

## INTRODUCTION

- Past research has indicated that the language to which children are exposed at home and school is associated with variability in mathematics achievement in the elementary school years (Thompson, Napoli, & Purpura, 2017; Grammer et al. 2016).
- In addition, the ways in which parents talk with their children about past experiences have been linked to differences in children's memory skills.
- These enhanced memory skills, which are driven by parent-child conversations, may also be an essential key to children's overall mathematics achievement.
- Hudson, Coffman, and Ornstein (2018) found that the children of parents who use more metamemory talk (references to the process of remembering) have higher math accuracy scores, as well as increased strategy effectiveness when solving simple addition problems.

## SPECIFIC AIMS OF THE STUDY

In this examination of parent-child conversations and children's mathematics achievement, we aim to

- Explore linkages between parent-child reminiscing conversations and children's mathematics performance.
- Extend previous research on children's mathematics performance as a function of parental elaborative talk to include standardized measures of mathematics achievement.

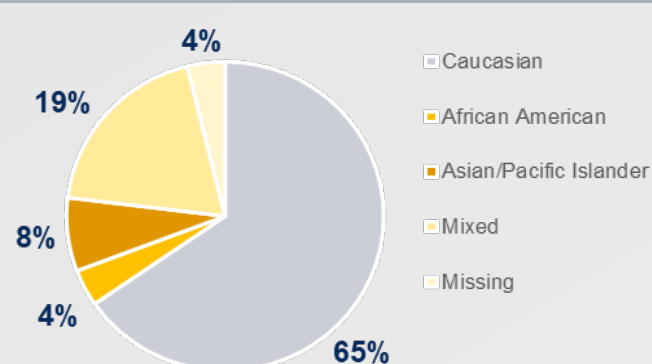
## METHODS

- Data from this study are drawn from an ongoing longitudinal study that is designed to examine children's cognitive and academic skills during the transition to elementary school.
- Data include child-, home-, and school-level measures that are collected across the kindergarten year.
- The collection of data is ongoing and will allow for multi-level analyses through the beginning of the second grade year.

## PARTICIPANTS

Participants were drawn from 3 schools and included 51 kindergarteners:

- 26 Males, 25 Females
- Age Range: 4.93 to 6.43 years



## MEASURES

### Mother-Child Reminiscing Task: MRM (Reese, Haden, & Fivush, 1993)

- Each mother was asked to choose two novel, shared, one-time events to talk about with their child in whatever way felt natural for them.
- These conversations were audio-recorded, transcribed and then coded using a structural/functional coding system (adapted from Haden, 1998; Reese et al., 1993).
- Mothers were categorized as having a low or high elaborative style based on a median split.

Code	Definition
Elaborations	Statements/questions that included new information
Repetitions	Statements/questions including the same information
Confirmations / Negations	Confirming or negating something the other said
Associative Talk	Describing past, future, or related events

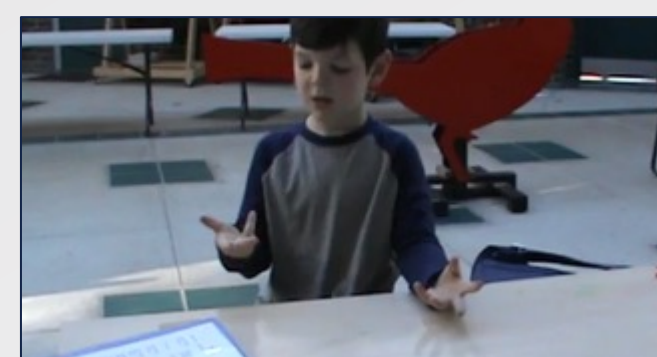
### Math Problem Solving (Siegler & Jenkins, 1989)

- Children were asked to solve ten simple addition problems, as well as to provide an explanation of how they solved each problem.
- Children received one point for each correct answer.
- Children's observed and self-reported behaviors were analyzed to determine the strategy used (e.g. Sum, Shortcut Sum, Min, Max, Finger Recognition, Decomposition) to solve each problem.
- Strategy effectiveness was characterized as the percentage of problems solved correctly when a strategy was employed.

