

The ABCs and Memory: How Kindergarten Teachers are Supporting Early Memory Development

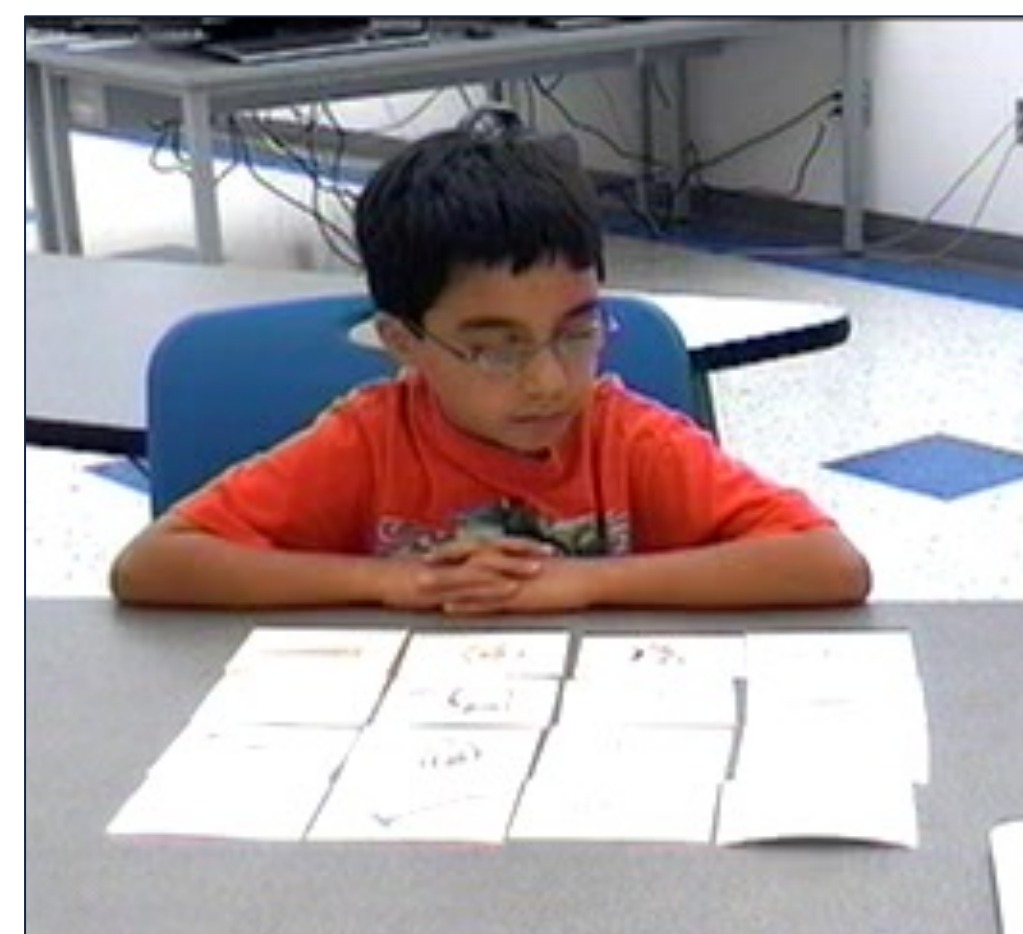
MEMORY DEVELOPMENT

The early elementary school years mark a significant period of growth in children's deliberate memory skills (Ornstein et al., 2008). These skills include a range of conscious strategies employed by individuals in the service of remembering - such as rehearsal, organization, and elaboration (Pressley & Van Meter, 1993). The use of memory strategies is linked to better recall and later study skills. Longitudinal studies have provided evidence that meaning-based sorting (grouping semantically-related items) increases between kindergarten and second grade (Kron-Sperl et al., 2008).

Organizational Sorting

Information is studied and stored in groups (e.g., categories) rather than as single units to aid in remembering.

