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INTRODUCTION

Children who demonstrate preferences for novel objects relative to familiar objects during infancy tend to have higher IQ scores during childhood. As a result of this consistent research finding, there has been a great deal of attention given to infant attentional and memory processes. Much of this infant work has focused on memory processes and associated neural networks, such as hippocampal and temporal areas. Individual differences in visual attention during the familiarization phase of infant memory paradigms are highly correlated with the amount of time spent looking at a novel object during the testing phase when infants can choose to look at the familiarized or novel object. Posner (Posner & Raichle, 1995) has suggested that the vigilance attentional network of the brain is involved in effortful sustained processing of continuous visual stimuli. It may be that it is individual differences in the functioning of the vigilance attention network yield individual differences in infant novelty scores.




In this study, we examined infant brain electrical activity (EEG) during the familiarization phase of the infant recognition memory paradigm. We hypothesized that infants with a novelty preference would have different EEG patterns in frontal scalp locations (corresponding to areas implicated in Posner's vigilance system) as compared to infants who do not demonstrate a novelty preference. In addition, we investigated brain electrical activity patterns at temporal scalp sites, and hypothesized that infants with novelty preference (thus successful recognition memory) would have greater temporal activity during the retrieval test phase.

PARTICIPANTS

Participants in this study were 23 5-month-old infants recruited from the New River Valley area of southwest Virginia. Infants were recruited if they were born within 2 weeks of their expected due dates and experienced no prenatal or birth complications. All infants weighed at least 2,500 grams at birth, required no oxygen at birth, and had no neurological diagnoses.

These data are drawn from a current longitudinal dataset following the cognitive and socio-emotional development of 100 infants into early childhood.

RECOGNITION MEMORY PROCEDURE

<p>Baseline EEG</p>  <p>With the infant seated on the caregiver's lap, the experimenter manipulates an infant toy and taps her fingernails for 60 seconds.</p>	<p>Familiarization</p>  <p>Infants encode the familiarization puppet by accruing 4 looks, each separated by a 3-second look away from the puppet.</p>	<p>Retrieval</p>  <p>Approximately 20 minutes after familiarization, infants are allowed to look at both the novel and familiar puppets for 30 seconds to establish visual preference.</p>
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RESULTS

Visual preference

Visual Preference was calculated according to Fagan's criteria (1971). During the retrieval phase, infants who spent more than 53% of the time looking at the novel puppet were labeled as Novelty Preferring (N=9). Infants who spent less than 53% of the retrieval phase looking at the novel puppet were categorized as having No Preference (N=14).

Baseline Physiology

There were no frontal or temporal differences in baseline EEG between infants who were novelty-preferring and those who did not express a novelty preference.

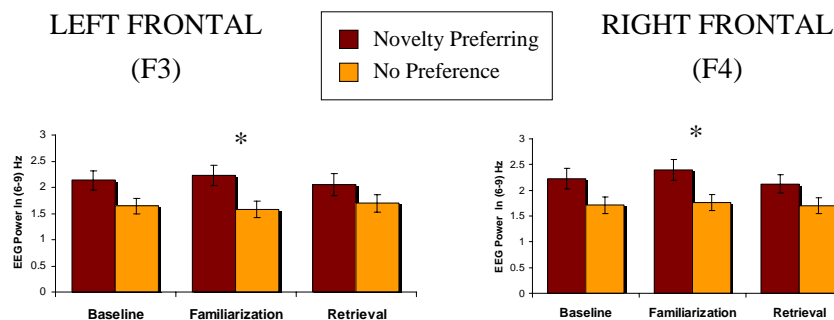
Familiarization

While encoding the familiarization puppet, infants who went on to demonstrate a novelty preference showed increased bilateral activity in frontal areas (specifically F3 & F4), as well as increased right temporal activity (T4) when compared to non-preferring infants who displayed no task-related changes in activity from any frontal or temporal scalp sites (p=.06).

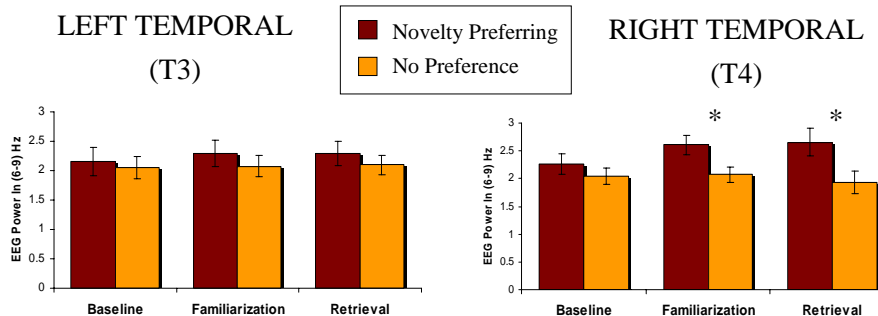
Retrieval

During the retrieval phase, infants who demonstrated a novelty preference showed increased activity in the right temporal cortex (T4) when compared to non-preferring infants (p=.06). Infants without novelty preference displayed no task-related changes in activity from any frontal or temporal scalp sites.

FRONTAL CORTEX



TEMPORAL CORTEX



DISCUSSION

Infants displaying a novelty preference had higher EEG power values at the left and right frontal scalp locations during the familiarization phase of the recognition memory task than did infants without novelty preference. This pattern of EEG activity may suggest that differences in executive attention during encoding impact novelty preference. In addition, novelty-preferring infants had greater EEG activity in the right temporal location compared to infants without novelty preference during both familiarization and test. The temporal area has been associated with recognition memory, specifically facial recognition, which is appropriate as the glove puppets contain facial features. These results suggest that task-specific increases in brain activity in the frontal and temporal regions may contribute to the formation of novelty preferences.