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Children's use of strategic techniques for remembering and the effectiveness of these deliberate strategies both improve across elementary school. However, developmental scientists are still in the early stages of exploring the course of development within individual children as well as the social processes that may influence this development. In a parallel literature, research on children's autobiographical memory has documented variations in children's memory skills as a function of parental elaborative style during shared conversations about the past, or mother-child reminiscing. This linkage suggests that perhaps something about this reminiscing context may also be important for the development of strategic memory skills. The current study allows for the examination of associations between children's deliberate memory and autobiographical memory as well as how both types of memory may be scaffolded by mother-child reminiscing. Using data from the first cohort of an ongoing study about children's memory, correlational analyses were conducted between kindergarten children's autobiographical memory and their deliberate strategy use and recall. Hierarchical linear regression models were used to predict these child outcomes from parents' observed elaborative reminiscing style. Results supported the connection between children's deliberate strategy use and recall as well as the association between parents' elaborative style and children's autobiographical memory. Interestingly, parents' elaborative style did not predict children's spontaneous strategy use, but rather their use of an organizational strategy after explicit training, suggesting that parents' style

is related to children’s ability to take advantage of instruction in a specific memory strategy. These findings provide valuable insight into the socialization of cognition, but also raise important questions about the role of parental processes in specific aspects of children’s memory development.

THE DEVELOPMENT OF CHILDREN'S AUTOBIOGRAPHICAL AND DELIBERATE MEMORY THROUGH MOTHER-CHILD REMINISCING

by

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CHAPTER I

INTRODUCTION

The early years of a child's life have been identified as a period of drastic growth in skills for remembering. Subsequently, research conducted towards the end of the 20^{th} century aimed to characterize children's memory, age-related differences, and the mnemonic strategies that children employ (Ornstein, Baker-Ward, & Naus, 1988). Prior to that time, it was assumed that children were rather non-strategic in their deliberate memory skills (for a review, see Ornstein, Baker-Ward, & Naus, 1988). It has since been shown that children's use of appropriate techniques for remembering and the effectiveness of deliberate strategies improves throughout elementary school (Ornstein, Haden, & San Souci, 2008). However, developmental scientists are still in the early stages of exploring both the course of development within individual children and the social processes that may influence this development (Ornstein & Haden, 2001). The research on the development of children's deliberate memory skills may be informed by a separate, but parallel literature on children's autobiographical memory. Indeed, through understanding the similarities between these two types of memory, as well as utilizing a contextualist approach to developmental science, important questions can be posed about the socialization of cognition.

In this parallel literature, research on children's autobiographical memory has focused on children's narratives of episodic memories. Autobiographical memory differs from episodic memory by integrating perspective interpretation, and evaluation of one's self, others, and time in order to cultivate a personal history (Fivush, 2011). Children's autobiographical memory is thought to be constructed through language processes, such as conversations and narrative building (Fivush, 2008), research that is informed by a cultural context that attaches values to the purpose of autobiographical memory (Wang & Ross, 2007). From a social constructivist perspective, children's autobiographical memory is scaffolded through parental support during shared reminiscing of past events (Vygotsky, 1978; Fivush, 2011), thus providing children with opportunities to encode, retrieve, and express autobiographical memories in narrative form (Ornstein, Haden, & Elischberger, 2006). However, it remains relatively unclear what specific aspects of mother-child reminiscing may be tied to children's development of autobiographical memory.

Examining these two separate areas of research focused on children's memory development, some researchers have investigated the overlap between deliberate strategy use and autobiographical memory (Langley, Coffman, & Ornstein, 2017). It has been suggested that studies aiming to better understand the process of children's memory development should be willing to move across conceptual boundaries of the information processing and social constructivist perspectives (Ornstein & Haden, 2001). To this day, relatively little is known about longitudinal and intra-individual developmental change in children's memory; there is even less information about how social forces at school or at home facilitate this change (Ornstein & Haden, 2001). Therefore, the current study examines two types of memory in young children, autobiographical and deliberate memory, as they are scaffolded by parental processes. Three key questions will be addressed in the following study about the development of children's memory: 1) *How is children's deliberate strategy use related to recall?* 2) *How are children's deliberate memory and autobiographical memory related?* and 3) *What role does mother-child reminiscing play in the development of children's autobiographical memory as well as their deliberate memory skills and use of deliberate strategies for remembering?*

Theoretical Framework

The existing body of literature that is focused on the development of memory utilizes two contrasting theoretical perspectives, thus carrying conflicting assumptions regarding the use of methods and the interpretation of findings (see Overton, 1991). By acknowledging the merit in both perspectives, the current study employs lab-based assessments of memory as well as collects information about the contexts of children's lives. It is important to recognize that laboratory research is not representative of children's everyday lived experiences, especially in communities where testing is not a common experience (Rogoff, Mejía-Arauz, & Correa-Chávez, 2015). Therefore, it is necessary to better understand how this study carries assumptions, hypotheses, and implications about children's everyday lives (Dahl, 2017).

According to Goldhaber (2000), theoretical assumptions arise from three major questions about human development. The first question addresses how well findings can be generalized to the entirety of the human species, or the universality of human development. The second question concerns the extent to which environmental (efficient), biological (material), and the interaction (formal) of these causes in a system effect human development. The third and final question addresses if factors comprising the process of developmental change can be reduced to their individual parts, or if they must all be considered in a holistic manner.

Further discussed by Goldhaber (2000), laboratory-based research in the field of children's memory encapsulates a *mechanist* worldview. From this perspective, children's memory develops as a function of both material and efficient causes, those of which can be reduced and separated from one another, and this development is universal across all human beings. Since the effects of individual variables can be isolated, experimental designs are considered a cornerstone of research employing a mechanistic approach. Moreover, there is no need to control for ecological validity since all findings are assumed to be generalizable across various settings and samples.

Starkly contrasting this worldview, work employing a *contextualist* perspective does not follow a reductionist analysis in which material and efficient causes are teased apart, rather it employs a holistic approach asserting that development is situation specific. Within the memory literature, it seems that researchers coming from this perspective are more concerned with what memory is used *for* rather than what memory *is* (see Fivush, 1993). For it is the context, reflecting multiple dimensions, that allow scientists to determine the conclusions that may be made from a study (see Baker-Ward, Ornstein, & Gordon, 1993).

The current study examines one context hypothesized to scaffold children's memory: parent-child conversations. Not only has the inclusion of contextual factors informed areas of inquiry, but without considering the dimensions of these contexts, findings from this study would not be understood as they relate to the "real world." Baker-Ward and Ornstein (2013) identified 13 key dimensions of context, of which lab- and field-based research differ, including emphasis on experimental control, meaningfulness of the memory task, and the participants' knowledge of the task and materials. For example, it is understood that children's memory performance looks different across tasks that are meaningful (mother-child reminiscing) and less meaningful to them (lab-based task administered by researcher). But it is also important to consider the sociocultural validity of measures, even if they claim to capture contextual information. Rogoff (2003) suggested that studying contexts separately from people is simply the same as studying people without contexts. Although many researchers claim to examine context in order to better understand behavior, the current study does not aim to separate behavior from context (e.g. conversations *at* home). In line with a contextualist perspective, this study employs measures that do not fit with the assumption that a boundary exists between individuals and context or culture (Rogoff, 2003; 2011).

A Multi-Level Approach

Since children come to understand the world through daily interactions with those closest to them, as well as active participation in community practices and social practices (Rogoff, 2003; Wang, 2013), cognitive development is acknowledged as a multifaceted, complex, and dynamic process that transpires within a cultural context (Wang, 2018). Culture can interact with cognitive development on different levels of context, from national policy to family practices. Therefore, a multi-level analysis approach is required to answer complex questions about children's cognitive development (Dweck, 2017; Halpern, 2017).

One way that researchers have conceptualized multiple levels of context is by using a bioecological systems perspective to examine the environment as it extends beyond initial settings of observation. Conceptualized by Bronfenbrenner (1977b), the environment consists of interconnected levels of a system, nested within one another, extending outward from the individual. With the individual at the center, the first level, or the *microsystem*, encapsulates the environment that is directly experienced by the individual (i.e. school, home, and family). The *mesosystem* addresses the interaction of settings housed in the microsystem (i.e. interaction of school and home). It is also important to understand how children's memory is developing as a function of indirect forces in the *exosystem*—for example, a parent's place of work may influence the way they interact with their child, indirectly effecting their development (Bronfenbrenner, 1977a). Lastly, work that includes indicators of the *macrosystem* aims to better understand societal-level influences on children's development, such as culture, beliefs, or customs (Bronfenbrenner, 1977b). This multi-level theoretical model not only explains how levels of context interact with one another, but how cognitive development is shaped by multiple levels of context simultaneously.

One final piece of Bronfenbrenner's bioecological systems theory that is of great relevance to parent child conversations is *proximal processes*. Proximal processes are viewed as a primary mechanism of development when considering two propositions of Bronfenbrenner's framework. The first proposition describes the nature and definition of proximal processes: “Human development takes place through processes of progressively more complex reciprocal interaction between an active, evolving biopsychological human organism and the persons, objects, and symbols in its immediate external environment,” (Bronfenbrenner & Morris, 1998, p. 996). From Bronfenbrenner and Morris’s (1998) written examples (i.e. playing or interacting with a young child, reading, and learning new skills), parent-child conversations align with this definition of proximal processes given their reciprocal and routine nature. Bronfenbrenner and Morris’s (1998) second proposition addressed the nature of proximal processes by focusing on the interaction between individual characteristics and environmental context:

> The form, power, content, and direction of proximal processes effecting development vary systematically as a joint function of the characteristics of the *developing person*; of the *environment*… the nature of the *developmental outcomes* under consideration; and the social continuities and changes occurring over *time* through the life course and the historical period during which the person has lived.
>
> (p.996, italics in the original)

In a systematic review of the use and misuse of Bronfenbrenner’s bioecological systems theory, Tudge, Mokrova, Hatifeild, and Karnik (2009) argued that in order to apply the theoretical framework in its entirety, information describing individual characteristics, environmental factors, and the process by which developmental change occurs over time must be included in analyses to preserve the integrity of the theory in its most mature form: the *Process-Person-Context-Time* (PPCT) model (Bronfenbrenner & Morris, 1998). Although many studies have not included all components of the PPCT model (Tudge et a., 2009), the current study aims to maintain a tight connection between

Bronfenbrenner's bioecological systems theory and the selected methodology and analyses. When used properly, Bronfenbrenner's framework can serve as a strong foundation for substantive models that aim to examined developmental change in context.

