

Introduction

Memories have been shown to be retrieved both *actively*, when trying, and *passively*, when not trying, to remember at the time of retrieval (Berntsen, 2010).

- Active and passive memory retrieval are similar in that adult ERP studies of recognition memory have shown memory effects for both. However, differences have been found in the underlying neural substrates and the use of strategic processes (e.g., Nelson, et al., 1998; Curran, 1999; Hall, et al., 2008; Bernsten, 2010).

Differences between active and passive retrieval during early childhood have not been empirically tested.

- This is of significant interest because, to date, all but one ERP study exploring memory retrieval before 5 years of age has used a passive paradigm (e.g., Bauer, et al., 2003; Riggins, et al., 2013; c.f. Marshall, et al., 2002).

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.

The current study examined ERP correlates generated during active and passive memory retrieval on recognition and source memory tasks in 4- to 5-year-old children.

- Based on previous ERP research in the current age range, two components of interest were examined: the Negative Component (Nc) 350-550ms post stimulus onset and the Positive Slow Wave (PSW) 800-1100ms post stimulus onset (Riggins, et al., 2013).

Question 1: Do active and passive retrieval differ on a recognition memory task?

N = 46; 4- to 5-year-old children

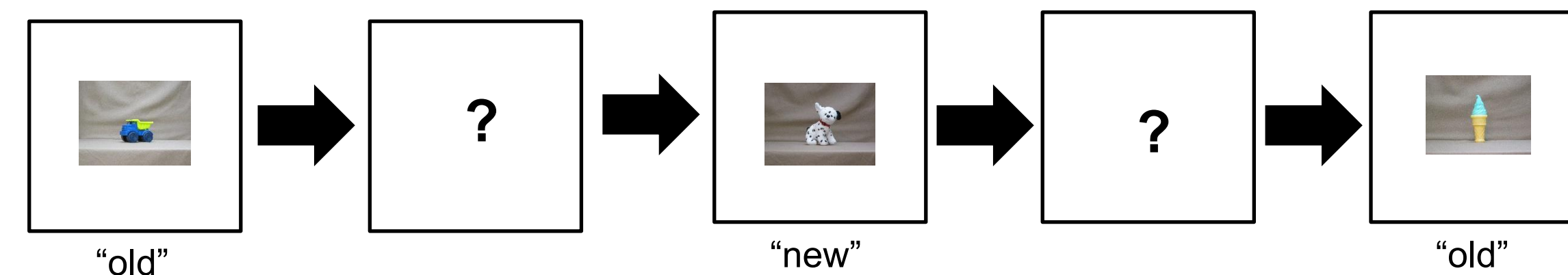
- Active n = 24 (mean age = 5.13 yrs, sd = .69)
- Passive n = 22 (mean age = 5.08 yrs, sd = .61)

Encoding

- Familiarized to 36 novel toys

Retrieval

- Viewed 36 old toys and 36 new toys while brain activity was recorded



Active

- Responded "yes" or "no" as to whether or not they played with each toy while brain activity was recorded