STRATEGIC SORTING OVER TIME

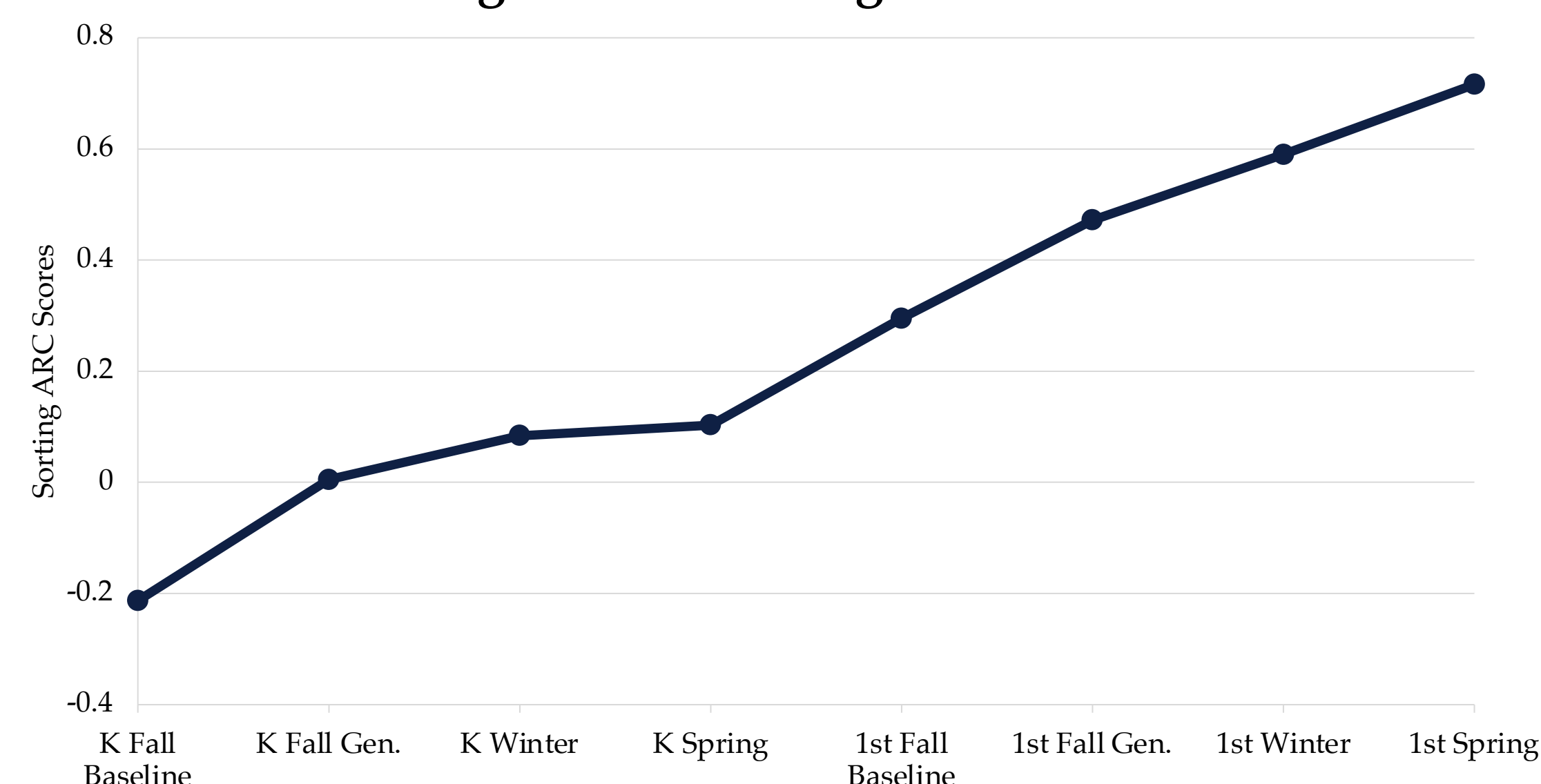


Clothing	Pants	Plants	Flower
	Shorts		Cactus
	Shirt		Tree
Furniture	Socks	Toys	Grass
	Couch		Blocks
	Table		Teddy Bear
Bed	Yo-yo		
Chair	Ball		

During a free recall with training task (Moley et al., 1992), children were asked to study and remember 16 drawings (from 4 categories). They were also instructed in how to sort the pictures into groups to promote recall. In the fall, both their spontaneous sorting (baseline) and uptake of strategy training (generalization) were measured. At the winter and spring timepoints, children completed a single trial with no strategy training.