Of the two child-level outcomes in the current study, autobiographical memory has been examined using a group-level analysis to understand differences in its development across cultures. As early as preschool, cultural priorities align with different self-goals in children (Wang, 2014). For example, Han, Lichtman, and Wang (1998) found that European-American children exhibited narratives of their episodic memories in ways that often referred to their own roles or subjective experiences (e.g., "I really wanted the red bag" and "The game was boring"); this may be due to the fact that many Western, particularly European American, cultures motivate individuals to elaborate on unique, personal experiences relevant to that individual's roles, feelings, and perspectives (Wang, 2018). Whereas relational self-goals, such as to fit in and belong are prioritized in many non-Western cultures (Wang, 2018).

Autobiographical memory has also been explored from a dyadic-level analysis situated in cultural context. This area of work has revealed how European American parents, while engaged in elaborative conversations about past with their children, focus on specific episodes, supplement rich embellished information, and strongly scaffold children's participation (Choi, 1992; Hudson, 2006; Martini, 1996; Mullen & Yi, 1995; Wang, 2001; Wang, Leichtman, & Davies, 2000).

On the other hand, questions around deliberate memory would benefit from being analyzed from a situation-level analysis. Although memory can be generally conditioned and activated intentionally, everyday situations may render memory more or less accessible to the individual (Hong et al., 2000). It has been suggested that academic settings may activate individual self-goals specific to said academic situations (Wang, 2018). By this virtue, it's understandable that some students may interact with the academic setting differently than others; these differences may result in variation in the development of deliberate memory.

By using a multi-level approach, the current study aims to paint a more detailed picture of how children's autobiographical and deliberate memory are directly and indirectly influenced context. By examining a microsystem-level process (parent-child conversations) on children's memory development, the current study will provide invaluable insight in an area that has been left relatively unexplored (Langley et al., 2011).

Literature Review

The Definition of Autobiographical Memory. An area of cognition speculated to be uniquely human is autobiographical memory. It moves beyond the mere recollection of experienced events to integrate perspective interpretation, and evaluation of one's self, others, and time in order to cultivate a personal history (Fivush, 2011). Autobiographical memory has been defined as an explicit and episodic memory of one's personal experience of an event of a specific time and place (Bauer & Fivush, 2010). Yet some researchers make a strong case for distinguishing between autobiographical and episodic memory (for a review, see Fivush, 2011). In order to allow for a more complete understanding of the development of each of these two types of memory, it is necessary to first differentiate between components of episodic memory. Episodic memory is thought to be comprised of two components: the first is the concrete details (who, what, when, where) whereas the second involves autonoetic consciousness, or the awareness that recalling a memory displaced by time is necessary (Tulving, 2002).

Fivush (2011) views autobiographical memory as building upon episodic memory in three ways: 1) episodic memories are joined together to construct an ongoing personal history and life narrative (Habermas & Bluck, 2000, McAdams, 2001), 2) these episodic memories serve social and emotional functions such as self-regulation, self-definition, and self-in-relation (Bluck & Alea, 2002, Fivush, 1988; Fivush et al., 2003; Pillemer, 1998), and 3) that autobiographical memories transcend other episodic memories in that they include memory of the self as the experiencer of that event, otherwise referred to as autonoetic consciousness (Tulving, 2002).

The Purpose of Autobiographical Memory. Human activity within a social-cultural model specifies what it is to be a person (Rogoff, 1990; Vygotsky, 1978). Individuals within a culture form a shared representation of reality that guides the definition of appropriate behavior (Nelson & Fivush, 2004). From an early age, children and infants are introduced to appropriate forms of behavior and socialized to strive for culturally valued skills, that are required to serve as a competent member of that culture. Autobiographical memory has therefore been identified as social-cultural skill: the purpose of which is determined by cultural values and norms (Fivush, 2011). For example, in Western cultures, adults are expected to have a coherent set of connected memories that describe who they are as a person (McAdams, 2001; Wang & Ross, 2007).

The concept of “self” as an autonomous being and that past experiences create and cause one’s future experiences is considered to be an idea specific to Western cultures (Fivush & Haden, 2003; Oyserman & Markus, 1993; Triandis, 1989). Because of this shared understanding of the value of autobiographical memory, the way that parents pass down its cultural value is present in socialization processes, such as parent-child conversations about shared past events, or mother-child reminiscing.

The socialization process of mother-child reminiscing has been found across an array of cultures (Miller et al., 1990), but the way in which parents reminisce with their children and the types of events under discussion vary. For example, Reese, Hayne, and MacDonald (2008) found that when Maori mothers engaged in reminiscing about their child’s birth story, they engaged in a highly “elaborative style” characterized by asking Wh- questions, making associations between the event under discussion, validating comments made by their children more frequently, and evaluating their children’s contributions to the conversation in a positive and routine manner. However, this elaborative style was not present in reminiscing about other shared routine events. Another example of variations across cultures comes from a study comparing Chinese mothers and European American mothers: Chinese mothers were especially elaborative about children’s role in appropriate social interactions compared to European American mothers (Wang & Fivush, 2005). Both of these examples indicate that the socialization of memory varies across cultural contexts, yet more research is required to better understand how this process results in culturally salient outcomes in children.

Mother-Child Reminiscing. A large portion of literature investigating children's autobiographical memory aims to examine its development in context. More specifically, researchers have investigated how children's autobiographical memory develops as a function of parental scaffolding in conversations about shared past events, or mother-child reminiscing. From a social constructivist perspective, when children start to engage in social activities outside their capabilities, adult scaffolding allows children to partake in these advanced activities that are otherwise inaccessible (Vygotsky, 1978; Haden, Haine, & Fivush, 1997). Indeed, this scaffolding process has been regarded has highly impactful in the facilitation of both the initial learning as well as future competence of a new skill (Vygotsky, 1978; Cox, Ornstein, & Valsiner, 1991). In this regard, language interaction between parents and children is the one of the primary mechanisms furthering cognitive development (Fivush, Haden, & Reese, 2006).

The process by which parents scaffold their children's memory looks different across families. One area of interest to researchers has been how mothers reminisce with their young children. A range of long-term benefits from reminiscing, including autobiographical memory development, has been established in the literature through longitudinal correlational and experimental studies (see Fivush, Haden, & Reese, 2006; Reese, 2013, for reviews). Langley, Coffman, and Ornstein (2017) described how variations in development of autobiographical memory skills arise from maternal reminiscing style: mothers who use a "high elaborative" style ask more Wh- questions, make more associations between the event under discussion, validate comments made by their children more frequently, and evaluate their children's contributions to the conversation in a positive and routine manner. A substantial amount of research has supported the connection between the elaborative style that parents carry when talking with their children (e.g. providing factual and emotional details, asking open-ended questions) and the subsequent amount of detail that children later remember about these events (Haden, Ornstein, Rudek, & Cameron, 2009; Jack, MacDonald, Reese, & Hayne, 2009; McGuigan & Salmon, 2004, 2006; Reese, Haden, & Fivush,1993; van Bergen & Salmon, 2010). This process has also been supported through experimental work in which mothers are coached in elaborative reminiscing. Children of mothers that were taught how to reminisce elaboratively evidenced more accurate and detailed autobiographical memories, more advanced emotion understanding, and higher levels of theory of mind (Reese & Newcombe, 2007; Taumoepeau & Reese, 2013; van Bergen, Salmon, Dadds, & Allen, 2009). These children also were able to deliver higher quality narratives about their own and others' experiences (Peterson, Jesso, & McCabe, 1999; Reese, Leyva, Sparks, & Grolnick, 2010; Reese & Newcombe, 2007).

Despite these findings, one limitation facing the mother-child reminiscing literature is the conceptualization of elaborative style. Although almost all studies in this sub-field have used a structural-functional coding scheme (Reese, Haden, & Fivush, 1993) identifying types of relevant categories of language, a lack of consensus persists regarding what aspects of elaborative style are relevant to memory development. The coding scheme created by Reese, Haden, and Fivush (1993) identified language categories of *elaborations* (statements /questions that add or request for more information about the event), *confirmations* (statement that confirm information given by the child), *repetitions* (repeating information), *associations* (describing past, future, or related events to the event under discussion), and *metamemory talk* (remarks about the remembering process or performance). Although the coding scheme allows for various types of language to be captured, Reese, Haden, and Fivush (1993) identified *elaborations* as the most instrumental subcomponent of elaborative style. Further work by Fivush, Haden, and Reese (2006) provided an extensive review on the integral role of elaborations as it relates to children's autobiographical memory development. However, the conceptualization of elaborative style has ranged from including *elaborations, repetitions,* and *confirmations* (Haden, Ornstein, Rudek, & Cameron, 2009), *elaborations* and *repetitions* (Jack, MacDonald, Reese, & Hayne, 2009), to *elaborations, associations, confirmations*, and *metamemory talk* (Langley, Coffman, & Ornstein, 2017). Differences in conceptualization across studies may be due to differing topics of inquiry, but this variability needs to be addressed when interpreting associations between parental input to children's memory development.

The relationship between maternal reminiscing style and children's contributions to reminiscing is viewed as bidirectionally influential. Mothers have shown to adapt their reminiscing style to child-level attributes such as attentional self-regulation and language skills (Bird, Reese, & Tripp, 2006; Farrant & Reese, 2000; Laible, Panfile Murphy, & Augustine, 2013; Rothbart, Ahadi, Hershey, & Fisher, 2001). Moreover, mothers' reminiscing style has been shown to differ as a function of previous attachment security in toddlerhood: mothers exhibited a higher elaborative style if they had previously formed a secure attachment with their children during toddlerhood (Newcombe & Reese, 2004; Raikes & Thompson, 2006).