Passive

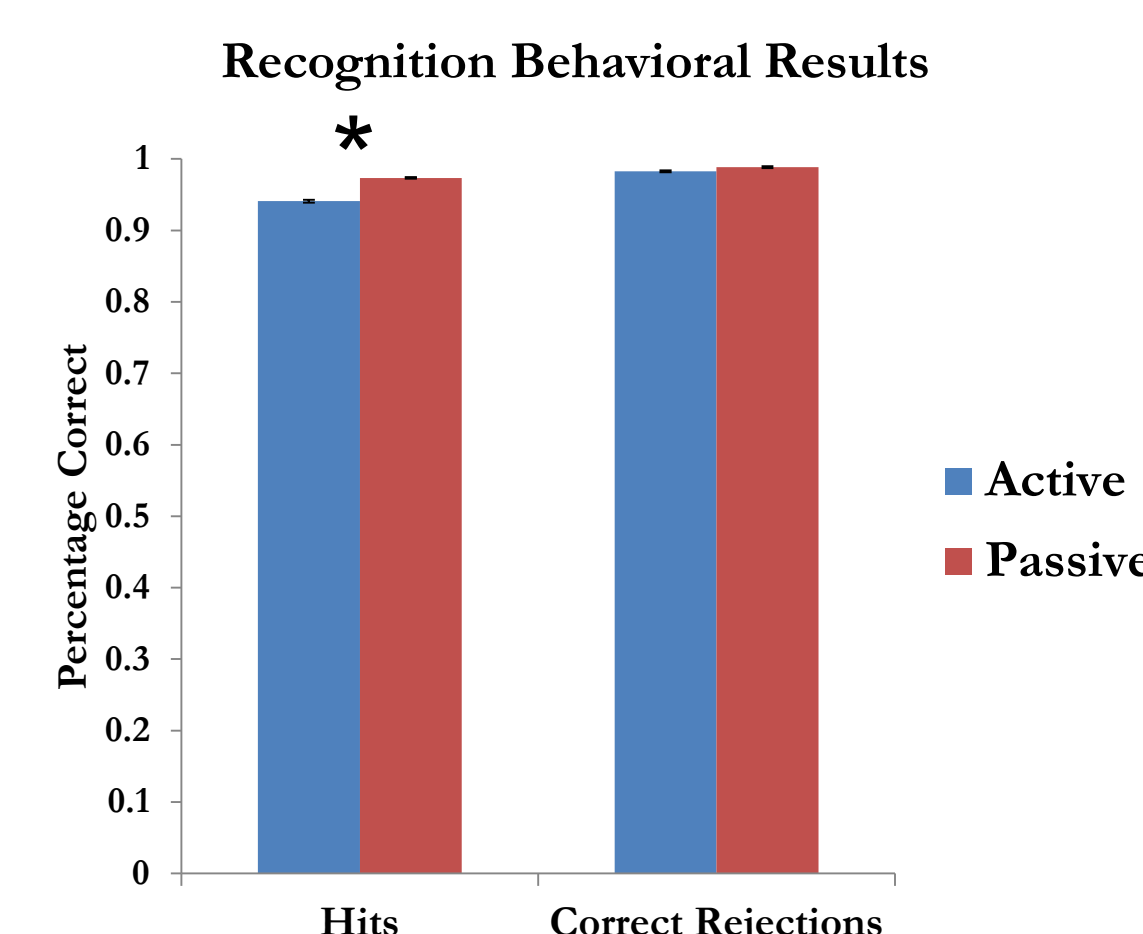
- Viewed the toys with no task
- After recording sorted the toys as to whether or not they had played with them

Recognition Behavioral Results

Memory recognition for the passive group was significantly better than the active group

- Active d' : 3.68
- Passive d' : 3.98
- $t(44) = -2.29, p = .03$

Differences were driven by the passive group's better recognition of previously played with toy as old