Problem	
1+3	8+7
6+1	3+8
3+6	9+8
7+7	5+7
2+5	9+6

### Woodcock Johnson (Schrack, McGrew, & Mather, 2014)

- Math Calculation: Children were asked to complete increasingly difficult math tasks that range from writing a single number to addition and subtraction.
- Math Fluency: Children were given three minutes to quickly solve a set of math problems

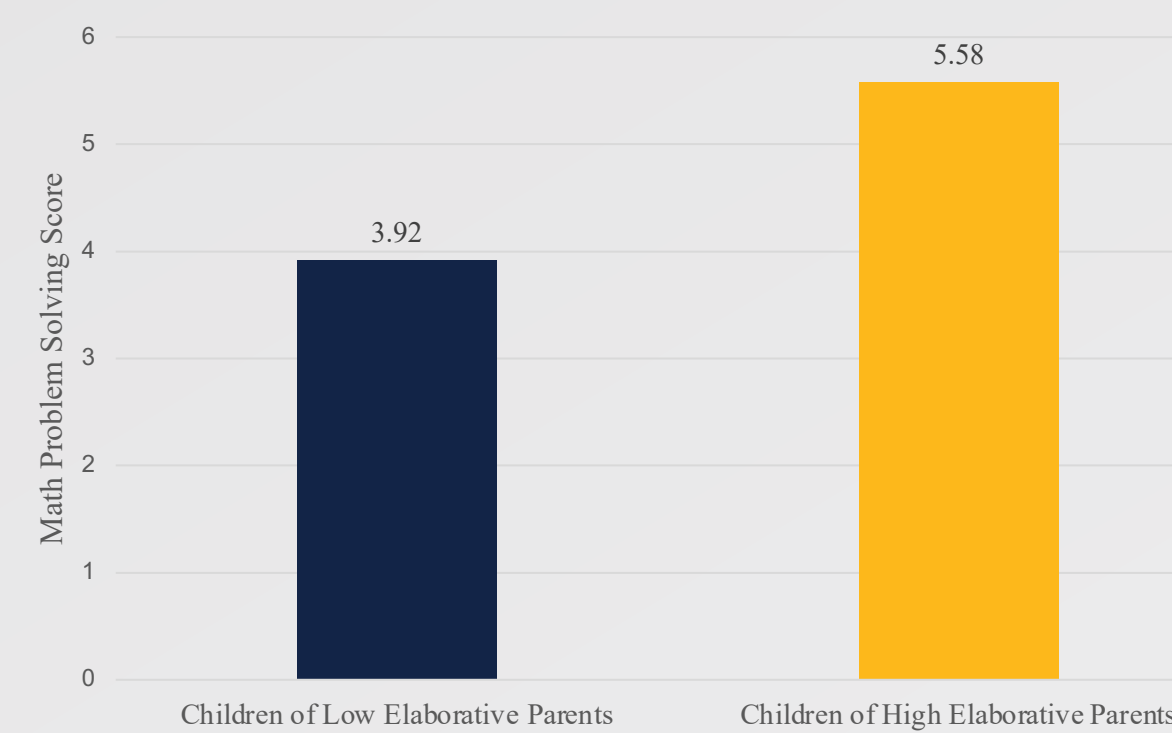