Although mothers have shown to adapt their reminiscing style to children's attributes, elaborative style is relatively stable across children within the same family (Haden, 1998), across these same children over time (Haden et al., 2009; Jack et al., 2009, Reese et al., 1993), and across different types of events under discussion (Reese & Brown, 2000; Reese & Neha, 2015). However, elaborative style does not seem to transfer to other instances of parent-to-child talk. Haden and Fivish (1996) found that mothers who were classified as highly elaborative in a reminiscing task were not necessarily highly elaborative in conversations about present events. Findings from work by Liable (2004) and Leyva, Sparks, & Reese (2012) also suggest that this elaborative style present in reminiscing does not transfer to other abstract conversations, such as extratextual talk during shared book reading. When taken together, these findings suggest that maternal reminiscing style is specific to events displaced by time.

The Definition and Measurement of Deliberate Memory. In contrast to the incidental nature of autobiographical memory, deliberate memory development has been conceptualized as the development of children's information processing in situations in which retention-specific actions (e.g., strategies) and higher-order cognitions are activated with the intention to remember target information (Roebers, 2013). With this definition in mind, researchers are primarily interested in the mnemonic techniques and strategies employed by participants and how that is related to their recall ability in tasks designed to assess deliberate memory (Ornstein et al., 2006; Schneider & Pressley, 1997).

One assumption of this line of inquiry is that memory strategies are at least in part under control of the individual. Memory strategies can be activated or terminated, modified or combined with other information processes (Ornstein et al., 2006). A second assumption implied by research on strategic memory is that memory strategies are exhibited consistently under similar task conditions; they should be distinguished from trial-and-error memory-related behaviors (Bjorklund, Dukes, & Brown, 2009). Deliberate memory is typically measured in laboratory settings where subjects are aware that the information or materials (e.g., words, pictures, objects) presented to them will need to be recalled at a later time (Ornstein, Haden, & San Souci, 2008). Laboratory-based tasks are ideal for lines of inquiry aiming to characterize children's memory and better understand the stages of its development; it is assumed that these findings are generalizable to all individuals across varying contexts.

Children's Strategy Use in Deliberate Memory Tasks. Children have shown to exhibit strategy-like behaviors (e.g., pointing, naming) as early as 18 months old (DeLoache, Cassidy, & Bown, 1985). These precursors of strategic memory skills are viewed as potentially indicative of children's ability to learn and employ strategic memory techniques later on when they enter formal schooling. Indeed, Baker-Ward, Ornstein, and Holden (1984), found that 4-year-old children exhibited study-like behaviors in a deliberate memory task. However, unlike the 6-year-olds in their study, their use of strategic behaviors was not related to their recall ability. Despite this, the presence of early strategy use suggests that kindergartners and preschoolers do understand the deliberateness of strategic memory: they should do *something* to work to remember information. Further supported by this study, children's use of appropriate techniques for remembering, and the effectiveness of said strategies, improves in elementary school (Ornstein, Haden, & San Souci, 2008). Causal linkages between strategic behavior and recall have been established through experimental training where in which children are coached to use strategic organizational techniques for remembering (e.g., Ornstein, Medlin, Stone, & Naus, 1985). This furthers the notion that children's advancement in recall ability is perhaps impacted by contextual factors.

Connections Between Autobiographical and Deliberate Memory. Despite being housed in separate literatures, Ornstein et al. (2006) suggest that the same key process of remembering (e.g. encoding, storage, retrieval, and reporting) underlies both autobiographical and deliberate memory. Langley et al. (2017) also described this overlap when comparing the two: autobiographical memory can be viewed as a blend between incidental and deliberate memory-- that although events are experienced without the intention of being remembered, the retrieval process is deliberate. Another known similarity between these two types of memory is that they are both linked to adult-to-child "talk." The work of Fivush et al. (2006) and Coffman, Ornstein, McCall, and Curran (2008) suggests that adults' conversations with children is a potential mediator of developmental change in both autobiographical and deliberate memory. In the case of mother-child reminiscing, memory requests presented by parents have the potential to facilitate children's process of retrieval and report of memory. These conversations about the past provide ample opportunity for children to practice retrieving memories and expressing the retrieved information to another person. Ornstein et al. (2006) found that by this same process, preschoolers were able to gain skills known to be important for deliberate memory tasks. Specific to variability in mothers' conversational style, a study conducted by Coffman and colleagues (2011) revealed that mothers' greater use of metamemory talk during conversations was positively associated with the use of spontaneous organizational strategies in deliberate memory tasks by their children. Although it seems that there is some research that supports the connection between autobiographical and deliberate memory development, more research is necessary to better inform how children's memory development is influenced by parental processes.

The Current Study

The data used for this study comes from the Classroom Memory Study: an investigation of children's memory, academic achievement, and other cognitive outcomes as they relate to aspects of the classroom and home environments. The sample involves two cohorts of students as they enter kindergarten – and are tracked across the kindergarten, first- and second-grade years, totaling 7 timepoints. By using a subset of the larger study's sample (from Cohort 1) and a subset of tasks across two timepoints in kindergarten, analyses from this study will provide a preliminary picture of associations between children's performance and aspects of their home context. This investigation will lay the foundation for subsequent longitudinal analyses aiming to understand how children's cognition develops in context.

The following hypotheses, displayed in Figure 1, will be tested:

Hypothesis 1: Higher levels of children's autobiographical memory will be associated with higher levels of deliberate strategy use, both within and across timepoints.

Hypothesis 2: Higher levels of autobiographical memory will be associated with higher levels of deliberate recall, both within and across timepoints.

Hypothesis 3: Higher levels of children's strategy use will elicit higher levels of recall, both within and across timepoints.

Hypothesis 4: Children of parents using high elaborative style in a remising task will exhibit higher levels of autobiographical memory at Time 1 in the Fall of kindergarten.

Hypothesis 5: Children of parents using high elaborative style in a reminiscing task will exhibit higher levels of strategy use, both within and across timepoints.

Hypothesis 6: Children of parents using high elaborative style in a reminiscing task will exhibit higher levels of deliberate recall, both within and across timepoints.

CHAPTER II

METHODS

Participants

Parents, children, and teachers were recruited as participants in the Classroom Memory Study, a longitudinal study focusing on memory development in school settings. The overall study design involves two cohorts of students as they enter kindergarten – and are tracked across the kindergarten, first- and second-grade years. An initial sample of 76 kindergarten students were selected across 3 schools in a Southeastern school district. Families with children in participating classrooms received a letter of invitation to participate in the study, and all children who returned consent forms were enrolled in the Classroom Memory Study with no criteria for exclusion. However, the current analysis examines a subsample of participants that took part in *all* administered tasks under investigation in this study. Therefore, the current analytic sample is comprised of 51 children (49% Female) ranging in age from 4.93 years to 6.43 years (Mean = 5.68) at Time 1. The diversity of the sample was representative of the school district from which the participants were drawn, with 65% of the children identifying as Caucasian, 4% African American, 8% Asian/Pacific Islander, 19% mixed racial identity, and 4% not reported. Primary caregivers taking part in the study completed background questionnaires. Of the primary caregivers taking part in the study, 92% identified themselves as mothers, 4% were fathers, 2% were grandparents, and 2% were nannies or other caretakers. Caregivers also provided information about their educational background, revealing that 94% of primary caregivers in the sample have completed high school or received a high school GED.

Procedures

After being recruited, children participated in assessments after school to complete multiple cognitive tasks administered by a research assistant. Assessments were administered at kindergarten entry in the Fall (Time 1) and Spring of the academic year (Time 2). To assess children's strategy use and recall ability in tasks of deliberate memory, two assessments were selected from a battery of assessments to use in analysis: the Free Recall Task with Training and the Object Memory Task. All assessments were video-recorded and later coded by research assistants.

Audio-recorders were also sent home with children at the beginning of the kindergarten school year (Time 1) for primary caregivers and children to complete the mother-child reminiscing task. After returned to the research team, audio recordings were transcribed and then coded for analysis.

Measures

Free Recall Task with Training (Moely et al., 1992). This task was administered to participants at timepoints 1 (Fall) and 2 (Spring). This deliberate memory task explores children's use of organizational strategies during study time (e.g., sorting) (Ornstein & Corsale, 1979). The aim of this task is to assess children's spontaneous use of an organizational strategy for remembering as well as their ability to use the strategy after specific training in a sorting technique. In this task, children first complete a *baseline trial* that tests their ability to remember 16 individual line drawings that fall into 4 conceptual categories on notecards. These drawings are images familiar to young children and are listed in Appendix C. During this trial, children's spontaneous strategy use during an open-ended study time as well as their spontaneous clustering during recall are scored. Children then undergo a second trial, or *training trial*, in which the research assistant orients children to an organizational sorting strategy aimed at training children to sort the 16 line drawings into 4 categories, demonstrating the potential to assist their memory (e.g., "*See how these cards are all pictures of food?*", "*What should we call this category*?"). Children then undergo a third trial, or generalization trial using a new set of 16 line-drawings of 4 categories. Like the baseline trial, children are not provided specific instructions on how to remember the drawings, but rather told to "work to remember." The Adjusted Ratio of Clustering (ARC) measure (Roenker, Thompson, & Brown, 1971) is used to characterize children's sorting during study in a standardized index; the score can range from -1 (below chance) to 0 (chance) to 1 (perfect categorical sorting). As can be seen in Figure 2, The formula for calculating ARC scores takes into consideration the degree to which chance can contribute to children's strategic sorting scores. Recall scores were also calculated based on how many total line drawings children are able to recall at each trial.