Strategic sorting was measured using an Adjusted Ratio of Clustering (ARC) score (Roemaker et al., 1971). Sorting ARC scores range from -1 (below chance) to 0 (chance sorting) to +1 (perfect categorical sorting).

Mean Sorting Across Kindergarten and First Grade



Children increased in their strategic sorting across the kindergarten and first-grade school years.

PARTICIPANTS

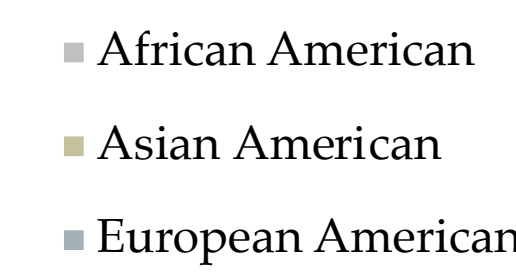
Children

- 76 children (41 girls, 35 boys)
- Age at K Fall Timepoint: 5.72 years (4.93–6.43)



Teachers

- 10 teachers (all female)
- Age: 36.10 years (24–53)
- Experience: 13.40 years (2–30)
- Degree: 5 bachelor's, 5 master's



KINDERGARTEN CLASSROOM CONTEXT

Cross-cultural memory research reports links between formal, Western-style schools and children's deliberate strategy use (Rogoff, 1981; Wagner, 1978). However, observations of elementary school classrooms indicate that teachers rarely focus on cognitive processes or memory strategies (Moley et al., 1992).

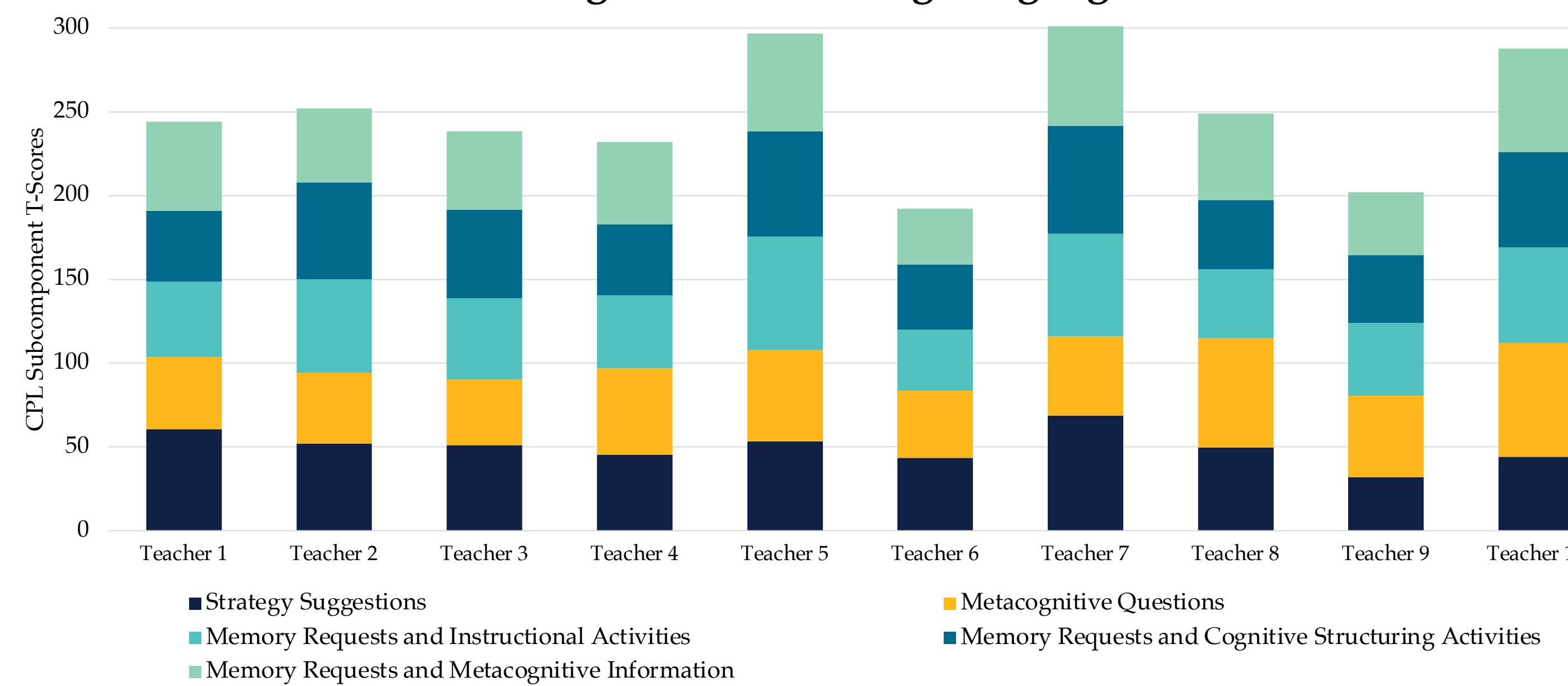
How are teachers supporting children's memory development?

