," "You're showing your panties," "You're making all that noise" "You're spitting on me"

Note: These are also coded by proposition. SO if the mother were to say, "Hey Michael! Can you come and talk to me?" That would get an OFF REG Attn and an OFF REG Verbal.

12. **:UN** – Unclassifiable – Include confirmations of a placeholder, an utterance that includes only the XX or XXX symbols and can't be determined by the context, or an
utterance that can not otherwise be classified into one of the above. If anything else in the turn can be classified into one of the other categories, do not code unclassifiable portions of the turn.

Child Coding Categories ($CHI)

1. **:MELAB** - Memory Elaborations – Children either more the conversations to a new aspect of the event or provide new information about the event being discussed.

   Examples. *"We gobbled ice cream."* MELAB
   "Jerry and Tony were there." -- MELAB MELAB
   "We ate and drank." MELAB MELAB

2. **:MREP -** Memory Repetitions - Child repeat information that was provided initially either by the child or the mother regarding the event without adding any new information.

   Note that children's responses to forced choice questions are coded as MREP (rather than evaluations).

   "Were you asleep or awake when you were riding on the mountains?" -- YNQ:ELAB YNQ:ELAB (C: *awake*. MREP)

3. **:EV** - Evaluations - Comments that in some way confirm or deny information provided by the mother.

   a. **:CON** - Confirmations - Yes, uhhuh, yeah, right.

   b. **:NEG** - Negations - No, uhuh, nope.

4. **:MQ** - Memory Questions - Children's genuine "open-ended" memory questions, asking the mother to provide information (if yes-no question, code as MELAB or MREP).

5. **:PL** - Placeholders - Child takes a conversational turn that is memory related, but provides no memory information ("I don't remember." "I don't know." "Guess what."). Only code a placeholder if it is the only applicable code in a turn. For example:

   M: Who was there? GMQ-ELAB
   C: I don't know.
   C: Marvin. – MELAB (do not code "I don't know" as a placeholder because the child went on to provide memory information within the turn.)

   M: Tell me all about the circus? GMQ-ELAB
   C: *I don't remember.* PL
   M: Were there elephants there? YN-ELAB

   Also includes "what?" if it's not being used for acoustical clarification

6. **:CL** - Clarifications - Requests or responses to requests for acoustical clarification. This code does not apply to request for semantic (meaning based) clarification.

7. **:MM** - Metamemory Talk - Child remarks about the process of remembering, or the child's memory performance ("I forgot." "That's all I remember." "I don't know ___ but I do know___."

8. **:ASS** - Associative Talk - Statements or questions that are not about the particular event under discussion, but is related to the one under discussion in one of the following ways:

1. Event - Talk concerning another past event that is in some way comparable to the event under discussion (e.g., "We saw fireworks a different night, didn't we?"). By definition, this has to be in *past tense*.

2. General Knowledge - Comments about facts about the world related to the event under discussion (e.g., "Ponies are baby horses."). Also includes talk about the present state of an object or thing that was part of the past event (e.g., "Where is my big seashell now?" "This is the hat I got."), talk about pictures of the event, spelling of relevant words, etc. This has to be in *present tense*.

3. Fantasy - Talk concerning the event under discussion, but that is fantasy rather than factual. Must be fantasy related to event under discussion, or else it is off topic.

4. Future - Comments concerning the future occurrence of the particular event in question.

5. Demo – The mother and/or child act things out. This can be a request from the mother to have the child act out something they did, the mother acting out something to give the child a hint, a child's response is an action or noise instead of words, or any song singing by mom and kid (for singing, if the mother and child alternate lines to the song, they each get 1 code per turn, but if they sing a whole song together, that only counts as 1 code for each of them)

6. Scripted/prep talk – This is talk that can either refer to how we generally do things in the world or serves to prepare the child for these types of experiences (e.g. when we cross the street, we hold hands, look both ways, etc.). This is more than just a piece of information related to the past event (which would be coded as general knowledge) – there are several details provided.

Note: These are coded by turn, NOT necessarily by proposition

Child off talk can also be coded as just OFF or as OFF REG. There are only 3 categories for child OFF REG:

OFF REG Comply: If the child performs the requested action, or answers the mother in a satisfactory way

OFF REG Disobey: When the child blatantly disobeys the mother (e.g. runs away, says "No!")

