Development of Covert Attention in Low-risk Preterm Infants

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Introduction

Spatial cueing paradigms have demonstrated that by 6-7 months of age infants are able to covertly shift attention following visual cues. The precise timing of this development is presumed to reflect changes in brain structure and function, such as the maturation of neural systems supporting voluntary eye movements.

Early attention development in preterm infants is of particular interest given the increased incidence of attention disorders in preterm populations. Although few studies have examined the development of covert orienting of visual attention in preterm infants, research suggests that in the absence of severe neurological injury, the development of the visual system follows corrected age.

The current pilot study aims to investigate covert orienting of attention in preterm infants, in order to examine the relative influence of maturation versus visual experience in the development of the brain structures necessary to produce early shifts in visual attention.

Questions

- **Do moderately preterm infants show alterations in the development of covert attention?**
- **How do maturation and visual experience contribute to the development of early covert attention abilities?**

Participants

All infants were also screened for significant prenatal or birth complications, developmental or neurological disorders, and vision or hearing impairments

Moderately Preterm Infants (n=28)
- tested at chronological age of 7 months (+/- 1 week)
- corrected age at test = 5.4 – 6.5 months
- gestation period = 32.6 – 37.0 weeks
- no severe neonatal medical illness

Full-Term Infants: Corrected Age-Matched (n=26)
- selected to match gender and corrected age of individual preterm infants (+/- 2 days)
- age at test = 5.4 – 6.5 months
- gestation period = 37.9 – 41.6 weeks

Full-Term Infants: Chronological Age-Matched (n=25)
- tested at chronological age of 7 months (+/- 1 week)
- gestation period = 37.7 – 41.0 weeks

Acknowledgments

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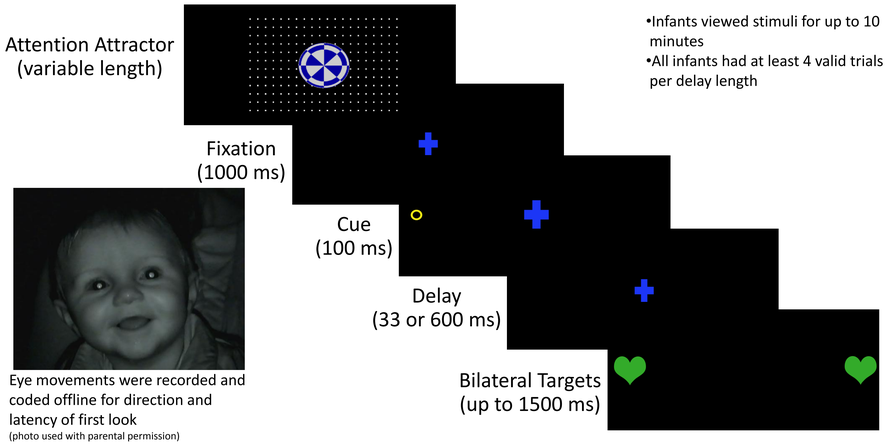
Methods: Spatial Cueing Task



- Infants viewed stimuli for up to 10 minutes
- All infants had at least 4 valid trials per delay length

Eye movements were recorded and coded offline for direction and latency of first look
(photo used with parental permission)

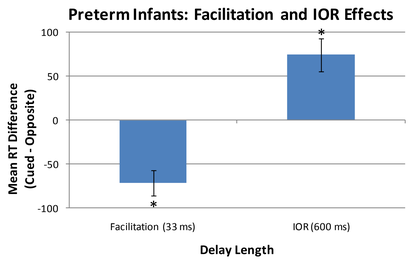
Difference Score RT Measure:
(average latency to targets in opposite location) – (average latency to targets in cued location)

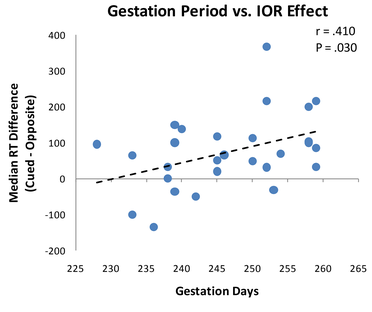
Facilitation: faster latency to the cued side than the non-cued side following a short delay (33 ms)

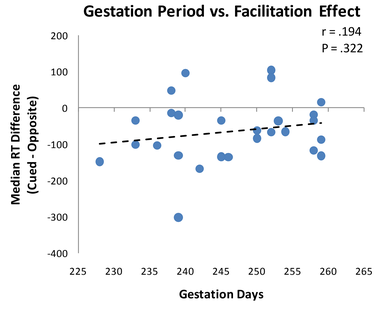
Inhibition of return (IOR): faster latency to the opposite, non-cued than the cued side following a long delay (600 ms)

Results: Preterm Infants

- **Preterm infants showed significant facilitation and IOR effects**
- **Preterm infants with longer gestation periods showed larger IOR effects**
- Length of gestation did not predict size of facilitation effects

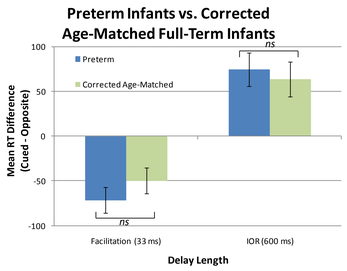






Is the relationship between degree of prematurity and IOR based on post-natal maturation time or visual experience?

Results: Group Comparisons

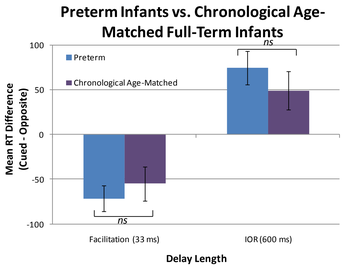


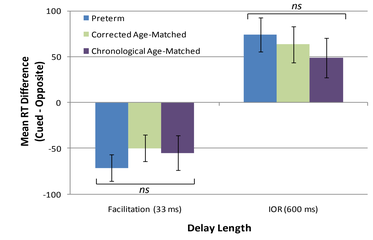
Is development of covert attention based on post-natal maturational time?

- Both groups show significant facilitation and IOR effects with no group differences
- No correlation between age at test and facilitation/IOR effects in corrected age-matched full-term infants

Is development of covert attention based on visual experience?

- Both groups show significant facilitation and IOR effects with no group differences





- No group differences (including between the two full-term groups of different ages) in facilitation/IOR effects

If group differences do not exist, why is IOR effect correlated with gestation period in the preterm group?

Discussion

What contributes to the development of covert attention during infancy?
- *not only post-natal maturation time*: no correlation between facilitation/IOR effects in corrected age-matched full-term group
- *not only visual experience*: no difference in facilitation/IOR effects in full-term comparison groups, despite unequal amounts of visual experience
- *not only gestation time*: correlation between IOR and gestation period is significant only in the moderately preterm group and becomes non-significant if full-term infants are included

Future directions include investigating the stability of covert attention within individual infants across time and better characterizing the relationship between IOR and later attention skills

Take-Home Message

By 7-months, moderately preterm infants do not show alterations in the development of covert attention. Post-natal maturation time and visual experience both likely contribute to covert attention development during infancy.