Increasing the contribution of familiarity: Does unitization improve children's performance on a relational memory task?

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Introduction

Children often experience failures on relational memory tasks that require the binding of two or more pieces of to-be-remembered information (e.g., Lloyd, Doydum, & Newcombe, 2009).

Dual-process models of memory propose that recognition memory is compose of two independent processes (Yonelinas, 2002).

- Familiarity – a global sense of knowing, capable of item memory
- Recollection – memory for specific contextual details, thought to be necessary for relational memory

Familiarity has been shown to be relatively developed by the end of early childhood, where as recollection continues to develop throughout middle childhood and into adolescence (e.g., Ghetti & Angelini, 2008). Failures on relation memory tasks may be due to immaturity in recollection.

Recent research with adults has found that stimulus manipulations and strategies that promote unitization of to-be-remembered information can increase the contribution familiarity to memory recognition (e.g., Diana, Yonelinas, & Ranganath, 2008). It is possible that these strategies may improve relational memory performance in children by increasing reliance on mature familiarity processes as opposed to immature recollection processes.

The goal of the present study is to take what is known about manipulations that increase the contribution of familiarity to relational memory in adults and implement a strategy that may improve young children's relational memory performance

Methods

Design:
2 Age Groups : 6-year-old v. 8-year-old children
2 Memory Conditions: Unitized Imagery v. Interactive Imagery

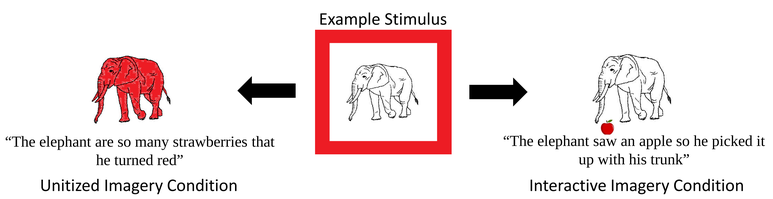
Participants:
A total of 70, 6- and 8-year old children were recruited from the University of Maryland Infant and Child Studies data base. Children were assigned to use either a Unitized Imagery or Interactive Imagery strategy when completing the task. Five participants were excluded from analysis for not understanding the task. For participant characteristics see Table 1.

Table 1: Group Characteristics

	Condition	N	Mean Age x (sd)	Gender
6-year-olds	Unitized Imagery	16	6.64 (.31)	9 male
	Interactive Imagery	17	6.43 (.29)	6 male
8-year-olds	Unitized Imagery	16	8.27 (.21)	9 male
	Interactive Imagery	16	8.37 (.34)	6 male

Task & Procedure: (adapted from Diana, et al., 2008)
During encoding, children were presented with 120 pictures from the Snodgrass & Vanderwart (1980) stimulus set surrounded by either a red or yellow boarder. All children were given the task of remembering the color that was presented with each picture. For each picture/color combination children generated an explanation relating the picture and the color and then visualized their explanation.

- Unitized Condition: Children were told to come up with a story for why the picture would be the color of the border and then visualize the picture in the color of the border.
- Interactive Imagery Condition: Children were told to come up with the story for why the picture would be with either an apple (for red border) or school bus (for yellow border) and then to visualize the picture interacting with the other object.



Method Continued

During retrieval children were presented with the same pictures as the encoding portion, but without the colored border. First children responded with whether they thought the border was red or yellow and then they made a judgment on a 3-point scale as to how confident they were about the color. It has been shown that children as young as 5 years of age can accurately make confidence judgments on a 3-point scale ranging from very confident to unconfident/guessing (Ghetti & Angelini, 2008).

Data Processing
The three-point confidence scales from each color were be combined to create a six-point scale ranging from very confident red to very confident yellow. These scales were used to plot receiver operating characteristics (ROCs) curves for each subjects. A dual-process memory model (Yonelinas, 1999) was then fit to each curve to extract estimates of recollection and familiarity.

$$P(\text{"red"}|red) = R_{red} + (1 - R_{red})f_{red}$$
$$P(\text{"red"}|green) = (1 - R_{green})f_{red}$$

Hypotheses

Hypothesis 1: 8-year-old children will recall the correct color more often than 6-year-old children.

