Development of Basic Indices of Attention to Nonsocial Events Across Infancy: Effects of Unimodal versus Bimodal Stimulation

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Introduction

Infant attention becomes more flexible and efficient across development with decreases in look length and processing time and concurrent improvements in disengagement of attention (e.g., Colombo, 2001; Johnson, Posner, & Rothbart, 1991; Ruff & Rothbart, 1996). Improvements in disengagement have been linked to self regulation and the regulation of social interactions, and faster processing has been linked to enhanced cognitive and perceptual skills and better developmental outcomes. Although much research has focused on the development of visual attention, particularly to static forms, there has been little focus on the development of attention to dynamic audiovisual events, dynamic visual events, or a comparison of the two. Moreover, an integrated picture of changes in attention across infancy for dynamic events is not available, as prior studies have used diverse methods, measures, and restricted age ranges.

According to the Intersensory Redundancy Hypothesis (IRH, Bahrick & Lickliter, 2000), multimodal stimulation provides redundancy across the senses (e.g., rhythm, tempo) and is highly salient, particularly to young infants. Intersensory redundancy available in multimodal stimulation is thought to maintain attention longer than unimodal stimulation from the same events and constrain attention to amodal, redundantly specified properties (such as rhythm, tempo, and intensity). This may be reflected by less frequent disengagement, as well as longer looks and processing times to bimodal as compared to unimodal events. Previous research from our lab assessing attention to social events has supported these hypotheses (Bahrick et al., 2008). In the present study, we predicted attention to nonsocial events would parallel that of social events if intersensory redundancy guides attention across domains in early development.

Method

We assessed the development of three basic indices of attention (disengagement, processing time, and look length) across the first 8 months of life, using data from several published and unpublished studies from our laboratory. Data from 360 infants at 2 (N = 68), 3 (N = 67), 5 (N = 158), and 8 months (N = 67) were analyzed. In all studies, infants were habituated to dynamic displays of a toy hammer tapping a rhythm under one of two conditions: (1) bimodal, synchronous, audiovisual or (2) unimodal (silent) visual. The mean number of looks away per minute (disengagement), time to habituation (processing time), and length of look were analyzed.

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Figure 1. Disengagement (Looks Away Per Minute)

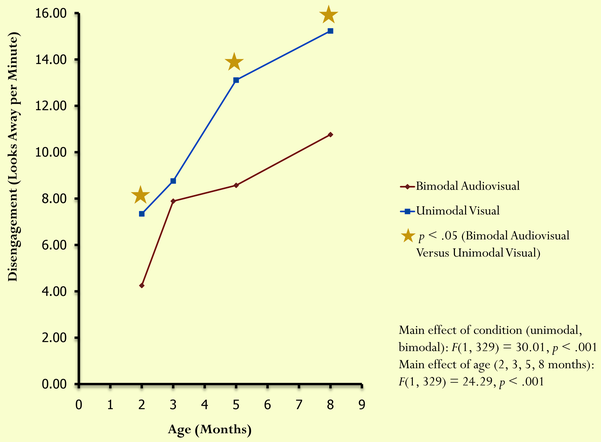


Figure 2. Processing Time

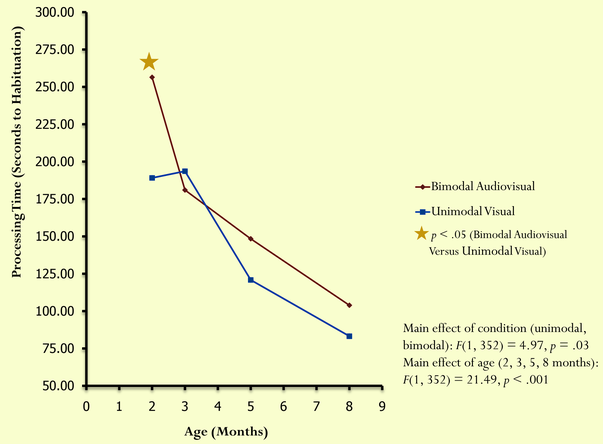
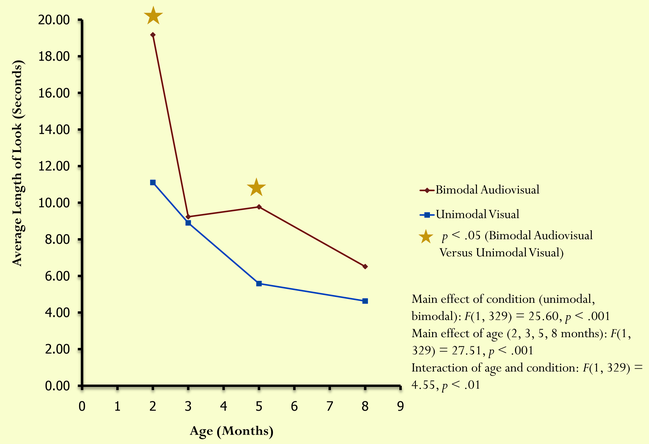


Figure 3. Average Length of Look



Results

Age (2, 3, 5, 8 months) x condition (bimodal, unimodal) between subjects ANOVAs were performed for each of the three indices of attention. Results (see Figures 1, 2, and 3) indicated significant main effects of age, and polynomial contrasts indicated significant linear trends for all variables (*p*s < .001), with mean number of looks away increasing, and mean length of look and processing time decreasing systematically across age, consistent with trends reported in the literature. Moreover, main effects of condition for all three variables were found, revealing fewer looks away, longer looks and longer processing times for bimodal, redundant displays than for unimodal visual displays (see Figures 1, 2, 3), consistent with predictions of the IRH. These bimodal-unimodal differences in attention, however, appeared to be attenuated in 3-month-olds. Together, these findings provide evidence for the greater attentional salience of redundant, multimodal events relative to unimodal visual events in early development.

Conclusions

The data from this study converge with previous data from our laboratory (Bahrick et al., 2008) investigating attention to dynamic social events (faces and voices) across infancy and are consistent with findings in the literature indicating increased disengagement and shorter length of look and processing times across infancy (e.g., Colombo, 2001; Johnson, Posner, & Rothbart, 1991; Ruff & Rothbart, 1996). Furthermore, along with our prior study of social events (Bahrick et al., 2008), these findings provide the first systematic empirical support for the prediction that bimodal, audiovisual events maintain attention more effectively than unimodal visual events across infancy from 2 to 8 months of age. The possible exception at 3 months of age will be explored in further research. Consistent with predictions of the IRH, our findings suggest that the intersensory redundancy available in multimodal events is highly salient, and recruits and maintains infant attention. Moreover, parallel findings across social and nonsocial events suggest that intersensory redundancy is a domain general attention mechanism. These findings provide a new developmental picture of changes in basic indices of attention to dynamic audiovisual and visual events across infancy. They can contribute to more integrated theories of the development of attention and to earlier identification of atypical developmental patterns.

References

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