Past research shows that teachers' use of memory-relevant instructional language (Cognitive Processing Language) is linked to children's memory development (Coffman & Cook, 2021).

Cognitive Processing Language

A total of 120 minutes of whole-group language arts and mathematics instruction was videotaped and coded for each classroom. The composite index of Cognitive Processing Language (CPL) is based on a subset of codes:

Teachers' Cognitive Processing Language T-Scores

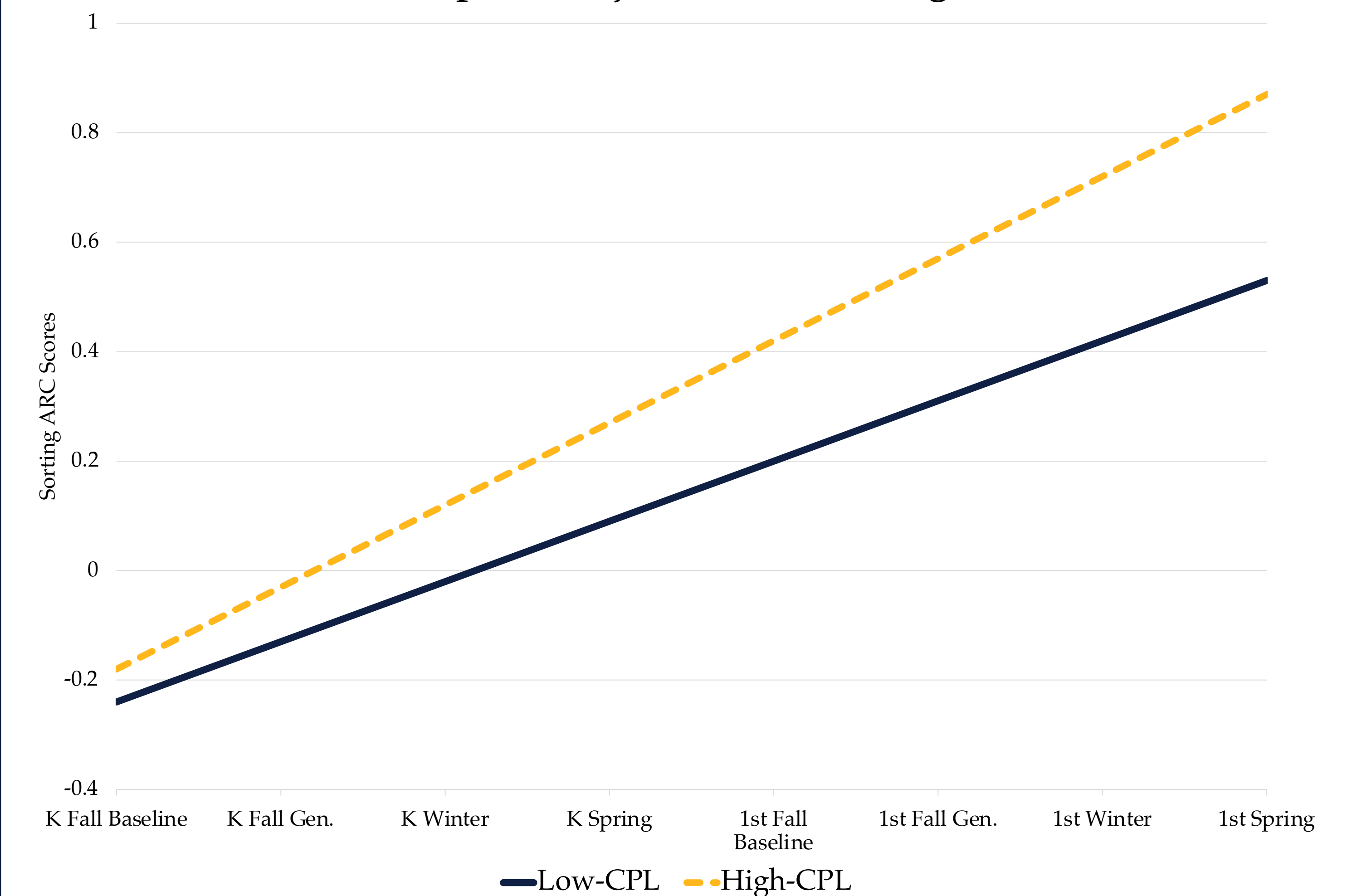


Code	Definition
Strategy Suggestions	Recommending that a child adopt a procedure for remembering or processing information
Metacognitive Questions	Requesting that a child provide a potential strategy, a utilized strategy, or rationale for a utilized strategy
Co-occurrence of Memory Requests and Instructional Activities	Requesting information from children's memory while also presenting instructional information
Co-occurrence of Memory Requests and Cognitive Structuring Activities	Requesting information from children's memory while simultaneously facilitating encoding and processing by focusing attention or organizing materials
Co-occurrence of Memory Requests and Metacognitive Information	Requesting information from children's memory while providing or soliciting metacognitive information

Kindergarten teachers varied in the amount of Cognitive Processing Language (CPL) they used during whole-class instruction.

LINKING MEMORY AND THE CLASSROOM

Model-Implied Trajectories of Sorting Scores



Fixed Effects	Coefficient	SE	t	p	95% Confidence Interval	
					Lower	Upper
Intercept	0.53	0.09	6.04	<0.01	0.36	0.71
Time	0.11	0.01	8.56	<0.01	0.08	0.13
Teachers' CPL	0.34	0.12	2.83	0.01	0.10	0.57
Teachers' CPL*Time	0.04	0.02	2.49	0.01	0.01	0.08

Note: Intercept is specified to the end of first grade. Intercepts and slopes did vary randomly, although only fixed effects are presented here.

Despite similar initial sorting scores (low-CPL = -0.23, high-CPL = -0.20), children who were taught by kindergarten teachers who used high levels of CPL had significantly higher sorting scores at the end of first grade. Moreover, these students also developed strategic sorting skills *more rapidly* than their peers who were exposed to low levels of CPL.

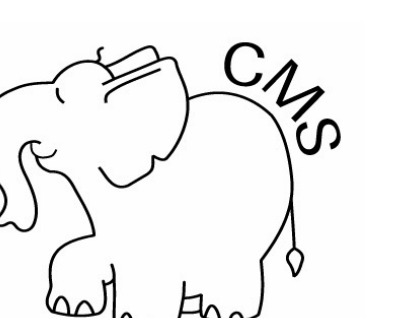