Recognition ERP Results

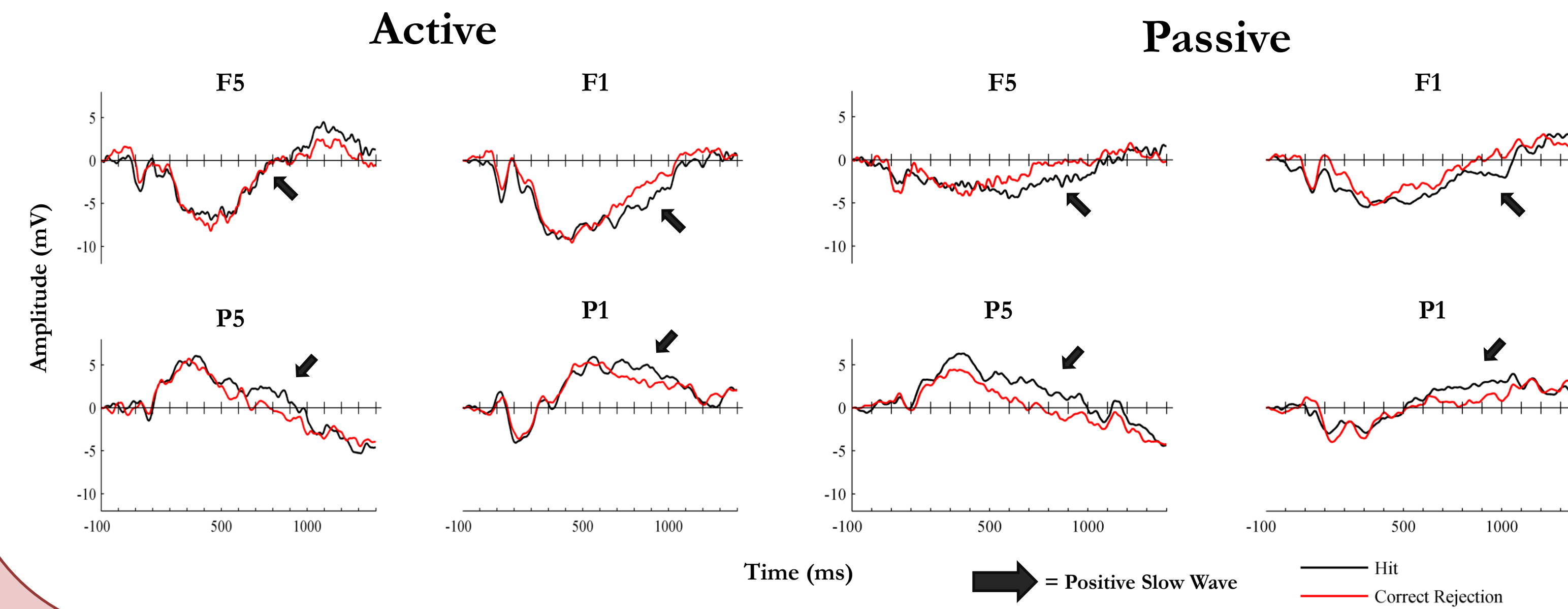
35 lead analysis

Negative Component (Nc) 350-550ms

- Group Similarities: Hits > Correct Rejections
- Group Differences: Active > Passive in frontal and central leads

Positive Slow Wave (PSW) 800-1100ms

- Group Similarities: Correct Rejection > Hit in frontal and central leads; Hit > Correct Rejections in parietal leads
- Group Differences: The memory effect in the Active group was greatest near the midline, whereas the effect in the passive group was greatest laterally



Question 2: Do active and passive retrieval differ on a source memory task?