OFF REG Sassy: When the child responds in a sassy, smartalic, or feisty kind of way. For example, the mother tells the child to sit on the blanket, and the child responds with, "YOU sit on the blanket!"

10. **:NR** - No Response - Child provides no response, as indicated by a "0" on the transcript. Note that if the child has a "0" but provides a nonverbal response (head nod, shake), then the "yes" or "no" is coded for the child, rather than a No Response.

11. **:UN** - Unclassifiable - Include confirmations of a placeholder, an utterance that includes only the XX or XXX symbols and can't be determined by the context, or an utterance that can not otherwise be classified into one of the above categories. If anything else in the turn can be classified into one of the other categories, do not code unclassifiable portions of the turn.

Other random notes:

5 or more objects are considered a list and only get 1 code (e.g., we got eggs, bread, milk, OJ, lunchmeat, and cookies at the grocery store = one statement elab)

People are all coded separately and do not count as a list

APPENDIX C: CHILD INDEPENDENT NARRATIVE TASK CODING MANUAL

Child Independent Narrative Structural/Functional Coding System

Durham Child Health and Development Study

Coding system adapted from: Haden (1998) and Reese, Haden & Fivush (1993) and the Developmental Pathways to Skilled Remembering (Ornstein and Haden)

Procedures: Using the CLAN module in the CHILDES program, the experimenter-child conversations will be transcribed verbatim from videotapes (behaviors will also be transcribed from the videotapes). The use of the video is particularly important for subsequent coding to enable us to code very young children's comments accurately through an examination of what was going on nonverbally when they occurred.

Prior to coding, parsing by utterance will be reviewed within the transcript, so that it will be possible to calculate Mean Length of Utterance accurately from these transcripts. In addition, the beginning and end of each event will be marked using the CLAN notation @BG: Event # and @EG: Event #. In this way, it will be possible to determine the frequency of each code by event.

Reliability: Pairs of coders will independently code 25% of the transcripts at each time point and establish an initial inter-rater reliability (reliability 1) averaging > 85%, with no single reliability estimate < 80% (percent agreement and kappa coefficient). At a later date, the master coder will code several additional transcripts (reliability 2), and then reassess reliability with each of the secondary coders to check for coder drift.

Reliability will be computed for each secondary coder in relation to the master coder.

Child Coding Categories ($CHI)

1. **:MELAB** - Memory Elaborations – Children either move the conversations to a new aspect of the event or provide new information about the event being discussed.

Examples. *"We gobbled ice cream."* MELAB
"Jerry and Tony were there." -- MELAB MELAB
"We ate and drank." MELAB MELAB

2. **:MREP -** Memory Repetitions - Child repeat information that was provided initially either by the child or the mother regarding the event without adding any new information.

Note that children's responses to forced choice questions are coded as MREP (rather than evaluations).

"Were you asleep or awake when you were riding on the mountains?"
-- YNQ:ELAB YNQ:ELAB (C: *awake*. MREP)

3. **:MM** - Metamemory Talk - Child remarks about the process of remembering, or the child's memory performance ("I forgot." "That's all I remember." "I don't know ___ but I do know___."

4. **:ASS** - Associative Talk - Statements or questions that are not about the particular event under discussion, but is related to the one under discussion in one of following ways:

1. Event - Talk concerning another past event that is in some way comparable to the event under discussion (e.g., "We saw fireworks a different night, didn't we?"). By definition, this has to be in *past tense*.

2. General Knowledge - Comments about facts about the world related to the event under discussion (e.g., "Ponies are baby horses."). Also includes talk about the present state of an object or thing that was part of the past event (e.g., "Where is my big seashell now?" "This is the hat I got."), talk about pictures of the event, spelling of relevant words, etc. This has to be in *present tense*.

3. Fantasy - Talk concerning the event under discussion, but that is fantasy rather than factual. Must be fantasy related to event under discussion, or else it is off topic.

4. Future - Comments concerning the future occurrence of the particular event in question.

5. Demo – The mother and/or child act things out. This can be a request from the mother to have the child act out something they did, the mother acting out something to give the child a hint, a child's response is an

action or noise instead of words, or any song singing by mom and kid (for singing, if the mother and child alternate lines to the song, they each get 1 code per turn, but if they sing a whole song together, that only counts as 1 code for each of them)

6. Scripted/prep talk – This is talk that can either refer to how we generally do things in the world or serves to prepare the child for these types of experiences (e.g. when we cross the street, we hold hands, look both ways, etc.). This is more than just a piece of information related to the past event (which would be coded as general knowledge) – there are several details provided.