Novel findings from this study suggest that experiences in kindergarten may continue to play a role in children's development of strategic memory even after they transition to first grade. Early exposure to metacognitively-rich instructional language may therefore prepare students to take advantage of instruction in subsequent grades. This work provides a foundation for future teacher trainings and professional development programs.

Kindergarten teachers may support children's memory development during and beyond the school year by using higher levels of Cognitive Processing Language.

ACKNOWLEDGEMENTS



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Beyond Parents' Elaborations: Children's Memory Questions in Reminiscing Conversations are Related to Early Metacognitive Monitoring

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INTRODUCTION

- A rich literature has documented how the use and effectiveness of appropriate strategies for remembering improve across the elementary school years (Ornstein, Haden, & San Souci, 2008).
- Researchers have been interested in examining aspects of children's everyday lived experiences that are thought to support the development these skills during the transition to elementary school, such as parent-child reminiscing conversations. Specifically, parents' *elaborations* have been linked to children's autobiographical memory skills (Fivish et al., 2006) and deliberate memory skills (Langley et al., 2017).
- However, two gaps in the literature persist: a) the way in which reminiscing conversations may support other components of children's skilled remembering, such as *metacognition*, has been relatively unexplored, and b) children's contributions in these conversations have not been a focus of the literature.
- In younger children, components of metacognition, such as *monitoring* has been examined through information-seeking behaviors, such as asking questions or children's detection of a comprehension or compliance issue when presented within ambiguous goal (Revelle et al., 1985; Flavell et al., 1981).
- Therefore, the following study aims to examine parent and child contributions in reminiscing conversations as they relate to children's emergent metacognitive monitoring and deliberate strategy use on an Object Memory Task.

