

Infant Visual Preferences within the Modified-Oddball ERP Paradigm



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Abstract and Methods

An oddball paradigm was used to measure ERP components associated with recognition memory in infancy. Infants were exposed to brief presentations of three types of memory stimuli: frequent familiar, infrequent familiar, and infrequent novel. Paired-comparison trials involving simultaneous presentation of a familiar and a novel stimulus were interspersed in the brief presentations. EEG recordings were made with a 126-channel system and ERP averages were made from -50 ms to 2000 ms around stimulus onset for brief stimulus exposures, and for the duration of the paired-comparison trials. The goals were to examine the consistency between ERP components and behavioral measures of recognition memory.

Participants

Infants in the following three age groups were used as participants: 4.5, 6, and 7.5 months of age. Only infants born full-term, weighing greater than 2500 g at birth, with no pre- or perinatal medical complications were used.

Procedure

Infants were familiarized with two stimuli (phase 1), then they were given brief stimulus presentations of each familiar stimulus to insure equivalent ERP responding to each stimulus prior to the testing phases (phase 2). Infants were then exposed to three paired-comparison trials comparing: frequent familiar vs infrequent familiar, frequent familiar vs infrequent novel, and infrequent familiar vs infrequent novel (phase 3). Following phase 3, 60 s trials of modified-oddball brief stimulus presentations (phase 4) were followed by a single paired-comparison trial (phase 5). Phases 4 and 5 were repeated until the infant became tired or fussy.

EEG Recording and ERP Analysis

A high-density 128 channel EEG recording system was used. The vertex was used as the reference for the recordings. The sampling rate of the EEG was 250 Hz, and band-pass filters were set from 0.1 to 100 Hz, with 20K amplification.

Two ERP components were computed. First, the EEG was segmented beginning 48 ms prior to the onset of the brief visual stimulus and through 2 s following. The Nc component was quantified. Second, ICA was used to identify eye movements in the visual preference EEG, remove those components numerically from the EEG, and then ERP components were averaged from the onset of the fixation onset. We expected to find a Nc at fixation onset.

Results

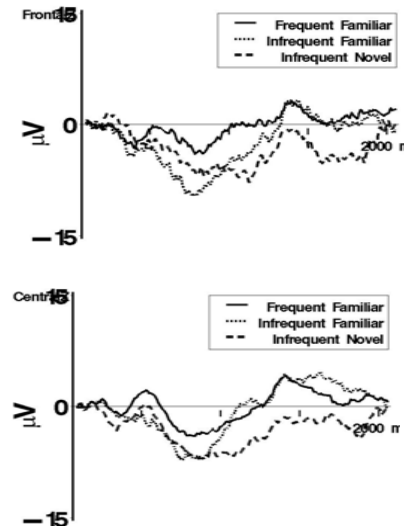
Visual Paired-Comparison Novelty Preference

The analysis revealed interesting age effects in the behavioral data. The youngest age group failed to demonstrate novelty preferences for any comparison trial. Novelty preference scores increased across

Age	Paired-Comparison Choice Trials		
	FF vs. IN	IF vs. IN	FF vs. IF
4.5 Months	.521(.26)	.528(.28)	.544 (.23)
6 Months	.562(.29)	.629(.26)	.534(.31)
7.5 Months	.659(.24)	.561(.23)	.649(.26)

Modified Oddball Trials The Nc ERP Component

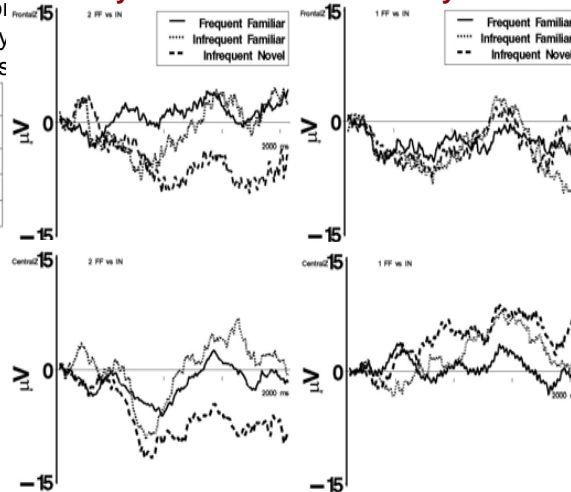
There was a main effect of stimulus type on Nc amplitude to the brief stimulus. All age groups demonstrated greater amplitude Nc following novel stimulus presentations than following familiar



Oddball ERP and Novelty Preference

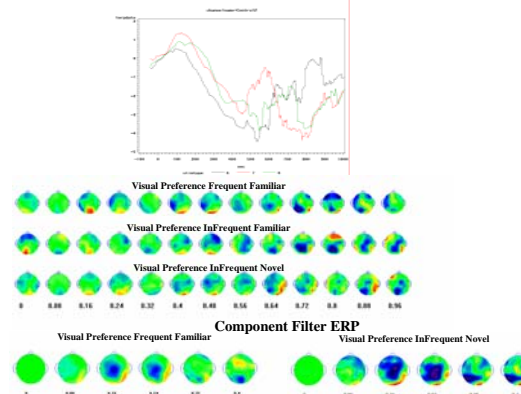
The ERPs on the modified-oddball procedure were compared for infants that showed novelty preference (or not) on the visual paired comparison trials. Infants showing novelty preference showed larger Nc in the oddball procedure

Novelty Preference Familiarity Preference



Visual Paired-Comparison ERPs

The ERPs on the visual preference procedure were examined averaged from the look onset

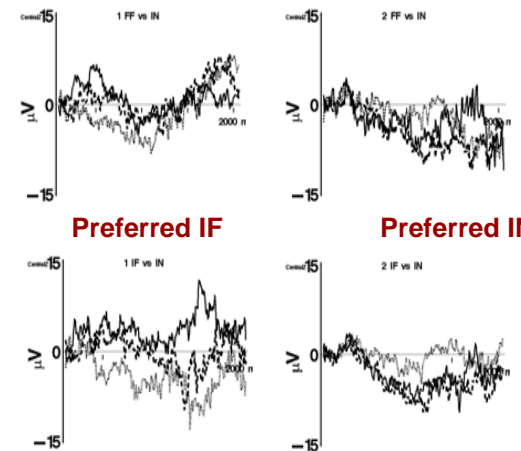


VP ERP and Overall Preference

The ERPs on the visual preference procedure were compared to overall preference. There was a tendency for novelty preference participants to show larger ERPs to the novel stimulus when looking at it. AND, on individual trials the Nc was largest to the stimulus that was preferred regardless of type.

Preferred FF

Preferred IN



Summary

The 26- and 32-week-olds preferred novel stimuli, whereas the 20-week-olds preferred familiar stimuli.

Infants that showed an overall novelty preference (behavior) also had the largest Nc to the novel stimulus in the modified oddball presentations. Infants that showed no or familiar preference had equivalent Nc to the oddball stimuli.

Greater amplitude Nc was found to the preferred stimulus regardless of type; but since overall the preferred stimulus was the infrequent novel, it also showed greatest NC.

These findings indicate that behavioral measures can be successfully integrated into ERP studies of infant cognitive development, although ERP and behavioral findings may not be entirely consistent.