5. **:OFF** - Off - Within the event conversation, instances when the event is not the topic of discussion. In contrast to associative talk, off talk is not related at all to the event being discussed.

APPENDIX D: OBJECT MEMORY TASK CODING MANUAL

Object Memory Task Coding Scheme

Overview and Rational for Coding Scheme

- Scheme is designed to capture both physical interactions with the stimuli such as playing and manipulation; visual inspection of the array; and language used in the performance of the task, such as object naming and object descriptions.
- The interest is on children's task approaches rather than on the effects of varying types of interactions on the recall of specific stimuli; therefore, time-sampling was chosen to capture the children's behavior in performing the task.
- The distinction between deliberate and non-deliberate behavior is established based on the basis of the previous work of Baker-Ward, Ornstein and Holden (1984). Specifically, behaviors that have been determined to characterize deliberate memory include those that are expressions of memorization in that they occurred to a significantly greater extent when children were given instruction to "remember" rather than to "play" in the Object Memory Task.

Coding Scheme

- Two-minute study period will be divided into 24 five-second blocks/intervals
- Each of the five-second intervals will be coded separately for the occurrence of both verbal and non-verbal task approaches
- The instance or occurrence of every behavior exhibited in an interval will be noted
    - For all non-verbal task approaches and non-deliberate verbal task approaches, this is a code of "yes" (scored 1) or "no" (scored 0) indication of the occurrence of a behavior and not the duration of the behavior or the number of times the behavior occurs during the interval
    - For deliberate verbal task approaches (associations, object talk, categorization, naming and relevant talk) this code will indicate the number of times the behavior occurs during the interval
    - If a verbal behavior spans across two intervals, count the behavior in the interval where the majority of the words are spoken.
    - If a nonverbal behavior (such as visualization, engage, or off-task) spans across two intervals such that the only way the behavior would meet the requirements is if we looked across the intervals, DO NOT COUNT the behavior in either

interval. For example if the first second of a visual falls in one interval and the second half second falls in the second interval, do not count the behavior in either interval.

- Each interval will be coded for the predominant non-verbal and verbal task approach exhibited in the interval of question.
    - For example in the case of a non-verbal task approach, if a child spends three seconds manipulating the task items and two seconds playing with the task items, the block will be coded as manipulation
    - To decide the predominate verbal behavior, use the amount of time dedicated to each verbal behavior. For example, if there is one naming and one association in an interval, but if two seconds are spent toward naming and one is spent on an association, then the predominate behavior would be naming. Please note that if the child is naming a couple of items and takes a short pause between each naming, you would still count the whole process toward the amount of time spent naming, not just the amount of time it takes to speak one word.
- **Based on both the predominate non-verbal and the predominate verbal codes**, each five-second block will be categorized as indicative or not indicative of deliberate mnemonic activity
    - This will be the major dependent measure (the number of 5-second intervals of the study period (range 0-24) characterized by the presence of deliberate mnemonic activity)
    - If there is a "mismatch" between the verbal and nonverbal codes, the interval will be coded "non-deliberate."
- Objects recalled at completion of task will be recorded

Overview of Deliberate and Non-Deliberate Task Approaches

		Behavior	Definition
Non-Verbal Task Approaches	**Deliberate Behaviors**	Manipulation	A child makes any type of manual contact with the objects that does not involve their unique properties
		Pointing	A child points to the objects without touching or moving them
		Categorization	A child groups two or more items together physically, the presence of grouping must be obvious to the observer
		Visual Examination	A child scans the objects without touching any of them
		Overt Mnemonic Activity	A child's behavior suggests overt studying, as in rehearsing aloud, hiding eyes while naming objects, as in self-testing
		Covert Mnemonic Activity	A child's behavior suggests covert studying, as in moving the lips as if rehearsing, alternating between closing the eyes and looking at the objects, an in self-testing
	Non-Deliberate Behaviors	Playing	A child manipulates objects by engaging with their unique basic properties
		Engages Examiner	A child makes eye contact with the examiner and is actively attempting to evoke examiner's response
		Distraction/Off-task	A child focuses on stimuli outside the context of the experiment
Verbal Task Approaches	**Deliberate Behaviors**	Association	A child verbalizes an association with or elaboration about an object (e.g., "I have a necklace like this")
		Object Talk	A child discusses physical properties of an object (e.g., "These glasses are green")
		Categorization	A child groups two or more items together verbally
		Naming	A child provides any label – conventional or personal – for any object, without further description
		Relevant Talk	A child asks or comments about the task or objects without providing specific information about objects.
	Non-Delib. Behaviors	Onomatopoeia	A child reproduces an imitation of sounds in words associated with objects or activities
		Irrelevant Talk	A child talks about objects or events completely outside of the task setting and with on reference to the task setting