N = 16; 4- to 5-year-old children

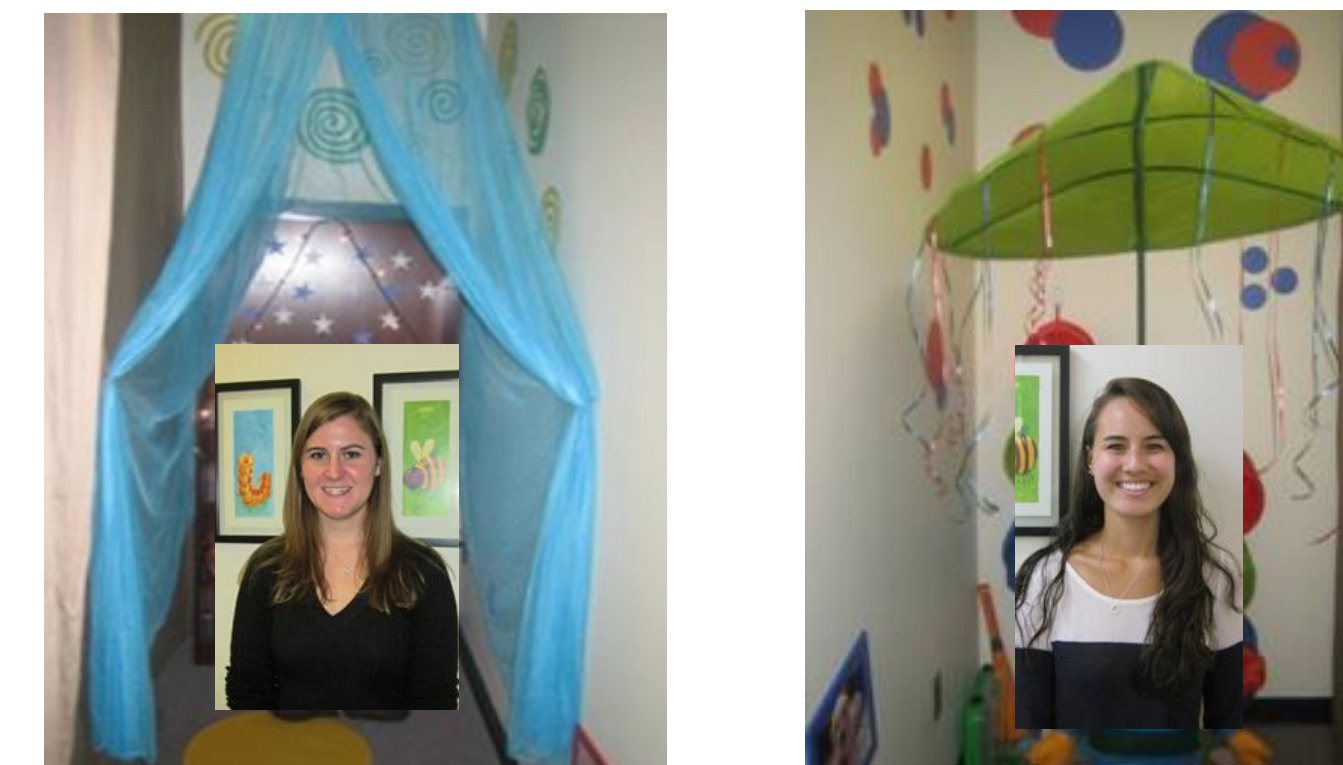
- Active n = 7 (mean age = 4.52 yrs, sd = .71)
- Passive n = 9 (mean age = 4.90 yrs, sd = .58)