Object Memory Task (Baker-Ward, Ornstein, & Holden, 1984). This task was administered to participants at Time 1 (Fall). The Object Memory Task is used to assess simple techniques for deliberate remembering, including behavioral and linguistic strategies children display while attempting to remember a set of stimulus objects (Baker-Ward, Ornstein, & Holden, 1984). Each child was given 2 minutes to remember a set of 15 unrelated items, listed in Appendix C. After 2 minutes passed, the objects were covered up by a cloth and participants were asked to recall everything they remember. The number of items that a child could recall ranges from 0-15. Administration of the task was video recorded for subsequent behavioral coding using the Observer XT v. 14 observational coding software. ***Behavioral Coding.*** Spontaneous strategies were coded using a coding scheme adapted from the work of Baker-Ward, Ornstein, and Holden (1984) that captured children's verbal strategies (e.g. naming, associative talk, object talk, categorizing) and behavioral strategies (e.g. pointing, manipulation, visual scanning). Behavioral strategies were coded as 'states' and therefore durations of these strategies were captured and summed into a total duration indicating a participant's behavioral strategy score. However, verbal strategies were coded as 'events' and therefore these codes were not coded for duration. The total number of event codes for each participant were summed to create a verbal strategy score. A composite score was also created to indicate the overall strategy use by the child. This was done be summing the total duration of behavioral codes and designating one second for each verbal code (ex. if a child exhibited five verbal strategies, five seconds were used to represent these events). The creation of the composite score is illustrated in Table 1, that displays the breakdown of individual codes within verbal and behavioral categories. Examples and descriptions of behavioral and verbal codes are shown in Table 2.

Mother-Child Reminiscing (Reese, Haden, & Fivush, 1993). This task was administered to participants at Time 1, in line with the assumption that maternal reminiscing style is stable across time (Reese et al., 1993; Reese, 2002). This task serves as a measure of children's autobiographical memory as well as parents' elaborative conversation style. Parents were instructed to think of two specific past events to discuss with their children that 1) were novel, 2) were shared between the parent and child, and 3) occurred over the past summer. Audio recorders were sent home with instructions for primary caregivers and children to reminisce at the time and place they desire, aiming to capture a more natural setting. After freely discussing the two past events, previously selected by the parent, audio recorders were returned to the research team to be transcribed verbatim. ***Conversation Coding.*** Transcriptions were then coded using a structural-functional coding scheme adapted from the work of Reese, Haden, and Fivush (1993) and Haden (1998). First, codes ascribed to utterances fell into two broad categories: maternal coding categories (MOT) and child (CHI). Although numerous individual codes within these categories can be provided, the primary codes of interest for parents included 1) open-ended questions, 2) yes-no questions, and 3) statement elaborations, and the primary code of interest for children was solely memory elaborations. Definitions and examples of child codes are discussed further below. Transcriptions were coded by research assistants, each establishing inter-rater reliability of at least 80% with a master coder at the beginning of coding.

Frequency of memory elaborations (MELABs) used by children was used to create scores representing children's autobiographical memory skills. A memory elaboration is defined as utterances made by the child that provide additional or new information about the event under discussion (e.g. "Grandma was there." "I had fun!") Based on the work of Reese, Haden, and Fivush (1993), elaborative style was measured by coding for elaborations. Parents' elaborations can fall into one of three categories of utterances: *statement elaborations, open-ended questions*, and *yes-no questions*. Statement elaborations are utterances that provide additional or new information about the event under discussion (e.g. "Grandma was there too." "I remember you said you felt really hot."). Open-ended questions are questions that ask the child for new information about the event under discussion (e. g. "How many people were there?" "What was the weather like?"). Yes-no questions are questions that ask the child to confirm or deny a piece of memory information. (e. g. "Was it hot or cold?" "Did you have fun?"). Definitions and additional examples of elaboration codes are displayed in Table 3.

Parental Education. Parental education was assessed through a self-reported background questionnaire completed by the primary caregivers of children participating in the study. Questionnaire results revealed that 4% of the sample of primary caregivers have received vocational or associate's degrees, 22% have a bachelor's degree, 32% have a master's degree, and 42% have professional degrees such as a PhD, MD, or JD. Results were then coded into an ordinal categorical variable and included as a covariate in statistical analyses (0 = no postsecondary education, 1 = some postsecondary education, 2 = vocational or associate's degree, 3 = bachelor's degree, 4 = master's degree, 5 = professional degree).

Children's Working Memory. Children's working memory was assessed using the Digit Span task (Jacobs, 1887). The children were read a string of numbers up to nine digits and asked to repeat the numbers they were read. If they answered incorrectly, they were given another string of the same length. Four separate trials comprised one test, two in which children are asked to correctly repeat the string of numbers forwards and two in which children are asked to correctly repeat the string of numbers backwards. The largest backward string (DIGlbs) was used as a covariate in the current analysis, or the largest backward string of numbers that a child can recall during the assessment. The largest backward string was chosen to assess children's working memory because children must first encode information, store it, manipulate it (for further backwards recall) and then recall and report this information. Because of this cognitively demanding process, the largest backward string was chosen over the longest forward string when considering its role as a control variable.

Analytic Strategy

All data analyses were conducted using SPSS v. 23 (Armon, NY, IBM Corp). First, descriptive statistics were computed for all child-level outcomes: Frequency and percentage of MELABs representing children's autobiographical memory, Sorting ARC scores representing children's strategy use in the Free Recall Task with Training, verbal, behavioral, and composite strategy scores for strategy use in the Object Memory Task, and recall scores representing children's recall ability in both the Free Recall Task with Training and the Object Memory Task. This provided preliminary findings about the distribution of children's autobiographical memory, strategy use, and recall scores in the fall and the spring of the kindergarten year.

Next, correlational analyses were conducted between tasks at the child level to address Hypotheses 1-3. This allowed for interpretation of associations between children's performance on an autobiographical and deliberate memory task within as well as across two timepoints.

After understanding memory outcomes as they relate to one another within and across timepoints, analyses were conducted to better understand the role of parents' elaborative style in children's autobiographical memory, deliberate strategy use, and deliberate recall. This was approached in a similar way to the child-level outcomes by first providing descriptive statistics about distributions of individual codes that comprise these composite measures. Then descriptive statistics were provided pertaining to the distribution of parents' elaborative style at Time 1. This allowed for further understanding surrounding the type of language parents use when reminiscing with children. As noted previously, parents' elaborative style was only analyzed at Time 1 (Reese et al., 1993; Reese, 2002), but it was included in regression models predicting children's strategic skills and recall for both Time 1 and Time 2. Findings from these analyses identified associations between aspects of maternal style and children's memory performance.

Hierarchical linear regressions were conducted predicting children's autobiographical memory, deliberate strategy use, and deliberate recall at Time 1 from parents' elaborative style at Time 1 (Hypotheses 4-6). Regression analyses were also conducted predicting children's deliberate strategy use and deliberate recall at Time 2 from parents' elaborative style at Time 1 (Hypotheses 5 & 6). All hierarchical linear regressions included covariates of parental education and children's working memory. Significant interactions are recognized when comparing p-values to an alpha of .05. Results within and across two timepoints are discussed by highlighting significant findings they address.

CHAPTER III

RESULTS

First, descriptive statistics were computed for all child and parent variables. Then within-task correlations were conducted in order to describe associations between strategy use and recall for both deliberate memory tasks, the Object Memory Task and the Free Recall Task with Training. Across-task correlations were then conducted to describe associations between deliberate strategy use and recall and children's autobiographical memory. Finally, a series of hierarchical regression analyses were conducted to predict children's deliberate strategy use, recall, and autobiographical memory.

Child-Level Descriptive Statistics by Task

Descriptive statistics are provided for both independent and dependent variables in the current study, including 1) children's MELABs at Time 1 representing their autobiographical memory, 2) children's spontaneous strategy use and recall in the Object Memory Task at Time 1, 3) children's strategy use at baseline and generalization trials of the Free Recall Task with Training at Time 1 and the generalization trial at Time 2, 4) children's recall at baseline and generalization trials of the Free Recall Task with Training at Time 1 and the generalization trial at Time 2, and 5) parents' elaborative style at Time 1.

Mother-Child Reminiscing. Children's Autobiographical memory is measured by averaging the frequency of MELABs, or utterances that add additional or new information about the event under discussion, across the two events under discussion in the mother-child reminiscing task. Within the current sample, MELABs ranged from 2 to 84 occurrences with a mean of 25.26 (*SD* =16.49).

Object Memory Task. Children's spontaneous strategy use was measured by summing the total duration of verbal and behavioral strategies employed during the 2-minute study period. As can be seen in Table 3, the number of verbal strategies that children evidenced ranged from 0 to 63 strategies, with a mean of 10.55 (*SD* = 14.16), whereas the average duration of behavioral strategies ranged from 61 to 123 with a mean of 113.18 (*SD* = 16.51) at Time 1. It is important to remember that within the descriptive statistics for children's verbal strategies, for figures representing duration, 1 second was used as a placeholder for each instance of a verbal code. A composite strategy score was calculated by combining the total number of strategies, verbal and behavioral, that were used by each child. Shown in Table 3, children's composite strategy scores ranged from 63 to 181 with a mean of 123.73 (*SD* = 19.79). The number of objects that children were able to recall ranged from 1 to 12 with an average of 6.82 (*SD* = 2.33). There were 15 total objects that children had the opportunity to recall.

Free Recall Task with Training. The index of children's strategy use in this task was their strategic sorting, as measured by the sorting ARC score, which represents the degree to which children sorted the 16 cards into 4 conceptual categories during the study phase of each trial. Using the Adjusted Ratio of Clustering (ARC) measure

(Roenker, Thompson, & Brown, 1971), scores could range between -1 (below chance level of categorical sorting) and 1 (complete categorical organization). Shown in Table 4, the mean sorting ARC score increased from below chance at baseline of Time 1 ($\bar{x}$ = -.21, *SD* =.14), to approximately chance at generalization of Time 1 ($\bar{x}$ = -.03, *SD* = .427), and then to above chance at generalization of Time 2 ($\bar{x}$ = .07, *SD* =.50). At baseline of Time 1, the children's sorting ARC scores ranged from -.23 to .78. However, at generalization trials for Time 1 and Time 2, the range widened to a minimum score of -.23 and a maximum of 1, showing that some children sorted all 16 cards into the 4 semantic categories.

Children's recall scores indicate the total number of stimuli children remembered for each trial of the Free Recall Task with Training. As can be seen in Table 4, children's average recall at generalization trial increased from 7.34 cards (of the 16) at Time 1 to 8.39 at Time 2. However, children's recall scores slightly decreased from 7.75 at the baseline trial to 7.34 at the generalization trial within Time 1.