## DESCRIPTIVE STATISTICS

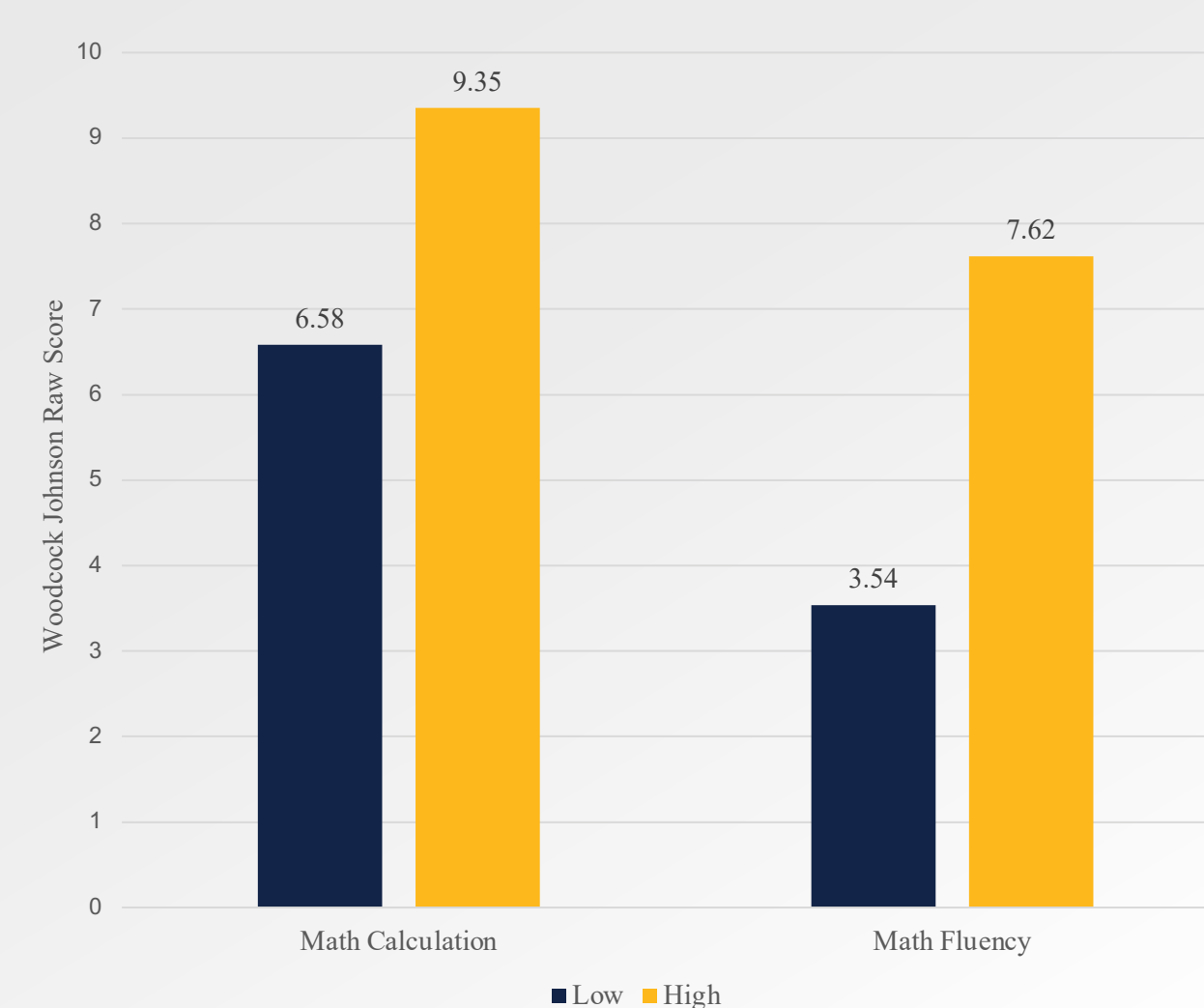
	Mean	Min	Max	SD
Parental Elaborations	39.58	7.50	119.0	22.59
Math Problem Solving Accuracy	4.78	0.0	10.0	2.99
Math Problem Solving Strategy Effectiveness	59.15	0.0	100.0	34.59
WJ Calculation Score	8.02	0.0	17.0	5.12
WJ Fluency Score	5.66	0.0	24.0	5.20

Note. Descriptive statistics for WJ Calculation and Fluency represent raw scores.