Encoding

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

Retrieval

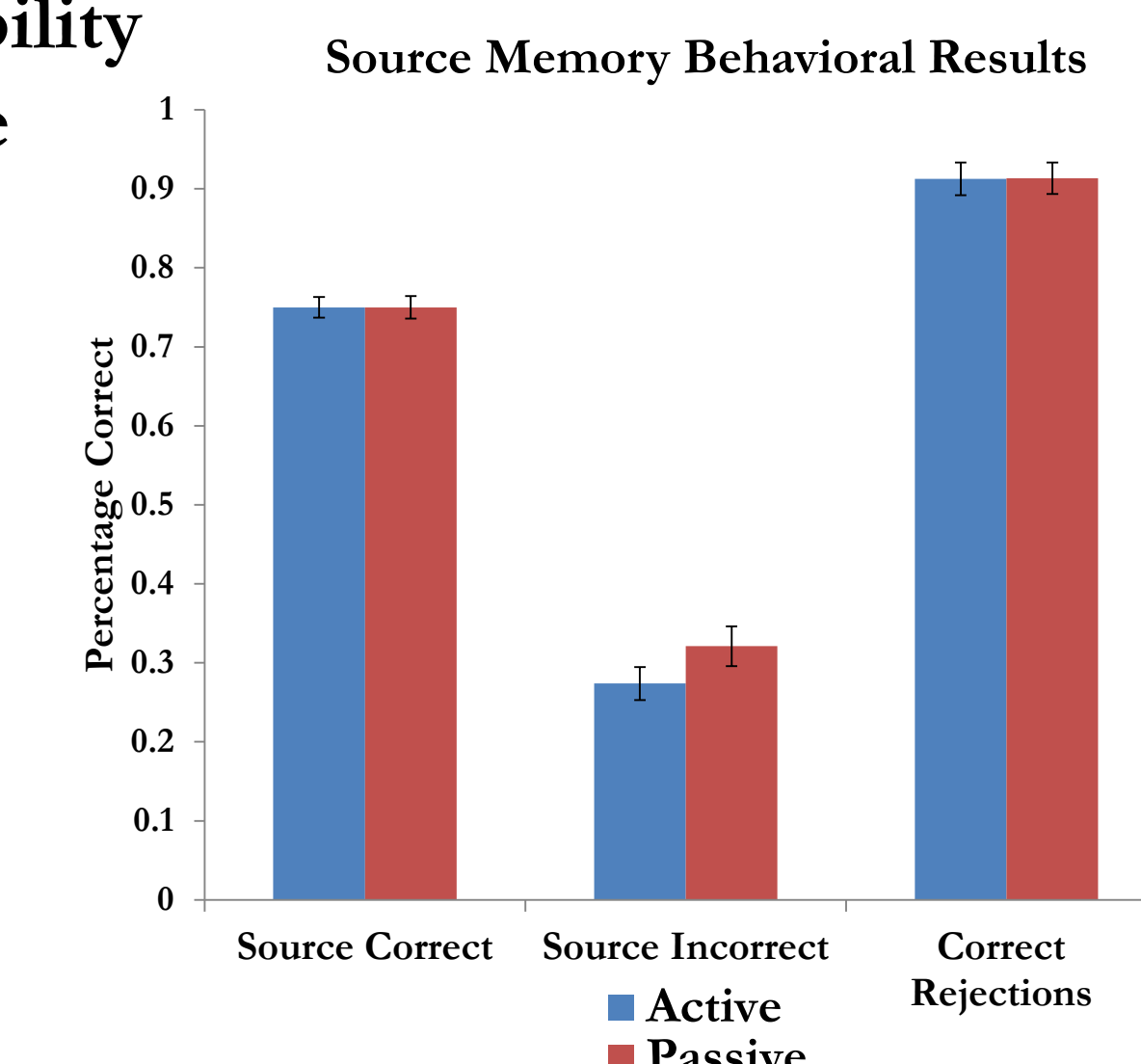
- Viewed 72 old toys and 36 new toys while brain activity was recorded
- The Active group completed an exclusion paradigm during recording, responding "yes" to toys that belonged to researcher A and "no" to toys that belonged to researcher B and new toys
- The Passive group viewed the toys with no task and then completed the same process dissociation task after recording



Source Behavioral Results

There were no differences between groups in their ability to differentiate old toys from new toys or differentiate source correct toys from source incorrect toys

- Source Correct versus Correct Rejections
 - Active d' : mean = 2.39 sd = .80
 - Passive d' : mean = 2.47 sd = .98
 - $t(14) = -.17, p = .87$
- Source Correct versus Source Incorrect
 - Active d' : mean = 1.38 sd = .49
 - Passive d' : mean = 1.37 sd = .67
 - $t(14) = .02, p = .98$