Parent-Level Descriptive Statistics

Parents' elaborative style was assessed using a coding scheme that was adapted from the work of Reese, Haden, and Fivush, (1993). Elaborative style was measured by first summing all elaborations across codes of 1) statement elaborations, 2) open-ended questions, and 3) yes-no questions. Then frequency of elaborations was averaged across the two events under discussion in the mother-child reminiscing task. Shown in Table 5, Elaborative style ranged from 7.5 to 119 with a mean of 39.58 (*SD* = 22.59).

Child-Level Within-Task Correlations

After reporting the descriptive statistics for all independent and dependent variables, within-task correlations were conducted in order to describe the associations between strategy use and recall for both deliberate memory tasks of the Object Memory Task and the Free Recall Task with Training.

Object Memory Task. As is displayed in Table 6, children's composite strategy scores were positively associated to recall at Time 1 ($r = .29$, $p < .05$). For the two subcomponents of the composite strategy score, although children's behavioral strategies were not related to recall, children's verbal strategies were significantly associated with their recall performance at Time 1 ($r = .28$, $p < .05$).

Free Recall Task with Training. Within Time 1, children's baseline recall and generalization recall were significantly associated with one another ($r = .41$ $p < .01$) as can be seen in the first column of Table 7. Additionally, children's sorting ARC scores at generalization were significantly associated with their generalization recall at Time 1 ($r = .31$, $p < .05$), as can be seen in the third column of Table 7. Similarly, at Time 2, children's sorting ARC scores at generalization ($r = .57$, $p < .01$) were related to their recall, as can be seen in the 5th column of Table 7.

As can be seen in the 2nd column of Table 7, children's sorting ARC scores during the baseline trial at Time 1 were associated with their generalization recall at Time 2 ($r = .33$, $p < .05$). Additionally, children's generalization sorting ARC scores for Times 1 and 2 were associated with one another ($r = .35$, $p < .05$).

Child-Level Across-Task Correlations

In order to describe the relations between children's autobiographical and deliberate memory, bivariate correlations were conducted between children's MELABs strategy use in the Object Memory Task and the Free Recall Task with Training, as well as recall in the Object Memory Task and the Free Recall Task with Training. Shown in Table 8, children's MELABs were not associated with their recall on either the Free Recall Task with Training or the Object Memory Task task across any trials and timepoints. Children's MELABs were also not significantly related to their spontaneous strategy use in the Object Memory Task, nor their spontaneous strategy use at the baseline trial of the Free Recall Task with Training at Time 1. However, after receiving training in the Free Recall Task with Training, children's MELABs were found to be positively associated with their strategy use at the generalization trial of the Free Recall Task with Training for both Time 1 ($r = .30$, $p < .05$) and Time 2 ($r = .28$, $p < .05$).

Hierarchical Regressions Predicting Child Outcomes

After conducting correlational analyses across child-level variables, hierarchical linear regressions were conducted to address hypotheses 4-6, predicting child-level outcomes from parents' elaborative style while controlling for parental education and children's working memory.

Children's Autobiographical Memory. A hierarchical regression analysis was conducted to predict children's autobiographical memory skills, or MELABS, from parents' elaborative style while controlling for children's working memory and parental education. Shown in Table 9, the results for Step 1 of the hierarchical regression revealed that neither parents' education nor children's working memory significantly predict children's MELABs. At Step 2, after adding parents' elaborative style, the model significantly predicted children's MELABs (ΔR^2 = .60, p < .001) and explained 64% of the variance in children's autobiographical memory (R^2 = .63). In the final model, parents' elaborative style was found to be a significant contributor to the model (B = .56, β = .78, p < .001) over and above both children's working memory and parental education.

Children's Deliberate Memory Strategy Use. A series of hierarchical regression analyses were conducted to predict children's strategy use and recall in the Free Recall Task with Training and the Object Memory Tasks across trials and timepoints. For all regressions predicting children's strategy use or recall, children's working memory and parental education were included as covariates. Shown in Tables 10 - 13, analyses examining children's strategy use across tasks were conducted first. Shown in Table 10, the results for Step 1 of the hierarchical regression analysis predicting children's Object Memory Task composite strategy scores at Time 1 revealed that neither children's working memory nor parental education significantly predicted children's strategy use. At Step 2, after adding parents' elaborative style, the model still did not significantly predict children's composite strategy scores (ΔR^2 = .02, p > .05). Explaining only 5% of the variance in children's composite scores (R^2 = .05), neither parents 'elaborative style nor covariates significantly contributed to the overall model.

Results for the regression analysis predicting children's baseline sorting in the Free Recall Task with Training at Time 1 were similar and are displayed in Table 11. At

Step 1, neither children's working memory nor parental education significantly predicted their spontaneous sorting ARC scores. Results remained not statistically significant at Step 2 after adding parents' elaborative style to the model (ΔR^2 = .00, p > .05) and explained 4% of the variance in children's baseline sorting scores (R^2 = .04). Neither children's working memory nor parents' elaborative style contributed significantly to the overall model.

Results for the hierarchical regression analysis predicting children's sorting ARC scores at the generalization trial at Time 1 are displayed in Table 12. At Step 1, neither children's working memory nor parental education significantly predicted the outcome. But at Step 2, after adding parents' elaborative style, the model was found to be predictive of children's sorting ARC scores after training, at the Time 1 generalization (ΔR^2 = .09, p < .05) and explained 12% of this outcome (R^2 = .12). In Step 2 of the model, parents' elaborative style significantly contributed to the model over children's working memory (B = .01, β =.31, p < .05).

The final hierarchical regression analysis predicting strategy use examined children's generalization sorting ARC scores at Time 2. Shown in Table 13, at Step 1, neither children's working memory nor parental education predicted the sorting ARC scores at generalization of Time 2. After adding parent's elaborative style to the model at Step 2, results remained non-significant (ΔR^2 = .00, p > .05) and explained 1% of the variance in the outcome (R^2 = .01). Neither parents' elaborative style nor covariates significantly contributed to the overall model when predicting children's sorting ARC scores at generalization of Time 2.

Children's Deliberate Memory Recall. The final group of hierarchical regression analyses, shown in Tables 14 - 17, examine the role of children's working memory as well as parents' elaborative style when predicting children's recall ability on the Object Memory and the Free Recall with Training Tasks across trials and timepoints. Shown in Table 14, the results for Step 1 of the hierarchical regression analysis predicting children's Object Memory Task recall scores at Time 1 revealed that although children's working memory significantly predicted to the model (B= .90, β = .30, $p < .05$), the overall model at Step 1 was not predictive of children's recall scores and accounted for only 12% of the variance in these scores (R^2 = .12). After adding parents' elaborative style at Step 2, the model remained non-predictive of children's Object Memory Task recall scores (ΔR^2 = .01, $p > .05$) and children's working memory was no longer a significant contributor to the overall model.

Similar results are displayed in Table 15 for the hierarchical regression analysis predicting children's baseline Free Recall Task with Training recall scores at Time 1. At Step 1, children's working memory significantly predicted their baseline Free Recall Task with Training recall scores (B= 1.90, β = .53, ΔR^2 =.30, $p < .001$) and accounted for 30% of the variance in these scores (R^2 = .30). At Step 2, children's working memory remained a significant contributor to the model, but when adding parent's elaborative style, the overall model was not significantly predictive of children's baseline Free Recall Task with Training recall scores at Time 1 (ΔR^2 = .00, $p > .05$). Neither parents' elaborative style nor children's working memory significantly contributed to the final model.

Results from the regression predicting children's recall scores at generalization in the Free Recall Task with Training at Time 1 shown in Table 16. At Step 1, although the overall model is predictive, neither children's working memory significantly contributed to the mode predicting children's recall scores. At Step 2, after adding parents' elaborative style, the model still did not significantly predict children's Free Recall Task with Training recall scores at generalization (ΔR^2 = .02, p > .05). Explaining only 17% of the variance in children's composite scores (R^2 = .17), neither parents' elaborative style nor covariates significantly contributed to the overall model.

The final hierarchical regression analysis examined children's Free Recall Task with Training recall scores at the generalization trial at Time 2. As can be seen in Table 17, results at Step 1 highlight that although the model including children's working memory and parental education was not predictive of children's recall scores (ΔR^2 = .10), children's working memory significantly contributed to the model (B = 1.03, β = .31, p < .05). After adding parents' elaborative style at Step 2, the model remained non-predictive of children's Free Recall Task with Training generalization recall scores at Time 2 (ΔR^2= .02, p > .05). Despite this, children's working memory remained a significant contributor to the overall model (B = 1.07, β =.33, p < .05).

CHAPTER IV

DISCUSSION

Children's Deliberate Memory Development

The current study builds on previous research that has focused on children's memory as it develops in context. One primary goal of this study was to gain a more nuanced understanding towards the associations between strategy use and recall. By utilizing two different deliberate memory assessments capturing children's spontaneous and trained strategy use, results from the current study provide insight into how differing strategies are tied to recall across tasks. For example, both the Object Memory Task (Baker-Ward, Ornstein, & Holden, 1984) and the Free Recall Task with Training (Moely et al., 1992) included measures of children's spontaneous strategy use. In line with previous findings, despite only being instructed to "work to remember" stimuli, children in the current study exhibited a range of various strategy-like behaviors without explicit training (Baker-Ward, Ornstein, & Holden, 1984). However, within the Object Memory Task, only spontaneous verbal strategies, not behavioral, were significantly associated with children's recall ability at Time 1. Additionally, in the Free Recall Task with Training, children's spontaneous sorting strategies were not significantly related to children's recall within or across timepoints. In line with previous work, these findings suggest that the connection between children's strategy use and recall is not strong in early kindergarten (Ornstein, Haden, San Souci, 2008; Baker-Ward et al., 1984).

Additionally, due to the significant association between children's spontaneous verbal strategy use and recall in the Object Memory Task, these findings suggest that the relationship between strategy use and recall may differ across deliberate memory tasks.