AIMS OF THE STUDY

In the is exploration of the connections between parent-child reminiscing and children's cognitive skills, we aim to:

- Describe children's contributions to reminiscing conversations as a foundational skill in the development of early metacognition.
- Examine associations between parents' elaborations, children's memory questions, and children's deliberate memory and metacognition.

METHODS

- Data for this study were drawn from an ongoing longitudinal study of children's memory and cognitive skills as they transition into elementary school.
- Child-, home- and school-level measures were collected across the kindergarten year.
- Continuing data collection will allow for multi-level assessments through the beginning of the second grade.

PARTICIPANTS

Participants were drawn from 5 schools and included 98 kindergarteners:

- 43 Males, 55 Females
- Age Range: 4.93 to 6.47 years
- 54% Caucasian, 31% students of color

MEASURES

Mother-Child Reminiscing Task: MRM (Reese et al., 1993)

- Mothers were asked to choose two novel, shared, one-time events to talk about with their child in whatever way felt natural for them.
- Conversations were audio-recorded, transcribed and then coded using a structural/functional coding system (adapted from Reese et al., 1993).
- Particular attention was paid to mothers' elaborations and children's self-initiated memory questions.

Parent Codes		Definition
Elaborations	Statement Elaboration	Utterances that provide additional or new information about the event under discussion
	Open-ended Question	Questions that ask the child for new information about the event under discussion
	Yes-no Question	Questions that ask the child to confirm or deny a piece of memory information

Child Codes		Definition
Memory Question		Children's genuine "open-ended" memory questions, asking the mother to provide information

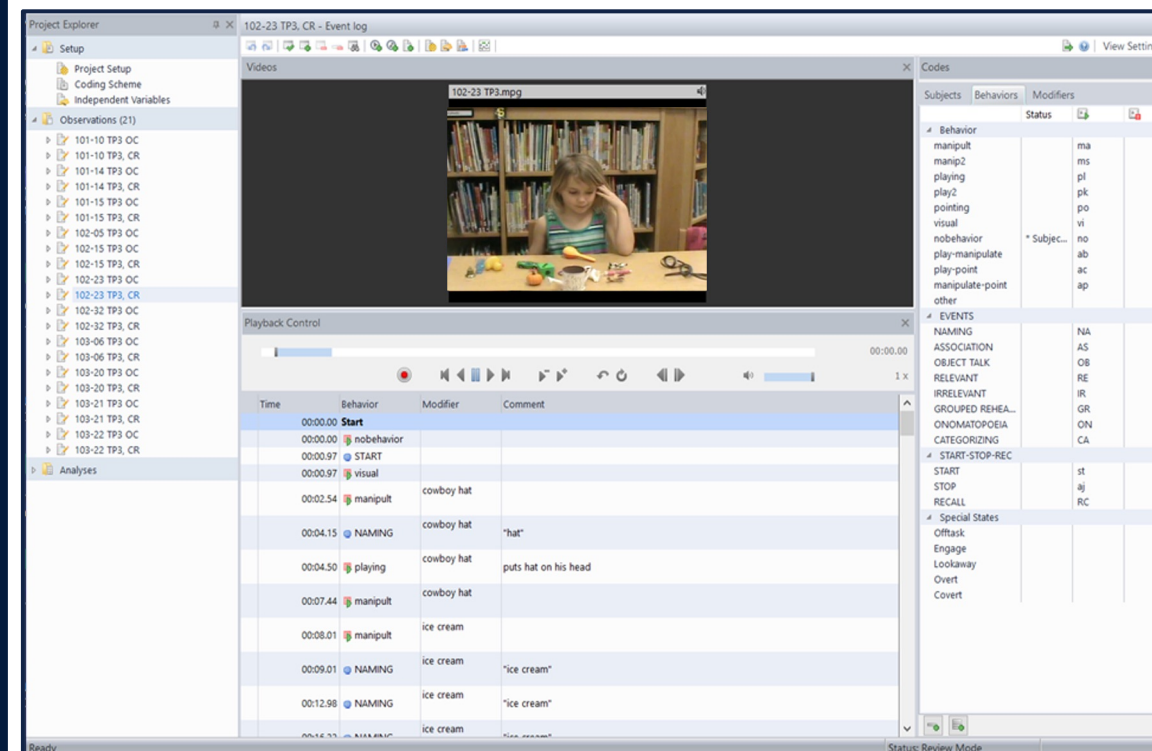
The Object Memory Task: OBJ (Baker-Ward et al., 1984)

