

Behavioral and Electrophysiological Examination of Recollection and Familiarity in Early Childhood

Meghan Graham & Tracy Riggins
University of Maryland, College Park
Department of Psychology

Introduction

- Dual processes models of recognition memory propose (Yonelinas, 2002):
 - Familiarity-a general sense of having seen something before
 - Recollection-retrieving contextual details about the time or place the item was encountered
- Processes are associated with dissociable ERP effects in adults (Friedman & Johnson, 2000)
- Evidence from source memory paradigms in middle childhood suggests that recollection is later-developing than familiarity (e.g., Cycowicz, et al., 2001; Czernochowski et al., 2005). However, few studies have examined recollection in early childhood.
- Old/new ERP effects have been observed in preschool-aged children (Riggins et al., 2009, Marshall et al., 2002). However, these studies did not allow for the direct comparison of ERPs to recollected vs. familiar items.
- This study presents a novel paradigm for examining recollection and familiarity in early childhood using behavior and ERPs.

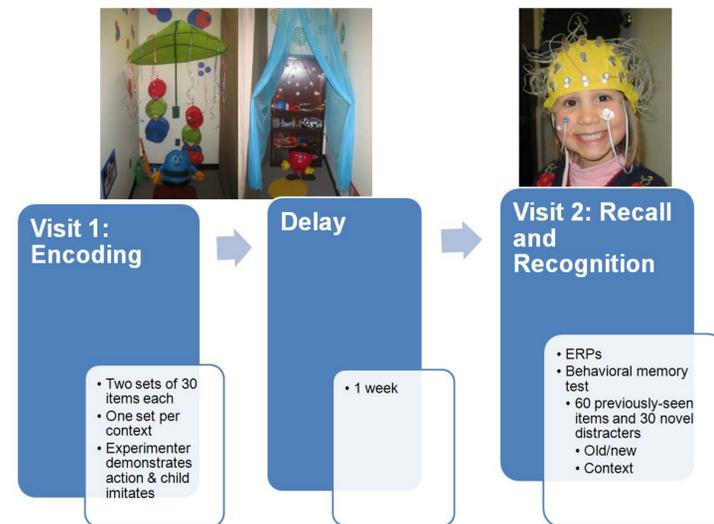
Method

Participants

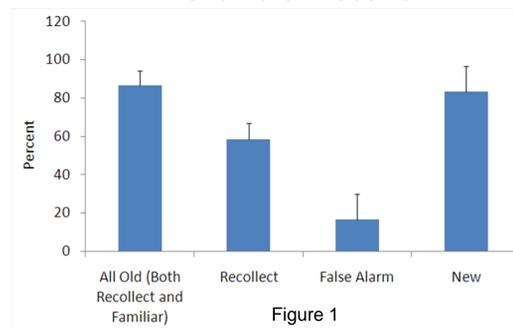
Behavioral:
47 children (24 male), mean age 5.57 years (range 5.03-6.43).

ERP:
A subset children with a minimum of 10 usable ERP trials per condition who also performed above chance on the source task. This resulted in the inclusion of 24 children (11 male), mean age 5.67 years (range 5.04-6.43).

Children made two visits to the lab, approximately a week apart (mean delay=6.83 days, range=5-9 days).