Despite a lack insignificant correlation between children's spontaneous strategy use and recall before training, results highlight the significant association between children's strategy use at generalization, or after having received training, their recall in the Free Recall Task with Training. Children's recall ability across all trials and timepoints of the Free Recall Task with Training were significantly intercorrelated. Additionally, children's sorting strategies were only related to recall ability during the generalization trials for Times 1 and 2. This indicates that although children's spontaneous strategy-like behavior is not related to recall, children's ability to take up strategic training is subsequently related to their recall ability both at the time of training and 1 year later. Moreover, children's sorting strategy use during the generalization trial at Time 1 was significantly associated with their strategic sorting at Time 2. These results all suggest that children's ability to take up and successfully execute strategic organizational training in the service of a memory goal persists beyond the Fall semester of kindergarten. In line with previous research, the current study's findings reiterate that the success of children's strategy use as a means of deliberately encoding, storing, and retrieving information increases as children age (Ornstein et al., 2008). However, additional research is necessary to uncover the mechanisms by which this development occurs.

Children's Autobiographical and Deliberate Memory

A secondary goal of this study was to examine how children's deliberate memory and autobiographical memory are related. Correlational results showcased that children's autobiographical memory was not related to their deliberate recall or their spontaneous strategy use across both the Object Memory Task and the Free Recall Task with Training for all trials and timepoints. However, children's autobiographical memory was related to their strategic sorting at both post-training generalization trials for both timepoints in the current study. This means that children's autobiographical memory was only related to their strategy use after receiving training in organizational sorting strategies. These findings suggest that there is a connection between children's autobiographical memory skills and their ability to take up and use strategic organizational sorting in the service of a memory goal. This may be because (as described in Langley et al. (2017) autobiographical memory and deliberate memory share similar retrieval processes. In both the Free Recall Task with Training and mother-child reminiscing tasks, children must engage in the process of retrieving information from their memory and reporting it to another individual. Although children's sorting ARC and recall scores were highly correlated with one another for both generalization trials, children's MELABs were only connected to children's ability to take up and further apply organizational techniques after training. Future research would benefit from further exploring if the associations between children's sorting strategy use and recall are moderated by other indicators of memory, such as autobiographical memory.

Parental Processes Predicting Children's Deliberate and Autobiographical Memory

The final aim of this study was to understand the role that mother-child reminiscing plays in the development of children's autobiographical memory as well as in their deliberate recall and strategy use. Even when controlling for parental education and children's working memory, parents' elaborative style during mother-child reminiscing conversations predicted children's autobiographical memory skills. Although this is a correlational, observational design, these findings echo results from research employing experimental designs that support the strong ties between parents' elaborative style and children's autobiographical memory (Reese & Newcombe, 2007; Taumoepeau & Reese, 2013).

Regarding the role of parental processes and strategy use, findings from hierarchical regression models revealed that even when controlling for working memory and parental education, parents' elaborative style only predicted children's strategy use at the Time 1 generalization trial of the Free Recall Task with Training. These findings suggest that the elaborative style that parents use in reminiscing conversations predicts children's ability to take up and apply strategic organizational skills. However, due to the concurrent nature of these results, it is impossible to determine the direction of these effects. For example, it is possible that child-level factors elicit higher levels of parents' elaborative style. Nevertheless, these findings do provide information about the role that parents' elaborative style plays over time due to the results from the regression model predicting children's strategy use at Time 2. Since results of this regression analysis were non-significant, these findings suggest that parent's elaborative style is not predictive of children's *retainment* of this training across the school year. One possible explanation for this is children's engagement in the school context and introduction to other experiences across the school year. For example, some researchers interested in studying children's strategy use have examined the role of teachers' Cognitive Processing Language in classrooms (Coffman et al., 2008, Grammer, Coffman, & Ornstein, 2013). In order to further understand the unique role that mother-child reminiscing plays children's development throughout the transition to elementary school, it is important for future research to examine how aspects children's contexts of learning change during this period.

As for children's deliberate recall, parents' elaborative style did not significantly predict recall in any of the regression models across task or timepoint. Children's baseline recall and generalization recall in the Free Recall Task with Training at Time 1 were both predicted by Step 1 in the regression models, comprised of children's working memory and parental education. These results suggest that children's recall ability cannot be directly tied to parental processes such as mother-child reminiscing. Future research would benefit from the consideration of additional child-level, parent-level, or context factors that may contribute to the development of children's recall, such as self-regulation, autonomy supportive parenting, or familial values placed on memory.

Strengths and Limitations

Methods. Despite the current study's informative results, findings are limited due to a small sample size of 51 parent-child dyads. Future research should aim to maintain higher statistical power and validity through using a larger sample. Findings from this study are also fairly limited to the sample from which data was collected: a school district in a mid-sized town in the Southeast region of the United States. Of the caregivers taking part in the study, 96% had a bachelor's degree or higher, which is not representative of the greater population. Given previous findings that highlight cultural variations in parents' elaborative style (Han, Lichtman, & Wang, 1998; Hudson, 2006), findings from this study are culturally embedded. However, this study highly benefitted from collecting observational data to better understand how children's memory develops in context.

Use of Theory. The current study benefitted from examining how aspects of children's memory develops in context. By investigating cognition from a social constructivist lens, findings from the current study have "real world" applications and challenges assumptions about the universality of basic cognitive processes. However, one limitation facing this study is a disconnect between theory and practice. By employing the theoretical framework of Bronfenbrenner's bioecological systems theory (1998), mother-child reminiscing is viewed as a *proximal process* taking place within the microsystem, the most immediate level of context. However, due to the nature of the mother-child reminiscing task, the idea that shared reminiscing conversations occur in a structured, isolated nature is an assumption of family processes. It has also been suggested by Tudge et al. (2009) that in order to properly adhere to this theoretical framework, studies must employ the most mature form of the theory: the *Process-Person-Context-Time* (PPCT) model (Bronfenbrenner & Morris, 1998). Despite gathering information about proximal processes, future work would benefit from including additional levels of context, such as community, school, or culture. Although children's deliberate memory was assessed at two timepoints (Fall and Spring semester of kindergarten), the current study's investigation was limited to the span of one academic year. Similar to the work of Coffman et al. (2008) and Ornstein, Haden, & San Souci, (2008), in order to better understand how deliberate strategy use and recall develop during this critical time in development, additional timepoints are necessary in future research.

Measures. The second primary group of limitations in the current study encompasses the scope, construction, and use of measures. Previous work employing the structural functional coding scheme created by Reese, Haden, and Fivush (1993) measures children's autobiographical memory by calculating the frequency of *memory elaborations,* or new or additional information about the event under discussion. In the current study, parent-child dyads discussed two separate shared past events and then the frequency of memory elaborations made by the child was averaged across the two events. The mother-child reminiscing task does not have a time limit, therefore the calculation of MELABs is perhaps in part driven by the length of the conversation: longer conversations allows for more opportunity to express a memory elaboration. Although this appears to be a major limitation, the work of Fivush (2011) and Reese (2013) has emphasized that the conceptualization of this measure is to capture the quality, level of detail, and complexity of children's autobiographical narratives, which is subsequently observed by the amount of detail that children provide. Although Fivush (2011) argued that autobiographical memory is not linguistically based, her work did emphasize that it cannot be measured outside of one's narration of that memory. One's autobiographical memory is comprised of bits and pieces of sensory components that have been stored and then retrieved and reconstructed using canonical narrative forms as an organizational guide (Rubin, 2006). Therefore, placing constraints on the conversations within this task, such as a time limit, would hinder the accurate measurement of autobiographical memory.

This same operationalization process for autobiographical memory applies to the measurement of elaborative style. Parents' elaborative style is based on the average frequency of elaborations across two events therefore it is confounded by the length of conversations between parents and children. Although it seems as though more talkative parents are simply counted as more elaborative parents, this claim has been strongly contested by researchers. Mothers who talk more in other conversational contexts, such as book reading, free play, and caregiving activities are not necessarily those who are highly elaborative during reminiscing (Haden & Fivush 1996; Leyva, Sparks, & Reese, 2012). Given the additional findings that support the stability of elaborative style over time (Reese, 2002; Reese, Haden, & Fivush, 1993) and across different children in the same family (Haden, 1998), the use of the mother-child reminiscing coding scheme is identified as a strength of the current study due to its strong internal and external validity.

An additional strength of the current study is the operationalization of elaborative style as a continuous variable. A number of previous studies that examined parents' elaborative style has used a median split method to dichotomize an originally continuous variable (Reese, Hayne, & McDonald, 2008; Langley, Coffman, & Ornstein, 2017; van

Bergen & Salmon, 2010). Research questions aiming to classify and characterize parents' elaborative style have benefited from this method as it allows samples of parents to be split into groups of "High" vs. "Low" elaborative. However, the current study is strengthened by the ability to describe the nuanced continuum of parents' elaborative style and its ties to other continuous variables.

The final issue of measurement facing the current study is the conceptualization of parents' elaborative style. The current study conceptualized elaborative style upon frequency of *elaborations* alone, in line with previous literature (Reese, Haden, & Fivush, 1993). However, other work examining maternal reminiscing style have classified elaborative style in various ways, from *elaborations, repetitions, and confirmations* (Haden et al., 2009), *elaborations* and *repetitions* (Jack, Macdonald, Reese, & Hayne, 2009), to *elaborations, confirmations, associations,* and *metamemory talk* (Langley et al., 2017). The variety in conceptualizations is perhaps due in part to their perceived relevance to child outcomes. For example, the relevance of elaborations towards the development of children's autobiographical memory has been well supported (Fivush, Haden, & Reese, 2006), but studies aiming to extend elaborative style as it is associated with other types of memory my find relevance in additional components of the reminiscing experience.

For example, findings from a study conducted by Coffman et al. (2011) revealed that mothers' greater use of metamemory talk during mother-child reminiscing was positively associated with children's spontaneous strategy use in a deliberate memory task at the beginning of kindergarten. Not only does this reinforce the importance of parental processes on deliberate memory prior to entering kindergarten, but it raises questions about the importance of metamemory talk in mother-child reminiscing. Although previous work is suggests the relevance of metamemory in mother-child reminiscing, literature pointing towards its relevance in classroom settings is far more pronounced. Subsequently, a substantial body of literature has amassed over the past decade that investigates the role of metacognitive talk used by *teachers*. Due to the causal linkages established between metacognitive language used by teachers and children's strategy use and recall (Grammer et al., 2013), investigating the association between parents' metamemory talk and children's deliberate memory remains an important future direction in research.