- Children were asked to "work to remember" as many objects as possible and given a 2-minute study period prior to a recall trial.
- Spontaneous information-seeking behaviors and deliberate strategies (verbal and behavioral) were coded.



Construct	Indicator	Examples
Strategy Use	Verbal Strategies	naming, object talk, associations, categorizing
	Behavioral Strategies (sec)	manipulations, pointing, visual scanning, dual codes
Metacognitive Monitoring	Information-Seeking Behaviors	asking the research assistant for the name of an unknown object
	Latency to Seek Information (sec)	number of seconds it takes to seek information for the first time

Figure 1. Interface of the Observer XT Behavioral Coding Software



WITHIN TASK RESULTS

Characterizing Reminiscing Conversations

Figure 2. Sample of Coding Parent-Child Reminiscing

M: We ate, did you see anything fun at Cinderella's castle at night time?	Confirmation; General memory question elaboration
C: Fireworks and Tinkerbell!	Memory elaboration x2
M: What did Tinkerbell do?	General memory question elaboration
C: She flew over Cinderella's castle!	Memory elaboration
M: And what did she do? Did she light it up? That was super fun, wasn't it?	General memory question elaboration; Yes-no elaboration x2
C: How did she light it up?	Memory question
M: With her little wand	Statement elaboration

MRM Descriptive Findings

Variable	Min	Max	Mean	SD
Parent Elaborations	7.5	119	38.53	20.56
Child Memory Questions	0	3	.60	.78

Descriptive Statistics for Children's Behaviors in OBJ

Strategy Use Descriptive Findings

Variable	Min	Max	Mean	SD
Verbal Strategies				
Naming				
Associations	0	65	11.40	14.38
Object Talk				
Categorizing				

Behavioral Strategies (sec)	Min	Max	Mean	SD
Manipulations				
Pointing	26	124	96.40	21.88
Visual Scanning				

Composite Strategy Score				
Verbal Strategies	34	234	109.35	30.80
Behavioral Strategies				

Metacognitive Monitoring Descriptive Findings

Variable	Min	Max	Mean	SD
Frequency of Information-Seeking	0	3	0.22	0.55
Latency to Seek Information (sec)	5	156	109.76	33.30