Hypothesis 2: All children will benefit from a unitization imagery strategy and those in the Unitized Imagery group will recall the correct color more often than those in the Interactive Imagery group.

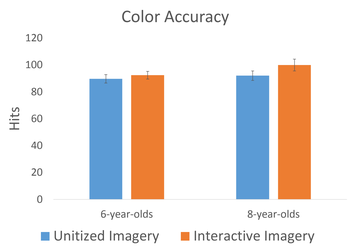
Hypothesis 3: 8-year-old children in the Interactive Imagery group will perform better than the 6-year-old children in the Interactive Imagery group due to the need for recollection, whereas no difference will be present in the Unitized Imagery group due to the increased contribution of familiarity.

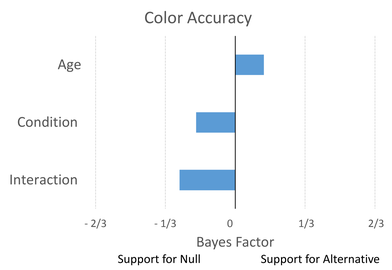
Hypothesis 4: Parameter estimates of familiarity will be greater for the children in the Unitized condition.

Hypothesis 5: Parameter estimates of recollection will not very across age or condition.

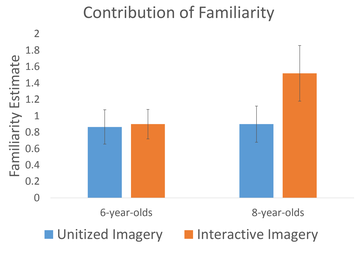
Results

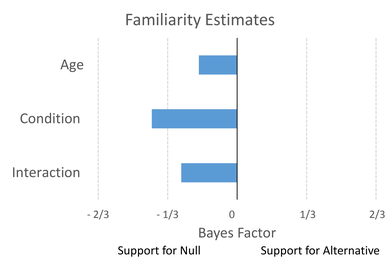
Memory Accuracy





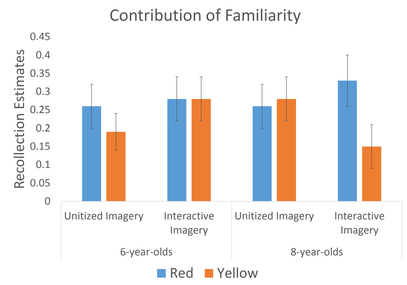
Familiarity

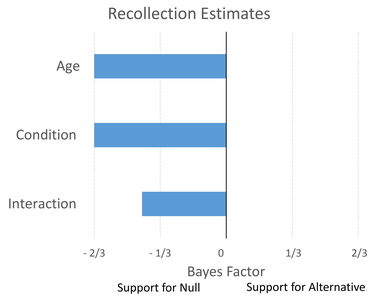




Results Continued

Recollection

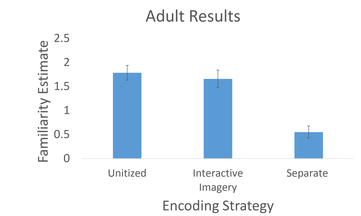


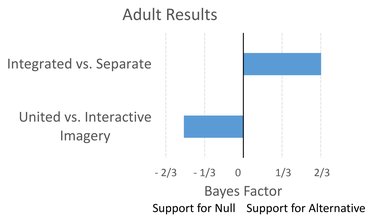


Discussion & Future Direction

The findings of this study did not support any hypothesis other than hypothesis 5, namely that parameter estimates of recollection did not very across Age Group or Condition. The lack of support for hypothesis 1 through hypothesis 3 stems from the lack of support for hypothesis 4. Since the memory strategy manipulation of unitization did not increase the contribution of familiarity to memory recognition no differences would be expected between memory conditions.

A recent study in adults from our lab also found no differences in the contribution of familiarity between unitization and interactive imagery strategies, however both strategies that involved some level to stimuli integration increased the contribution of familiarity compared to a separate visualization strategy.





Although a unitizated imagery strategy did not improve children's memory performance compared to an interactive imagery strategy, the results of our adult study suggest both may be beneficial compared to separate visualization. We plan to address this question in a follow-up study.

Acknowledgements

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