Comparison of incidental vs intentional source memory in young children: Evidence from ERPs

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Introduction

Memories can come to mind both *intentionally* when trying (i.e., active retrieval), and *incidentally,* when not trying, to remember (i.e., passive retrieval; Berntsen, 2010).

- Active and passive retrieval share similarities in that adult ERP studies of recognition memory have shown memory effects for both.
- However, differences have also been found in the underlying neural substrates and the use of strategic processes using PET and fMRI (Curran, 1999 Hall, et al., 2008; Bernsten, 2010).

Memory shows substantial development during early childhood due to changes in both basic and strategic components and their neural substrates (Shing, et al., 2008). It is currently unclear if both types of change are reflected in developmental ERP studies.

Compared to item memory, source memory shows substantial development during early childhood (Riggins, 2014). Research has suggested that the strategic component of memory plays a larger role in source memory compared to item memory (Shing, et al., 2010).

The current study examined ERP correlates generated during active and passive memory retrieval on item and source memory tasks in 4- to 5-year-old children. The two goals were to explore if different neural process seem to be involved with item and source memory, and if these process can be detected during both active and passive retrieval

- Based on previous ERP research in the current age range, two components of interest were examined: the early Negative Component (Nc) thought to be related to attention and modulated by memory and the later Positive Slow Wave (PSW) thought to be related to memory (Riggins, et al., 2013).

Methods

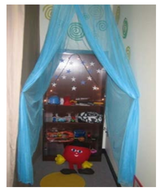
N = 83; 4- to 5-year-old children; between subjects

Item Memory
Active N = 23 (Age = 5.13 years, sd = .69)
Passive N = 22 (Age = 5.08 years, sd = .61)

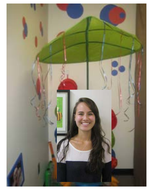
Source Memory
Active N = 20 (Age = 4.79 years, sd = .67)
Passive N = 18 (Age = 4.815 years, sd = .62)

Encoding

Item Memory
Familiarized to 36 novel toys



Source Memory
Familiarized to 72 novel toys in 2 rooms
36 with researcher A; 36 with researcher B



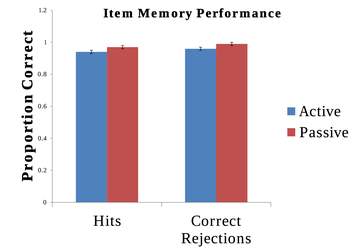
Retrieval
Viewed all old toys and 36 new toys while brain activity was recorded

	Item Memory	Source Memory
Active	Responded "yes" to toys they had played with and "no" to new toys *while* brain activity was recorded	Responded "yes" to toys that belonged to researcher A and "no" to new toys and toys that belonged to researcher B while brain activity was recorded (i.e,. exclusion paradigm)
Passive	Viewed the toys with no task during ERP recording. After recording, responded "yes" to toys they had played with and "no" to new toys	Viewed the toys with no task during ERP recording. After recording, responded "yes" to toys that belonged to researcher A and "no" to new toys and toys that belonged to researcher B

Behavioral Results

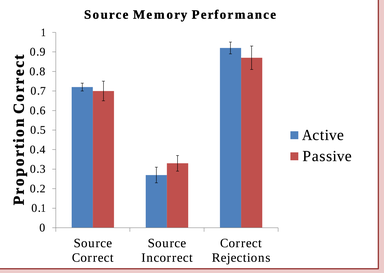
Item Memory

- There was no difference between the Active & Passive retrieval groups in their ability to discriminate old toys from new toys
  - Active d' = 3.70
  - Passive d' = 3.96
  - t(43) = -2.01, p >.05