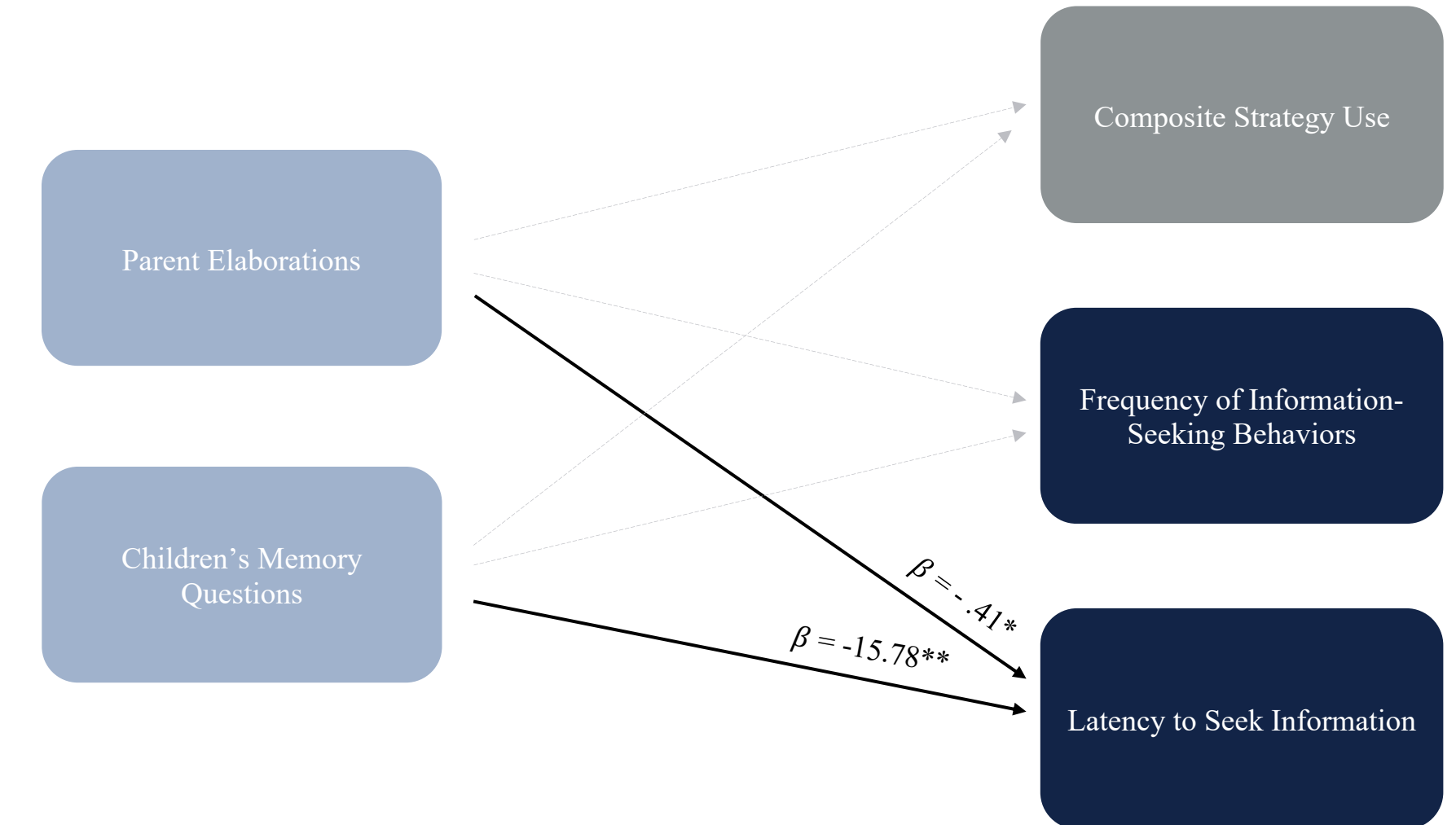
OBJ Within Task Associations

Within-Task Concurrent and Longitudinal Associations

	1.	2.	3.
1. Verbal Strategies	.		
2. Behavioral Strategies	.12	.	
3. Information-Seeking Behaviors	.01	-.04	.
4. Latency to Seek Information	.03	-.02	-.84**

- Children's total number of information-seeking behaviors were associated with their latency to engage in these behaviors. $+p<.10, *p<.05, **p<.01$

ACROSS TASK RESULTS



- Parents' elaborations and children's memory questions in reminiscing conversations did not predict differences in children's deliberate strategy use.
- However, these components of reminiscing conversations did predict differences in children's emergent metacognitive monitoring skills, specifically, the latency to seek information from a research assistant when presented with an ambiguous goal ($\beta = -.41, p < .05; \beta = -15.78, p < .01$).

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

DISCUSSION AND FUTURE DIRECTIONS

- Findings from this study highlight the role of parents' and children's contributions in reminiscing conversations towards children's emergent metacognitive skills during the transition to formal school. More specifically, children that frequently posed open-ended questions to their parents were quicker to autonomously seek out information from a research assistant than their peers who posed few memory questions when reminiscing.
- Additionally, these findings provide information about everyday aspects of children's lives that are thought to support the development of higher-order cognitive processes, such as metacognition. Indeed, early metacognitive monitoring is thought to set the stage for more advanced study techniques into adolescence (Weil et al., 2013).
- However, given that there are almost no short-term longitudinal studies examining children's emergent metacognitive skills (Roebbers, 2017), future work would benefit from examining the role of reminiscing conversations on longitudinal change in children's metacognition throughout the academic year.

ACKNOWLEDGEMENTS



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