

Intersensory Redundancy Impairs Face Perception in Early Development

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Introduction

Research has demonstrated that young infants are excellent perceivers of faces, however, little is known about infants' perception of faces in dynamic, multimodal events nor about the conditions that enhance versus attenuate face discrimination in early infancy. Bahrick and Lickliter (2000, 2002) proposed an "intersensory redundancy hypothesis" (IRH), which predicts that in early development, experiencing an event redundantly across two senses (bimodally) facilitates perception of amodal properties (e.g., synchrony, rhythm, tempo), whereas experiencing an event in one sense alone (unimodally) facilitates perception of modality specific properties (e.g. color, pattern, timbre). Face perception requires detection of modality specific information such as pattern and featural configuration. Therefore, in early development, the ability to discriminate faces should be enhanced in unimodal visual stimulation (in the absence of vocal stimulation) and attenuated in bimodal stimulation (audiovisual speech) where salient redundant amodal properties compete for attention. Bahrick, Lickliter, Vaillant, Shuman and Castellanos (2004) supported this prediction by demonstrating that two-month-olds discriminate faces under unimodal, but not bimodal, synchronous conditions. The present study tested the basis for these findings. We hypothesized that face-voice *redundancy* impaired face discrimination in young infants rather than simply the presence of stimulation from a second modality or having greater amount of stimulation (face plus voice). We assessed 2-month-old infants' face discrimination in bimodal, asynchronous stimulation, thus equating the overall amount and type of stimulation with that of the synchronous, bimodal condition, while eliminating redundancy (audiovisual synchrony). We predicted that infants would discriminate faces in this asynchronous, nonredundant condition.

Method

Twelve 2-month-olds were habituated in an infant-control habituation procedure to videos of one of two women (see Figure 1) speaking a nursery rhyme in which the auditory and visual information were asynchronous. The rhyme (30 s long) was presented out of synchrony with its soundtrack (offset by 15 s). Following habituation, infants received two test trials depicting the face of the novel woman speaking with the familiar, asynchronous voice. Visual recovery to the change in face served as the measure of discrimination.

Figure 1



Results

Results (along with those of our prior study; see Figure 2) supported our predictions and demonstrated that infants who received bimodal asynchronous stimulation showed significant visual recovery to a novel face ($t(11) = 5.63, p = .0002$). These results converge with the findings of Bahrick et al. (2004), where infants who received unimodal visual stimulation showed significant visual recovery to a novel face ($t(15) = 3.68, p = .002$), whereas infants who received bimodal synchronous audiovisual stimulation showed no evidence of visual recovery to the novel face ($t(15) = 1.60, p > .1$). Taken together with results of our prior research, the present results demonstrate that infants of 2-months of age are able to discriminate a change in face following bimodal asynchronous and unimodal visual stimulation but not following bimodal synchronous face/voice stimulation.

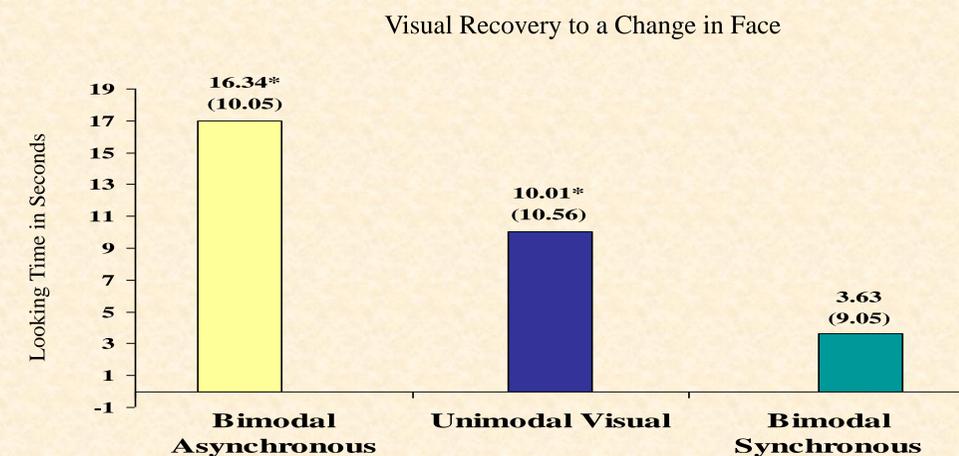
Conclusions

These findings, along with those of Bahrick et al. (2004) support predictions of the IRH and indicate that in early infancy face perception is enhanced when faces are experienced visually, (without intersensory redundancy) and attenuated in the context of naturalistic, redundant, audiovisual speech. Intersensory redundancy between movements of the face and sounds of speech is highly salient and attracts attention to amodal properties such as affect, rhythm, tempo, and prosody of speech (Bahrick & Lickliter, 2000; Bahrick, Flom, & Lickliter, 2002; Flom & Bahrick, in press) and away from the appearance of the face during early development. Contrary to the established view that faces are highly salient, these results suggest that faces are not always salient during early development.

References

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Figure 2



*= p<.01