Future Directions

The current study examined one context of children's everyday lives that scaffolds memory development: parent-child conversations. However, in order to understand unique influences of parental processes, other aspects of children's everyday contexts need to be included in analysis. For example, a large body of literature has focused on the unique effects of schooling on children's deliberate memory development. Literature focusing on the role of schooling across cultures suggests that aspects of the formal schooling context are associated with the development of strategic memory skills (Wagner, 1978; Scriber & Cole, 1978).

Although broad schooling effects are well-established, researchers like Moely and her colleagues (1992) conducted classroom observations revealed how teachers could be grouped across 1st, 2nd, and 3rd grade by their level of strategy suggestive instruction.

Subsequently, students in classes where teachers employed more strategy suggestions were more likely to engage in spontaneous strategic organization in recall tasks than students in other classes, but this finding only took place in first grade classrooms. Since the 1990s, more research has highlighted how instructional activities, cognitive structuring activities, and the provision of metacognitive information by teachers plays a role in children's strategic memory development (Coffman et al., 2008; Ornstein et al., 2010, Grammer et al., 2013; Coffman et al., 2019). Coffman et al., (2008) found that in classrooms characterized by higher levels of these behaviors, otherwise known as *Cognitive Processing Language* (CPL), children were not only using spontaneous strategic behavior in an object memory task at higher rate than their peers, but they were also better at transferring learned strategic organization skills to remember novel information.

Findings from this area of the literature highlight how different levels of context, such as school, have the potential to impact children's memory development. Future studies aiming to uncover how children's memory develops in context should employ methodologies that capture information at multiple levels of context. A recent example of this is the work of Hudson, Coffman, and Ornstein (2018) in which the role of both mothers' and teachers' language were examined as they support the development of children's mathematical competencies.

Conclusion

The current study provides further information about the role of parental processes on children's cognitive development: namely, the role of mother-child reminiscing in the development of children's autobiographical memory as well as deliberate strategy use and recall. Findings that supported the connection between parents' elaborative style and children's autobiographical memory were consistent with previous studies (Reese & Newcombe, 2007; Taumoepeau & Reese, 2013). The current study also extends previous findings connecting children's strategy use to recall in the Free Recall Organizational Task (Moely et al, 1992). However, these findings provide additional information specifically about the role of mother-child reminiscing for the uptake of strategic organizational strategies. Specifically, parents' elaborative reminiscing style did not predict children's spontaneous strategy use, but only their ability to deploy strategic sorting after training. Contrary to previous findings, children's deliberate recall ability was not predicted by parents' elaborative style (Langley et al., 2017). These findings provide valuable insight but also raise important questions of the nuanced role of parental processes in children's memory development in kindergarten. Understanding the socialization of children's memory through mother-child reminiscing prior to elementary school has the potential to inform educators, practitioners, and researchers about how children's cognitive outcomes are supported by various contextualized processes.

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APPENDIX A

DATA TABLES

Table 1

Descriptive Statistics for Children's Spontaneous Verbal, Behavioral, and Composite Strategies as well as Recall in the Object Memory Task

		Duration (sec)			
		Minimum	Maximum	Mean	St. Deviation
Behavioral Strategies	Pointing	0	82	4.96	13.77
	Manipulation	0	98	33.04	31.95
	Visual Scanning	0	123	69.03	48.36
	Dual Codes	2	123	69.57	47.59
Behavioral Strategy		61	123	113.18	16.51
Verbal Strategies	Naming	0	62	9.16	13.80
	Associative Talk	0	12	1.10	2.36
	Object Talk	0	2	.29	.53
	Categorizing	0	0	0	0
Verbal Strategy		0	63	10.55	14.16
Composite Strategy		63	181	123.73	19.79
Recall		1	12	6.82	2.33

Table 2

Spontaneous Behavioral and Verbal Strategies with Corresponding Code Descriptions from the Object Memory Task Coding Scheme (Baker-Ward, Ornstein, & Holden, 1984)

Behavioral Strategies	Pointing	Child points to a particular object without touching or moving it.
	Manipulation	Child makes any kind of manual contact with the objects (e.g. lifting or touching).
	Visual Scanning	Child scans the objects for at least 1.5 seconds without touching any of the objects
	Dual Codes	Any instance of two of these codes occurring simultaneously (e.g. pointing with one hand and manipulating with the other).
Verbal Strategies	Naming	Child Labels an object without further description (e.g. “Flower”, “this is a flower.”)
	Associative Talk	Child verbalizes and association with or elaboration about an object (e.g. I have a car like this at home.” “This isn’t a real cat.”)
	Object Talk	Child discusses the properties of the object (e.g. “These glasses are green.”)
	Categorizing	Child groups two or more items verbally or physically. (e.g. child groups items by color).

Table 3

Codes Comprising Elaborations with Corresponding Definitions and Examples (Reese, Haden, & Fivush, 1993)

Code	Definition	Examples
Statement Elaborations	Any declarative comment made by the parent that provides information about the event.	"Grandma was there." "That was a lot of fun!"
General Memory Questions	"Open-ended" questions asking the child to provide new memory information about an event.	"What did we do at the zoo?" "Tell me about going to the beach."
Yes-No Questions	Questions that ask the child to confirm or deny a piece of memory information provided by the parent.	"Was it hot or cold outside?" "Did you have fun?"

Note. Codes listed comprise the subcomponent *elaborations*, the only subcomponent of maternal reminiscing style used to conceptualize 'elaborative style' by the current study.

Table 4

Descriptive Statistics for Children's Sorting and Clustering ARC Scores and Recall Across Trials and Timepoints in the Free Recall with Training Task

	N	Minimum	Maximum	Mean	Std. Deviation
T1 Baseline Sorting ARC	51	-.23	.78	-.21	.14
T1 Baseline Recall	51	0	13	7.75	2.71
T1 Generalization Sorting ARC	50	-.23	1	-.03	.43
T1 Generalization Recall	50	0	14	7.34	3.29
T2 Generalization Sorting ARC	49	-.23	1	.07	.50
T2 Generalization Recall	49	2	14	8.39	2.56

Table 5

Descriptive Statistics for Parent Elaborations in the Mother-Child Reminiscing Task

	N	Minimum	Maximum	Mean	Std. Deviation
Elaborations	51	7.50	119	39.58	22.59

Table 6

Object Memory Task Within-Task Correlations

Variable	1	2	3	4
1. T1 Recall	-			
2. T1 Behavioral Strategies	.11	-		
3. T1 Verbal Strategies	.28*	-.15	-	
4. T1 Strategy Composite Score	.29*	.66**	.64**	-

**p* < .05. ***p* < .01.

Table 7

Free Recall with Training Within-Task Correlations

Time	Variable	1	2	3	4	5	6
Time 1	1. Baseline Recall	-					
	2. Baseline Sorting ARC	.27	-				
	3. Generalization Recall	.41**	-.01	-			
	4. Generalization Sorting ARC	.03	-.08	.31*	-		
Time 2	5. Generalization Recall	.43**	.33*	.26	.02	-	
	6. Generalization Sorting ARC	.14	.26	.20	.35*	.57**	-

**p* < .05. ***p* < .01.

Table 8

Children's Strategy Use, Recall, and MELABs Intercorrelations

Variable	MELABs
Object Memory Composite Strategy	.03
Object Memory Recall	.25
T1 Free Recall with Training Baseline Recall	.13
T1 Free Recall with Training Baseline Sorting	-.08
T1 Free Recall with Training Generalization Recall	.22
T1 Free Recall with Training Generalization Sorting	.30*
T2 Free Recall with Training Generalization Recall	.13
T2 Free Recall with Training Generalization Sorting	.28*

**p < .05. **p < .01. ***p<.001.*

Table 9

Hierarchical Multiple Regression Results for Children's MELABs

Variable	*B*	*SE B*	β	R^2	ΔR^2
Step 1				.03	.03
Constant	3.25	18.49			
DIGlbs	2.49	3.16	.12		
Parental Education	2.90	2.74	.16		
Step 2				.63	.60***
Constant	-16.00	11.75			
DIGlbs	.95	1.98	.04		
Parental Education	3.20	1.71	.17		
Parent Elaborations	.56***	.07	.78***		

Note. MELAB= children's autobiographical memory scores; DIGlbs = children's working memory as assessed by the Digit-span Longest Backward String task.
**p < .05. **p < .01. ***p<.001*

Table 10

Hierarchical Multiple Regression Results for Children's Composite Strategy Scores in the Object Memory Task at Time 1

Variable	*B*	*SE B*	β	R^2	ΔR^2
Step 1				.03	.03
Constant	127.80	23.15			
DIGlbs	3.26	4.52	.12		
Parental Education	-2.56	3.27	-.12		
Step 2				.05	.02
Constant	132.42	23.75			
DIGlbs	3.32	4.53	.12		
Parental Education	-2.60	3.28	-.12		
Parent Elaborations	-.11	.13	-.13		

Note. DIGlbs = children's working memory as assessed by the Digit-span Longest Backward String task.
$*p < .05$. $**p < .01$. $***p<.001$

Table 11

Hierarchical Multiple Regression Results for Children's Baseline Sorting in the Free Recall Task with Training at Time 1

Variable	*B*	*SE B*	β	R^2	ΔR^2
Step 1				.03	.03
Constant	-.03	.16			
DIGlbs	-.01	.03	-.04		
Parental Education	-.03	.02	-.19		
Step 2				.04	.00
Constant	-.02	.17			
DIGlbs	-.01	.03	-.03		
Parental Education	-.03	.02	-.19		
Parent Elaborations	.00	.00	-.05		

Note. DIGlbs = children's working memory as assessed by the Digit-span Longest Backward String task.
$*p < .05$. $**p < .01$. $***p<.001$