APPENDIX E: FREE RECALL WITH ORGANIZATIONAL TRAINING TASK SCORING INFORMATION

Variable Label	Variable Description	Variable Range
Sort Trial 1		
Sort Score	Does the child do any sorting in Trial 1?	0=none; 1=partial sort; 2=full sort
Categories Sorted	Number of semantic categories rep. by sorting in Trial 1	Number between 0-4
Number Sorted	Number of items sorted in Trial 1	Number between 0-16
Sort Groups	Description of categories sorted in Trial 1	Qualitative description
Sort ARC	Adjusted Ratio of Clustering score in Trial 1	*calculated in excel sheet
Clustering Trial 1		
Sort Score	Does the child do any sorting in Trial 1?	0=none; 1=partial sort; 2=full sort
Recall	Number of pictures recalled in Trial 1	Number between 0-16
Categories	Number of Categories were represented in recall of Trial 1	Number between 0-4
Pairs	Number of correctly ordered pairs in ordered recall of Trial 1	Number between 0-12
c1	Number of items recalled in Category 1 of Trial 1	Number between 0-4
c2	Number of items recalled in Category 2 of Trial 1	Number between 0-4
c3	Number of items recalled in Category 3 of Trial 1	Number between 0-4
c4	Number of items recalled in Category 4 of Trial 1	Number between 0-4
ER	Expected Pairs in Trial 1	*calculated in excel sheet
Cluster ARC	Adjusted Ratio of Clustering score in Trial 1	*calculated in excel sheet

Sort Trial 3

Sort Score	Does the child do any sorting in Trial 3?	0=none; 1=partial sort; 2=full sort
Categories Sorted	Number of semantic categories represented by the sorting in Trial 3	Number between 0-4
Number Sorted	Number of items sorted in Trial 3	Number between 0-16
Sort Groups	Description of categories sorted in Trial 3	Qualitative description
Sort ARC	Adjusted Ratio of Clustering score in Trial 3	*calculated in excel sheet

Clustering Trial 3

Sort Score	Does the child do any sorting in Trial 3?	0=none; 1=partial sort; 2=full sort
Recall	Number of pictures recalled in Trial 3	Number between 0-16
Categories	Number of semantic categories were represented in recall of Trial 3	Number between 0-4
Pairs	Number of correctly ordered pairs in ordered recall of Trial 3	Number between 0-12
c1	Number of items recalled in Category 1 of Trial 3	Number between 0-4
c2	Number of items recalled in Category 2 of Trial 3	Number between 0-4
c3	Number of items recalled in Category 3 of Trial 3	Number between 0-4
c4	Number of items recalled in Category 4 of Trial 3	Number between 0-4
ER	Expected Pairs in Trial 3	*calculated in excel sheet
Cluster ARC	Adjusted Ratio of Clustering score in Trial 3	*calculated in excel sheet

APPENDIX F: CALCULATION OF THE ADJUSTED RATIO OF CLUSTERING (ARC) SCORE INFORMATION

Calculation of the Adjusted Ration of Clustering (ARC) scores

(Roenker, Thompson, & Brown, 1971)

Adjusted Ratio of Clustering = (the number of pairs – expected pairs)/ (the total number recalled – number of categories – expected pairs)

ARC = (pr – ER) / (n-c-ER)

Expected Pairs = [the sum of the squares of the number of recalled from each category / total number recalled] – 1

ER = [($C1^2$ + $C2^2$ + $C3^2$ + $C4^2$) / n] – 1

Approximate Values with Number of Cards Sorted (varies by number of categories)

0 cards sorted = - .23
4 cards sorted = 0.00
8 cards sorted = .20
12 cards sorted = .43 to .60
14 cards sorted = .78
15 cards sorted = .88
16 cards sorted = 1.00

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