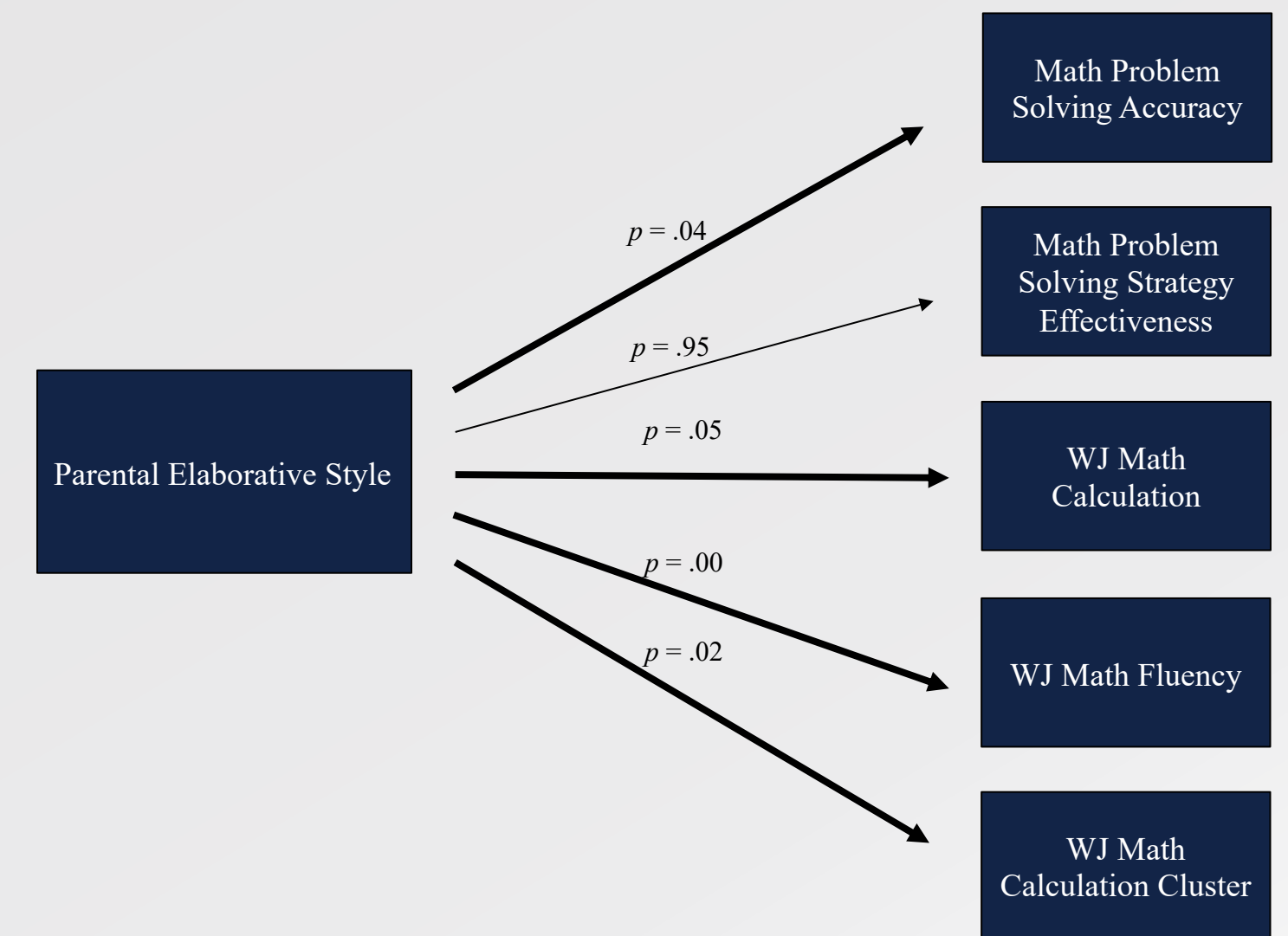
### Math Problem Solving Scores and Parental Elaborative Style



### Woodcock Johnson Scores and Parental Elaborative Style



## RESULTS



## DISCUSSION AND FUTURE DIRECTIONS

- Previous research has indicated that parents' conversational style may be linked to children's mathematics achievement and contribute to differences in mathematics performance at school entry, as well as later in school (Thompson, Napoli, & Purpura, 2017; Hudson et al., 2018).
- In this study, children's mathematics performance, as measured by observational and standardized measures of mathematics achievement, differed as a function of parents' elaborative style during reminiscing.
- Although results replicate those of Hudson et al., (2018) as it pertains to parents' conversational style and math accuracy, the findings regarding strategy effectiveness were not replicated. This suggests that more information is needed to explain differences in children's strategy effectiveness as a result of parents' conversational style.
- These results extended previous findings to include information regarding the role of parental reminiscing style on student performance on standardized mathematics achievement measures.
- Overall, these findings support and extend previous indications of associations between children's mathematics achievement and parents' conversational style at school entry. However, it is important to take into consideration the role that school – and more specifically teachers' language – may have later. The larger project from which these data are drawn allows for an examination of both home and school, contexts across the first few years of elementary school.