Table 12

Hierarchical Multiple Regression Results for Children's Generalization Sorting in the Free Recall Task with Training at Time 1

Variable	B	$SE\ B$	β	R^2	ΔR^2
Step 1				.03	.03
Constant	.06	.49			
DIGlbs	.06	.08	.13		
Parental Education	-.05	.07	-.11		
Step 2				.12	.09*
Constant	-.14	.48			
DIGlbs	.05	.08	.09		
Parental Education	-.05	.07	-.10		
Parent Elaborations	.01*	.00	.31*		

Note. DIGlbs = children's working memory as assessed by the Digit-span Longest Backward String task.
$*p < .05$. $**p < .01$. $***p<.001$

Table 13

Hierarchical Multiple Regression Results for Children's Generalization Sorting in the Free Recall Task with Training at Time 2

Variable	B	$SE\ B$	β	R^2	ΔR^2
Step 1				.01	.01
Constant	-.20	.56			
DIGlbs	-.00	.10	-.01		
Parental Education	.05	.08	.10		
Step 2				.01	.00
Constant	-.22	.58			
DIGlbs	-.01	.10	-.01		
Parental Education	.06	.08	.10		
Parent Elaborations	.00	.00	.03		

Note. DIGlbs = children's working memory as assessed by the Digit-span Longest Backward String task.
$*p < .05$. $**p < .01$. $***p<.001$

Table 14

Hierarchical Multiple Regression Results for Children's Recall Scores in the Object Memory Task at Time 1

Variable	*B*	*SE B*	*β*	R^2	ΔR^2
Step 1				.12	.12
Constant	5.75	2.51			
DIGlbs	.90*	.43	.30*		
Parental Education	-.33	.37	-.12		
Step 2				.13	.01
Constant	5.35	2.57			
DIGlbs	.87	.43	.29		
Parental Education	-.32	.37	-.12		
Parent Elaborations	.01	.01	.11		

Note. DIGlbs = children's working memory as assessed by the Digit-span Longest Backward String task.
**p* < .05. ***p* < .01. ****p*<.001

Table 15

Hierarchical Multiple Regression Results for Children's Baseline Recall in the Free Recall Task with Training at Time 1

Variable	*B*	*SE B*	*β*	R^2	ΔR^2
Step 1				.30	.30***
Constant	3.16	2.60			
DIGlbs	1.90	.45	.53***		
Parental Education	-.22	.39	-.07		
Step 2				.30	.00
Constant	3.26	2.68			
DIGlbs	1.90***	.45	.54***		
Parental Education	-.22	.39	-.07		
Parent Elaborations	-.00	.02	-.03		

Note. DIGlbs = children's working memory as assessed by the Digit-span Longest Backward String task.
**p* < .05. ***p* < .01. ****p*<.001

Table 16

Hierarchical Multiple Regression Results for Children's Generalization Recall in the Free Recall Task with Training at Time 1

Variable	*B*	*SE B*	β	R^2	ΔR^2
Step 1				.15	.15*
Constant	9.57	3.48			
DIGlbs	.950	.59	.22		
Parental Education	-1.02	.52	-.27		
Step 2				.17	.02
Constant	8.90	3.56			
DIGlbs	.90	.60	.21		
Parental Education	-1.00	.52	-.30		
Parent Elaborations	.02	.02	.13		

Note. DIGlbs = children's working memory as assessed by the Digit-span Longest Backward String task.
$^*p < .05$. $^{**}p < .01$. $^{***}p<.001$

Table 17

Hierarchical Multiple Regression Results for Children's Generalization Recall in the Free Recall Task with Training at Time 2

Variable	*B*	*SE B*	β	R^2	ΔR^2
Step 1				.10	.10
Constant	3.52	2.74			
DIGlbs	1.03*	.47	.31*		
Parental Education	.35	.41	.12		
Step 2				.12	.02
Constant	4.11	2.78			
DIGlbs	1.07*	.47	.33*		
Parental Education	.34	.41	.12		
Parent Elaborations	-.02	.02	-.15		

Note. DIGlbs = children's working memory as assessed by the Digit-span Longest Backward String task.
$^*p < .05$. $^{**}p < .01$. $^{***}p<.001$

APPENDIX B

FIGURES

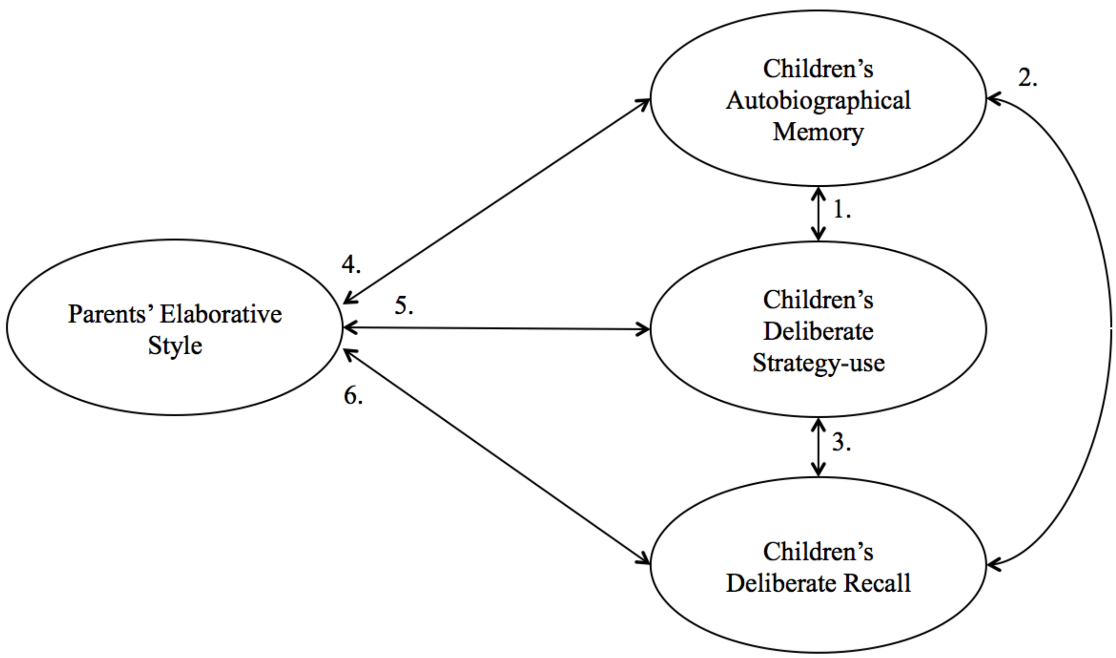

Figure 1. Substantive Model of Hypothesized Relationships Between Variables

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)

Figure 2. Calculation of the Adjusted Ratio of Clustering (ARC) Scores (Roenker, Thompson, & Brown, 1971)

APPENDIX C

INDEX

The following is a list of objects, arranged by sets of 15, that were used in the Object Memory Task. These unrelated objects were selected to be familiar to young children, using a selection procedure based of the work of Baker-Ward, Ornstein, and Holden (1984).

Set A	Set B	Set C
Binoculars	Sunglasses	Eye Patch
Cooking Pot	Stapler	Lock
Flute	Harmonica	Tambourine
Diaper	Pizza	Cherry
Boat	Motorcycle	Truck
Deer	Dinosaur	Zebra
Glove	Button	Knife
Pinwheel	Camera	Paint set
Rake	Flashlight	Shovel
Wagon	Block	Rolling pin
Cell Phone	Garbage can	Coin purse
Lemon	Flag	Large bow
Eraser	Flower pot	Dollar
Candle	Cone	Badge
Toothbrush	Straw	Leaf
Set D	Set E	Set F
Umbrella	Bottle	Feather
Paper clip	Strawberry	Bucket
Dice	Bracelet	Ice skate
Pumpkin	Playdoh	Paintbrush
Watering can	Mirror	Flower
Maraca	Baseball bat	Plate
Brush	Basket	Medal
Magnifying glass	Elephant	Skateboard
Horse	Trophy	Cat
Baseball Player	Ruler	Mask
Bell	Sponge	Hammer
Rubber Duck	Turtle	Banana
Goggles	Witch hat	Rabbit
Car	Helicopter	Key
Seashell	Globe	Whistle

The following is a list of line drawings used in the Free Recall with Training Task. Each line drawing comes from one of sixteen conceptual categories. Similar line drawings were used in the work of Moely et al. (1969) where children were successfully able to group categorically.

Conceptual Category	Picture Items
Clothes	shirt, shorts, pants, socks
Furniture	chair, table, couch, bed
Transportation	bus, bicycle, train, airplane
Fruits	apple, grapes, orange, pear
Eating Utensils	spoon, fork, bowl, cup
Musical Instruments	guitar, piano, drum, trumpet
Tools	hammer, saw, screwdriver, tape measure
Vegetables	carrot, peas, corn, potato
Bugs	bee, ant, butterfly, ladybug
Sports	football, baseball, basketball, soccer ball
Jobs	letter carrier, firefighter, police officer, trash collector
Toys	teddy bear, yo-yo, ball, blocks
Weather	snow, rain, sun, cloud
Body parts	hand, eye, foot, ear
Shoes	boots, sandal, sneaker, high heel
School Supplies	pencil, scissors, tape, ruler
Desserts	cookie, cake, ice cream, pie
Sea Animals	fish, whale, crab, octopus
Farm Animals	chicken, cow, pig, sheep
Plants	flower, tree, grass, cactus
Parts of a House	window, door, roof, chimney
Jewelry	watch, necklace, ring, earrings
Playground Equipment	swing, seesaw, slide, monkey bars
Baby Items	bottle, bib, stroller, crib
Art Supplies	crayons, marker, glue, paintbrush
Candy	gumball, chocolate bar, candy cane, lollipop
Drinks	juice, milk, soda, lemonade
Exercises	jumping rope, bike riding, swimming, running
Shapes	circle, square, rectangle, triangle
Bathroom Items	soap, comb, shampoo, toothpaste
Pets	rabbit, dog, bird, cat
Things you Wear on your Head	baseball cap, party hat, crown, cowboy hat