Source ERP Results

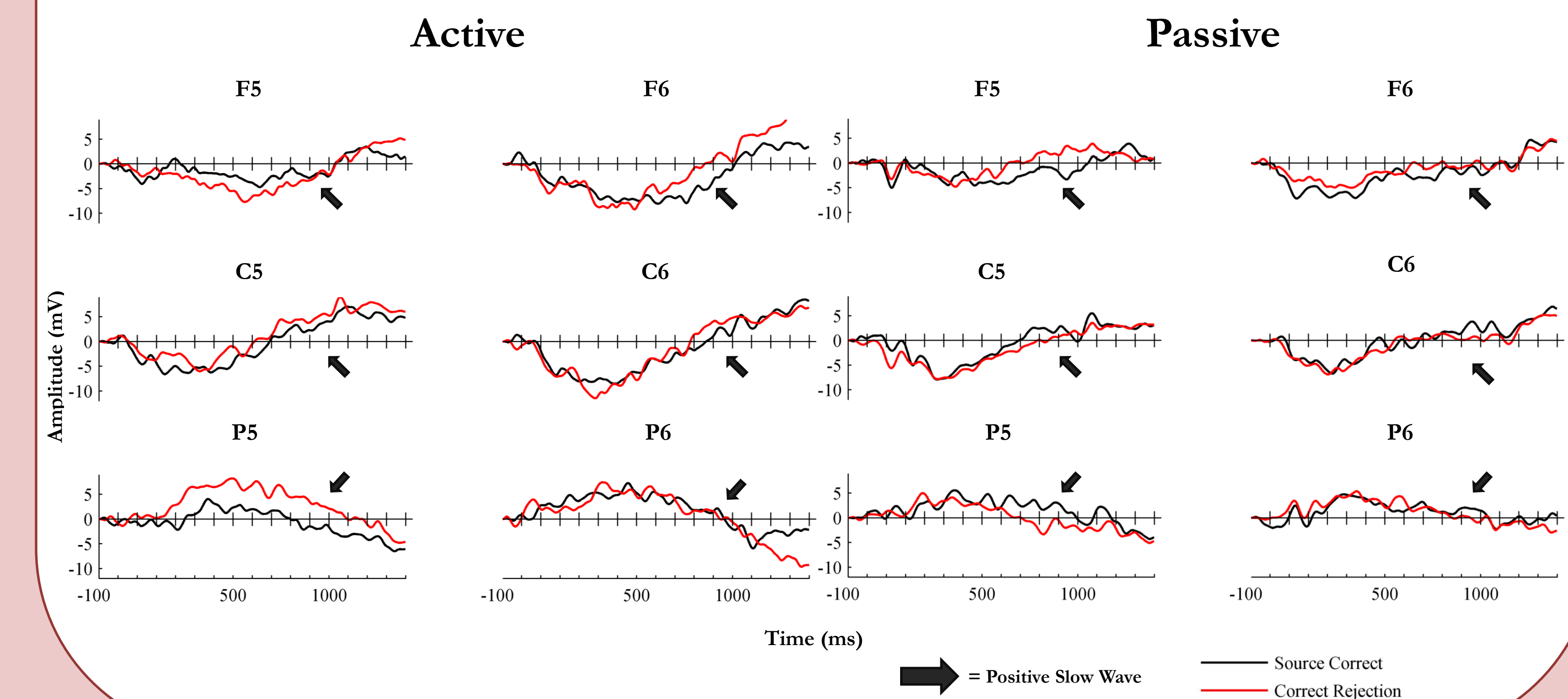
9 lead analysis (informed by study 1) – Preliminary Results

Negative Component (Nc) 350-550ms

- Group Similarities: No memory effects in either group

Positive Slow Wave (PSW) 800-1100ms

- Group Similarities: Correct Rejection > Source Correct in frontal leads
- Group Differences: Correct Rejection > Source Correct in central and left parietal leads for the Active Group



Conclusions

ERP memory effects were present on both recognition and source memory tasks for both active and passive retrieval conditions.

- However, these memory effects differed in spatial location. In addition, the Active group tended to show overall larger amplitudes (consistent with adult research).

These findings are similar to previous ERP studies in that memory effects were found with both retrieval conditions and consistent with previous research showing reliance on different neural substrates

- Future work will explore topographical differences between active and passive retrieval
- On a methodological note, participants in the Active group for both tasks had more movement related artifacts and therefore provided fewer useable trials.

Acknowledgements

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References

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