## ACKNOWLEDGEMENTS



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## INTRODUCTION

- There exists a sizable literature on the socialization of children's cognition, highlighting associations between mother-child reminiscing and the development of young children's autobiographical memory (see Fivush, Reese, & Haden, 2006).
- However, there is still quite limited understanding of the role of mother-child reminiscing in the facilitation of children's deliberate memory.
- Autobiographic and deliberate memory skills are largely examined in separate literatures, and the ways in which these two sets of skills may co-develop has yet to be fully explored. Ornstein, Haden, and Elischberger (2006) suggested the underlying processes of encoding, storing, retrieving information from memory, and sharing what was retrieved seem to be involved in both types of memory.
- Langley, Coffman, and Ornstein (2017) provided evidence that mothers' reminiscing style may be associated with children's deliberate memory skills.

## AIMS OF THE STUDY

In this exploration of the connections between parent-child reminiscing and the development of both autobiographical and deliberate memory, we aim to:

1. Describe children's autobiographical memory as a foundational skill in the development of children's deliberate memory.
2. Examine associations between parental reminiscing style and children's deliberate memory skills.

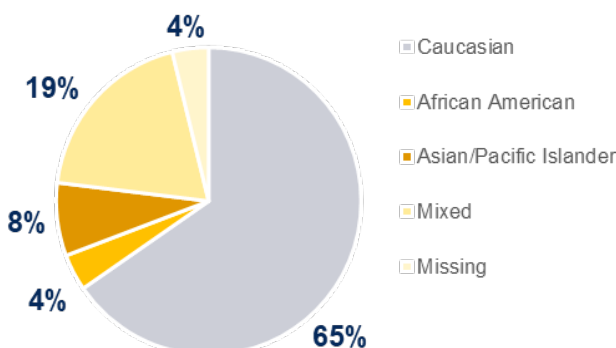
## METHODS

- Data for this study were drawn from the first cohort of 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 3 schools and included 51 kindergarteners:

- 26 Males, 25 Females
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## MEASURES

### Mother-Child Reminiscing Task: MRM

(Reese, Haden, & Fivush, 1993)

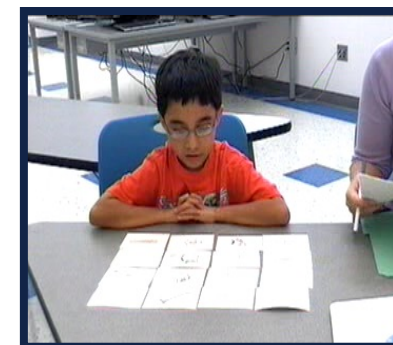
- Mothers were asked to choose two novel, shared, one-time events to talk about with their child in whatever way felt natural for them.
- Conversations were audio-recorded, transcribed and then coded using a structural/functional coding system (adapted from Haden, 1998; Reese et al., 1993).
- A standardized score to indicate elaborative style was computed and analyzed using a median-split approach, distinguishing high- vs. low-elaborative style parents. This is based on the work of Langley, Coffman, and Ornstein (2017).

Code	Definition
<b>Elaborations</b>	Statements/questions that added (or asked for) new information
<b>Confirmations</b>	Statements that confirmed information given by the child
<b>Associations</b>	Describing past, future, or related events to ones discussed
<b>Metamemory Talk</b>	Remarks about the remembering process/memory performance

### Free Recall and Organizational Training Task: FRT

(Moely et al., 1992)

- Children were asked to remember 16 line drawings (4 from each of 4 categories).
- Children completed a baseline trial (measuring spontaneous sorting), a training trial in which they were instructed in categorical organization, and a generalization trial that served as an indicator of their abilities to take advantage of this strategic instruction.
- The Adjusted Ratio of Clustering (ARC) measure (Roenker, Thompson, & Brown, 1971) was used to characterize children's sorting during study and clustering during recall; the measure ranges from -1 (below chance) to 0 (chance) to 1 (perfect categorical sorting and clustering).