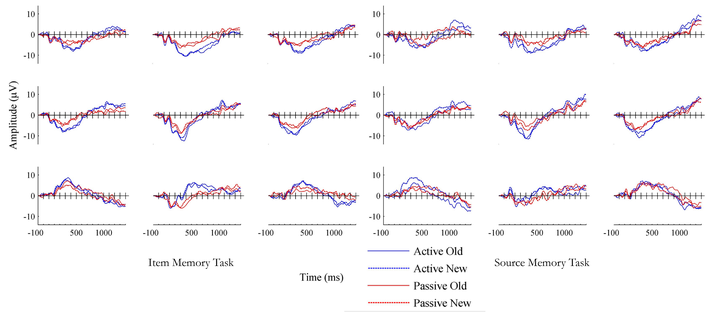


Source Memory

- There was no difference between the Active & Passive retrieval groups in their ability to discriminate source correct toys from new toys or source correct toys from source incorrect toys
  - Source Correct versus New
    - Active d' = 2.34
    - Passive d' = 2.08
    - t(36) = -0.90, p = .37
  - Source Correct versus Source Incorrect
    - Active d' = 1.34
    - Passive d' = 1.15
    - t(36) = -1.03, p = .31



ERP Results

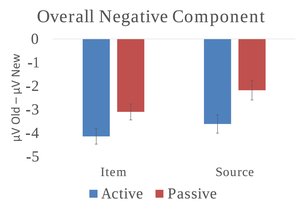


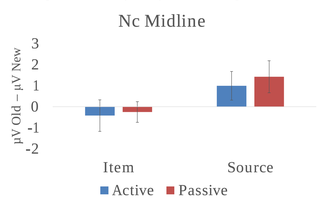
2 Group (Active v. Passive) x 2 Study (Item v. Source) x 2 Item (Old v. New) x 3 Coronal (Frontal v. Central v. Parietal) x 3 Sagittal (Left Lateral 5s v. Midline zs v. Right lateral 6s)

- For item memory old represents hits, whereas for source memory old represents source correct

Negative Component (Nc) 250-450 ms

- Overall amplitude was greater for the active group than the passive group. F(1,79) = 11.38, p < .01
- Amplitude along the midline was greater for old items was greater then for new items for children who completed the source memory task. F(1,36) = 5.47, p = .03

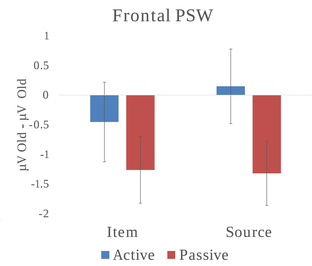


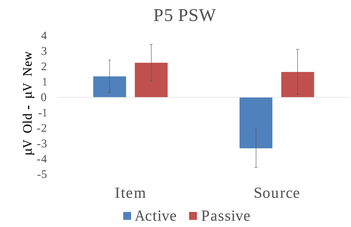


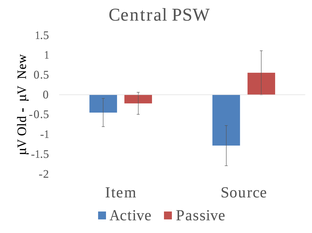
ERP Results

Positive Slow Wave (PSW) 800-1100ms

- Condition x Coronal x Sagittal x Group and Condition x Group x Study interactions
- For both groups in the item memory condition and the Passive group in the source memory condition, new items had greater amplitude than old items in frontal leads F(1, 43) = 3.75, 5.911, ps <.06
- For the Active source memory group, new items had greater amplitude than old item in central and left parietal leads F(1, 19) = 6.44, 7.17, ps<.04







Summary and Conclusions

Memory effects were present for both item and source memory tasks with both passive and active retrieval.

- The effects were more posterior and lateralized to the left hemisphere during active source memory retrieval compared to the other groups.

Different underlying neural process may be involved during source memory retrieval as opposed to item memory retrieval and passive retrieval paradigms my not capture the entire source memory retrieval process.

On a methodological note, participants in the active group for both tasks had more movement related artifacts and therefore provided fewer useable trials.

- Although active retrieval may be necessary for some studies, other studies my prefer passive paradigms, as less data will be lost and they can be completed by a larger variety of populations

Acknowledgements

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