Behavioral Results

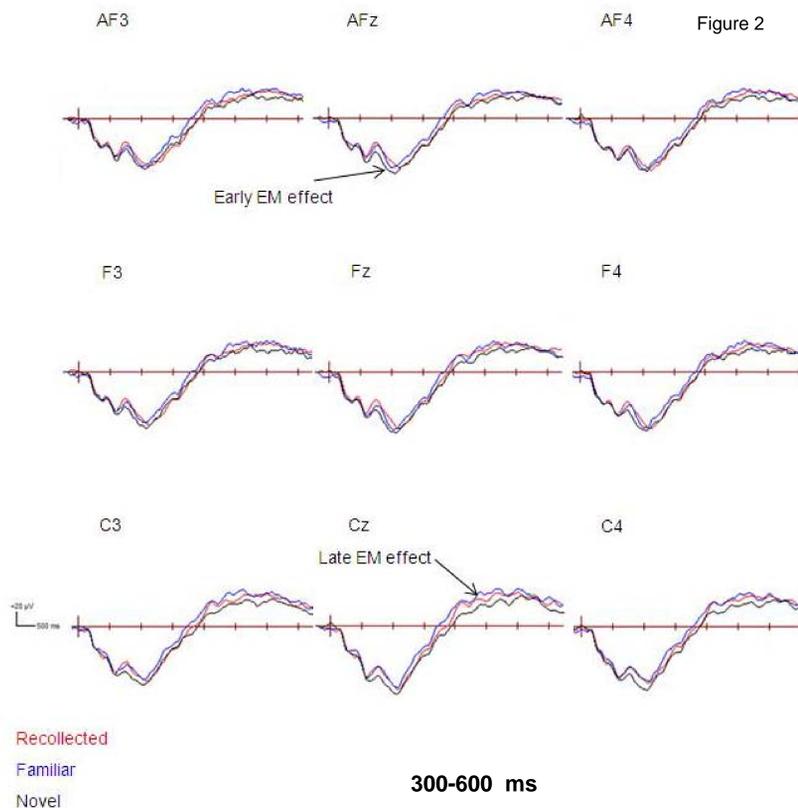


Bar graph shows behavioral results for the whole sample N=47 (figure 1). Behavioral results for the ERP sub-sample were similar, with the exception that the mean proportion recollected was higher (60.57% (SD=4.42%, range 53.33%-68.62%).

ERP Results

Analyses

- 2 time windows: 300-600 ms and 900-1500 ms.
- Lateral analyses: F1, F2, F3, F4, FC1, FC2, FC3, FC4, C1, C2, C3, C4, CP1, CP2, CP3 and CP4
- Antero-frontal analyses: AF3, AF4, AF7 and, AF8
- Midline analyses: Afz, Fz, FCz, Cz and CPz
- See figure 2 for representative waveforms.

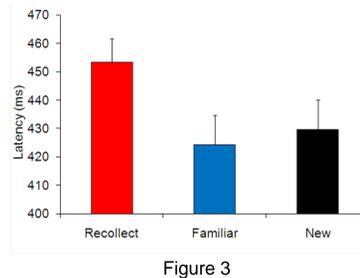


300-600 ms

Lateral: Across frontal leads, recollection was slower than familiar or new conditions (i.e., latency to peak was longer), $F(2,46) = 3.81, p = .05$. See Figure 3.

Antero-frontal: Recollection was slower than familiar or new conditions, $F(2,46) = 3.38, p = .04$.

Midline: Recollection was slower than familiar or new conditions at AFz, $F(2,46) = 7.13, p = .002$, and Fz, $F(2,46) = 3.69, p = .03$.



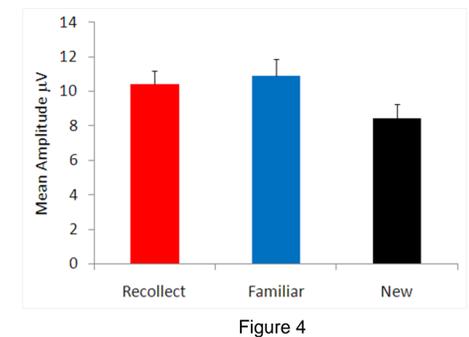
ERP Results (Continued)

900-1500 ms

Lateral: Amplitudes to recollected and familiar items were greater than those to new items, $F(2,46) = 4.03, p = .03$.

Antero-frontal: Amplitudes to recollected and familiar items were greater than those to new items, $F(2,46) = 3.00, p = .06$.

Midline: Amplitudes to recollected and familiar items were greater than those to new items $F(2,46) = 3.32, p = .05$. See Figure 4.



Discussion

- This study presents a behavioral paradigm in combination with ERPs that allows for the examination of recollection in early childhood. The 'event-related' nature of the paradigm allowed ERPs to be sorted based upon behavioral performance, such that ERPs associated with "recollection" and "familiarity" could be compared.
- The effect observed in the 300-600 ms window over frontal leads differentiated items that received correct source judgments from items with that received incorrect source judgments and new items, such that latency to peak was longer for items with correct source judgments. This "recollection effect" may reflect slower processing of items that are subsequently recollected, which is consistent with behavioral research in adults and middle childhood showing that slower responses reflect recollection (Cycowicz et al., 2003; Yonelinas, 2002).
- Longer latencies (like greater amplitudes in adults) may reflect increased retrieval processes or memory "monitoring" operations, both of which are increased when one recalls source information as opposed to item information (Rugg & Wilding, 2000).
- The effect observed in the 900-1500 ms window differentiated old items (regardless of accuracy of the source judgment) from new items, such that average amplitude in this window was greater for old compared to new items. This "old-new effect" may reflect greater allocation of processing resources when remembering an old item than when rejecting a new item.
- These ERP results suggest that familiarity and recollection may be present and dissociable by ERPs in early childhood.
- Data collection is ongoing for two follow up studies: 1) using the same paradigm to examine recollection in adults and 2) using a modified version of this paradigm in which children make the old-new and source judgments at the time that ERPs are recorded.

References

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