### Object Memory Task: OBJ

(Baker-Ward, Ornstein, & Holden, 1984)

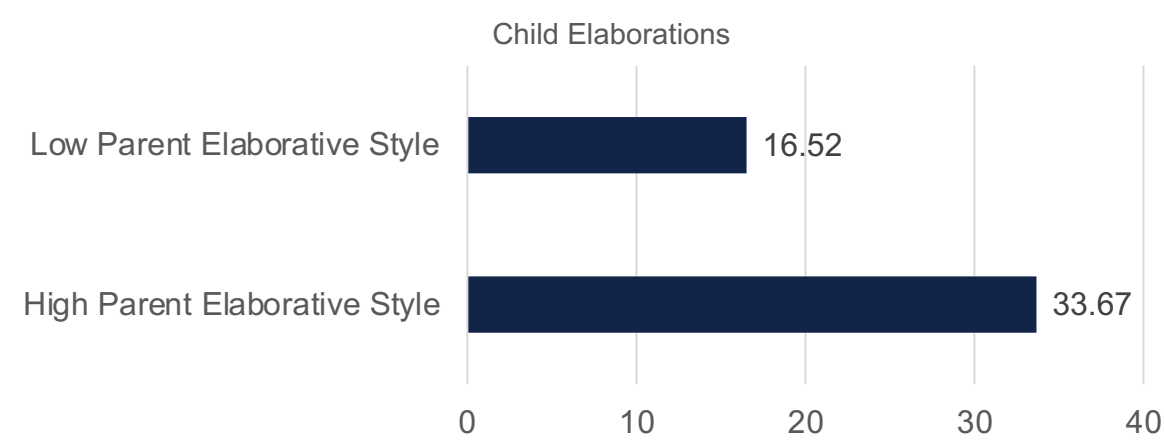
- Children were asked to "work to remember" as many objects as possible, using a 2 minute study period prior to a recall trial.
- Spontaneous strategic efforts were coded.

Verbal Strategies	Behavioral Strategies
Naming	Pointing
Associative Talk	Manipulation
Categorizing	Visual Scanning
Object Talk	Dual Codes (e.g., manipulation and pointing)



## WITHIN TASK RESULTS

### Parent Elaborative Style and Children's Autobiographical Memory



- Children's autobiographical memory elaborations differed as a function of their parents' elaborative style, such that children of parents with highly elaborative style reported more detailed recollections than children of parents low in elaboration ( $F(1, 49)=18.668, p<.001$ ).

### Children's Strategy Use in FRT

Descriptive Statistics Across Trials of FRT

Trial	Recall $X (sd)$	Sorting ARC $X (sd)$	Clustering ARC $X (sd)$
Baseline	7.64 (2.75)	-.21 (.14)	.30 (.53)
Training	13.01 (2.85)		
Generalization	7.34 (3.30)	-.03 (.43)	.56 (.43)

Correlations Among FRT Recall and Strategy Use

	Baseline Recall	Training Recall	Generalization Recall
Baseline Clustering ARC	.16	.06	.19
Baseline Sorting ARC	.27	.04	-.01
Generalization Clustering ARC	-.13	-.05	-.01
Generalization Sorting ARC	.03	-.08	.31*

- Children's ability to learn and take on strategic memory skills, specifically sorting, was significantly associated with their recall ability ( $r=.31, p<.05$ ).

### Children's Strategy Use and Recall in OBJ

Descriptive Statistics

	Mean	Standard Deviation
Object Recall	6.82	2.33
Verbal Strategies	10.66	14.71
Behavioral Strategies	114.36	15.12

