

Looking vs. Reaching: A Longitudinal Investigation of Infant Working Memory and EEG

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Introduction

Recently we proposed that the frontal skills of working memory and inhibitory control that are crucial for reaching performance on the A-not-B task (Diamond, 1990; Diamond, Prevor, Callender, & Druin, 1997) are likewise essential for performance on a looking version of the task at 8 months of age (Bell & Adams, 1999). Similar results have been demonstrated by others when the looking and reaching tasks tap similar cognitive skills (e.g., Matthews, Ellis, & Nelson, 1996).

Our next step has been to examine developmental trajectories of looking and reaching performance. Because the looking response matures prior to the reaching response, it may be that our 8-month-old infants performed similarly on the two task versions because reaching had caught up with looking. If looking does indeed mature faster, then we should be able to utilize a longitudinal sample of infants to capture that maturational process.

The focus of our previous work has been individual differences in task performance and associated electrophysiology (Bell, 2001; Bell & Fox, 1992, 1997). That remained a focus of this new longitudinal sample.

Methodology



Data were collected for this study in 2 cohorts (n=20). Data from cohort 1 (n=14) have been previously reported. This report has the combined data from cohort 1 and cohort 2 (n=6).

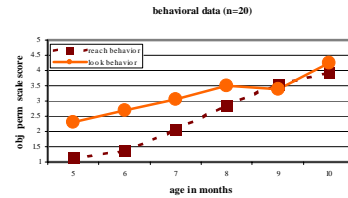
Each infant participated in looking and reaching versions of a spatial working memory task (Bell & Adams, 1999) at monthly laboratory visits from 5 to 10 months of age. The same experimenter assessed each infant on both versions of the task throughout the study.



Behavioral Data

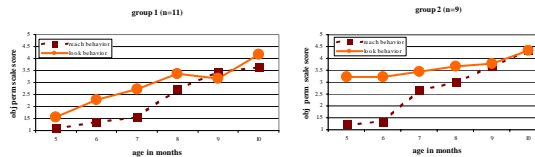
Behavioral data were coded on an ordinal scale. Infants were given scores appropriate for their performance at that particular monthly session. The score represented the infant's best performance at that session.

- 1 = found object partially hidden at one location
- 2 = found object completely hidden at one location
- 3 = found object hidden at 1 of 2 possible locations, but erred when object hidden in opposite location
- 4 = found object hidden at 1 of 2 possible locations with multiple displacements
- 5 = same as #4 but with a 2-second delay at each hiding
- 6 = same as #4 but with a 4-second delay at each hiding.

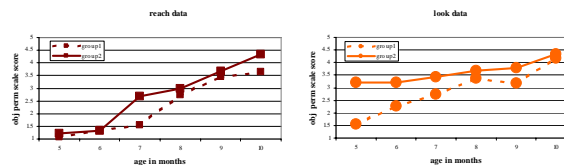


Individual Differences in Cognition

Examination of individual data revealed that there were actually 2 developmental patterns of performance. This was verified by K-means Cluster Analysis.

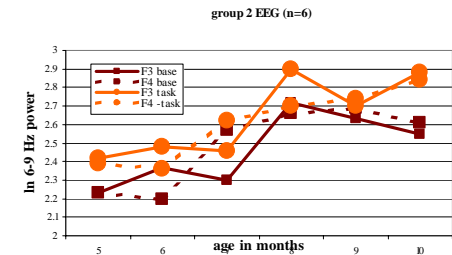
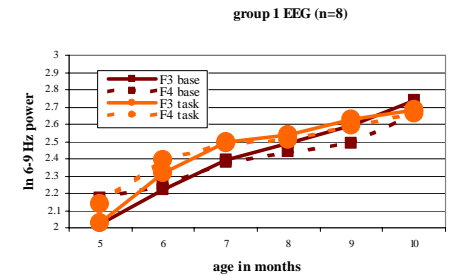


The two groups of infants had comparable developmental patterns on the reaching version of the task, but different developmental patterns on the looking version of the task. Group 2 appears to already be accomplished on the looking task by 5 months of age and, thus, shows little improvement by 10 month of age.



Frontal EEG Data

EEG data of the two performance groups have been examined to determine whether the different patterns of looking task performance were correlated with frontal EEG activity. These preliminary analyses involve the infants in cohort 1 only. With these 14 infants, there were trends toward a Group X Condition (baseline, task) X Age interaction ($p = .12$) and a Group X Age X Hemisphere interaction ($p = .06$). We anticipate that when the EEG analyses are completed for cohort 2, the combined longitudinal data set will have sufficient power to affirm these trends.



Discussion

These data demonstrate that the two performance groups appear to have not only different developmental patterns behaviorally, but physiologically as well. Examination of EEG data from other scalp locations will aid in clarifying the EEG developmental patterns that are associated with these group differences in task performance.