Associations Between Object Recall and Strategy Use

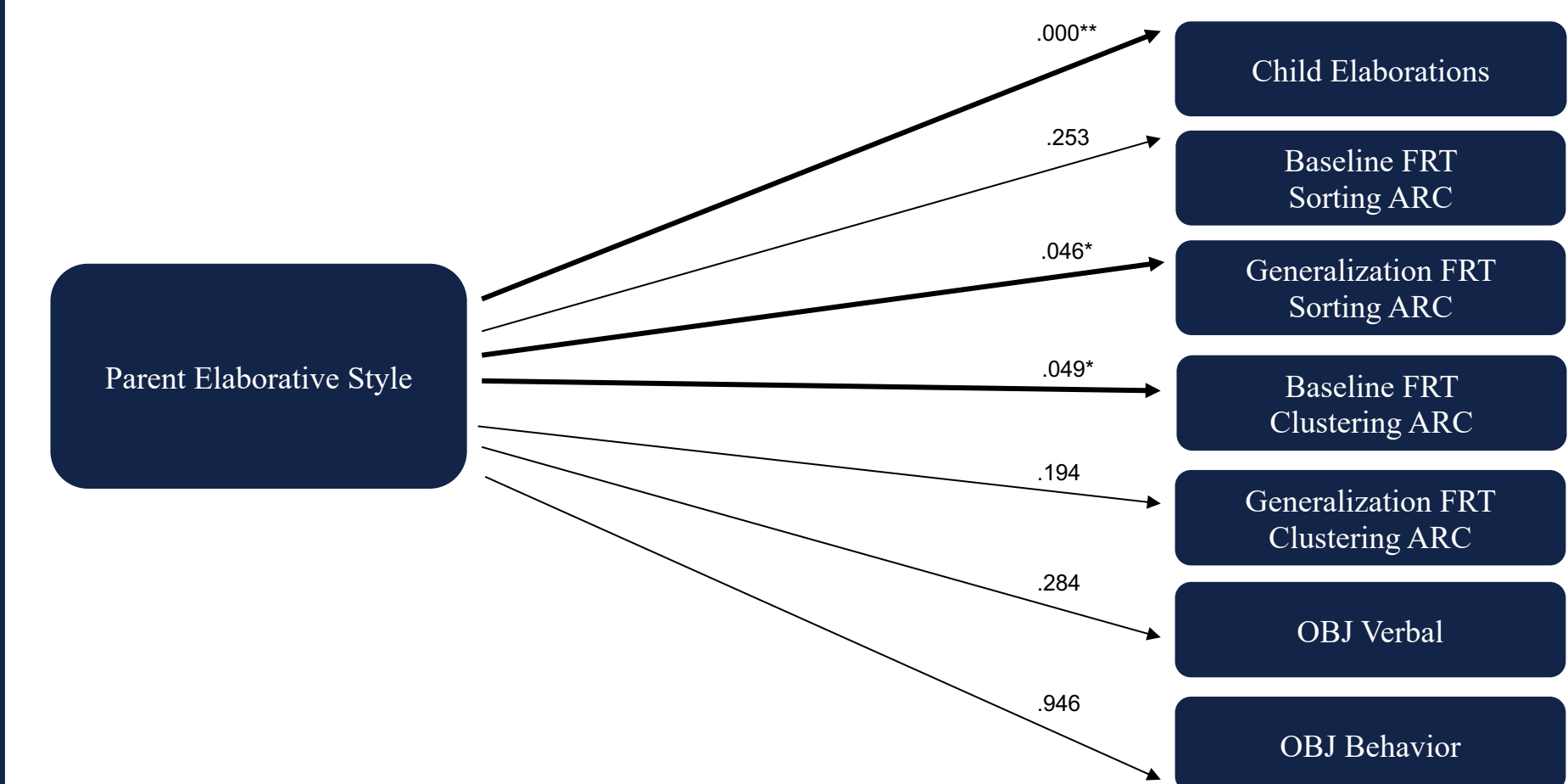
	Object Recall (R)
Verbal Strategies	.30*
Behavioral Strategies	-.05

- Children's use of verbal strategies (but not behavioral strategies) was correlated with recall.

\*\* $p<.01$ , \* $p<.05$

## ACROSS TASK RESULTS

### Connecting Parent-Child Conversations and Children's Memory Performance



- Several aspects of children's strategic memory differ as a function of parents' use of an elaborative reminiscing style.
- Children of parents with a higher elaborative style exhibited significantly more memory elaborations in MRM, as well as higher levels of spontaneous clustering (at baseline) and greater generalization of training in a clustering strategy in the FRT task.

## DISCUSSION AND FUTURE DIRECTIONS

- Preliminary data from the first cohort of an ongoing longitudinal study suggest that parents' elaborative style is associated with [some but not all measures of] children's strategic memory, but further investigation is required to understand further the interplay of home and school-level factors on children's developing memory skills.
- These preliminary associations, at a single time point at kindergarten entry, pave the way for future analyses that include additional time points and will allow for the examination of the unique and joint moderating influences of child, home, and teacher characteristics.
- The larger project from which these data are drawn will allow for the opportunity to expand our understanding of the ways in which characteristics of the home environment, especially those related to the richness of language to which children are exposed (e.g., in conversations about past events) may contribute to and perhaps moderate the impact of exposure to a classroom environment that is rich in teacher language on children's cognitive outcomes.

## ACKNOWLEDGEMENTS



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