

Abstract

Although research demonstrates that young infants are excellent perceivers of faces, we know little about their perception of faces in the context of naturalistic, dynamic, multimodal events such as audiovisual speech. Bahrick and Lickliter (2000) proposed an “intersensory redundancy hypothesis” (IRH) which holds that, in early development, experiencing an event redundantly across two senses facilitates perception of amodal properties (e.g., synchrony, tempo, rhythm) whereas experiencing an event in one sense modality alone facilitates perception of modality specific aspects of stimulation (e.g., pitch, color, pattern, configuration). Therefore, since discrimination of faces requires detection of modality specific information, in early development, discrimination should be enhanced when the faces are presented visually and attenuated when they are presented audiovisually. The present study assessed 2-month-old infants’ ability to discriminate unfamiliar female faces under bimodal (audiovisual) and unimodal (visual) conditions. Infants were habituated to videos of one of two women speaking a nursery rhyme under either a visual (silent speech) or an audiovisual speech condition. Results indicated that infants showed significant visual recovery to the novel woman in the unimodal visual condition but not the bimodal audiovisual condition. These findings support predictions of the IRH and demonstrate that in early infancy face perception is enhanced when the face is experienced visually, and attenuated when it is perceived in the context of dynamic, multimodal events such as audiovisual speech.

Introduction

The infant’s early social environment is characterized by close face-to-face interactions with adults. Although research demonstrates that young infants are excellent perceivers of faces, we know little about their perception of faces in the context of naturalistic, dynamic, multimodal events such as audiovisual speech. Further, it is not known under what conditions face discrimination is enhanced or attenuated. Bahrick and Lickliter (2000, 2002) proposed an “intersensory redundancy hypothesis” (IRH), which states that in early development, experiencing an event redundantly across two senses (bimodally) facilitates perception of amodal properties (e.g., synchrony, intensity, rhythm, tempo), whereas experiencing an event in one sense alone (unimodally) facilitates perception of modality specific properties (e.g. color, pattern, configuration, pitch, timbre). Since discrimination of faces requires detection of modality specific information such as hue, contrast, pattern, and the configuration of facial features, in early infancy, discrimination of faces should be enhanced in unimodal stimulation such as when faces are seen in the absence of accompanying vocal stimulation. In contrast, discrimination of faces should be attenuated in bimodal stimulation when the face and voice are presented together (e.g. audiovisual speech) and redundant amodal properties are salient and attract attention away from the appearance of the face. Research findings in the domain of voice discrimination have supported this principle. The voices of two women were discriminated by young infants in unimodal auditory speech but not in the context of bimodal audiovisual speech (Bahrick, Lickliter, Shuman, Batista, & Grandez, 2003). The present study paralleled our study of voice discrimination and tested young infants’ ability to discriminate between the faces of two unfamiliar women under bimodal, audiovisual speech as compared with unimodal, visual speech conditions.

Figure 1

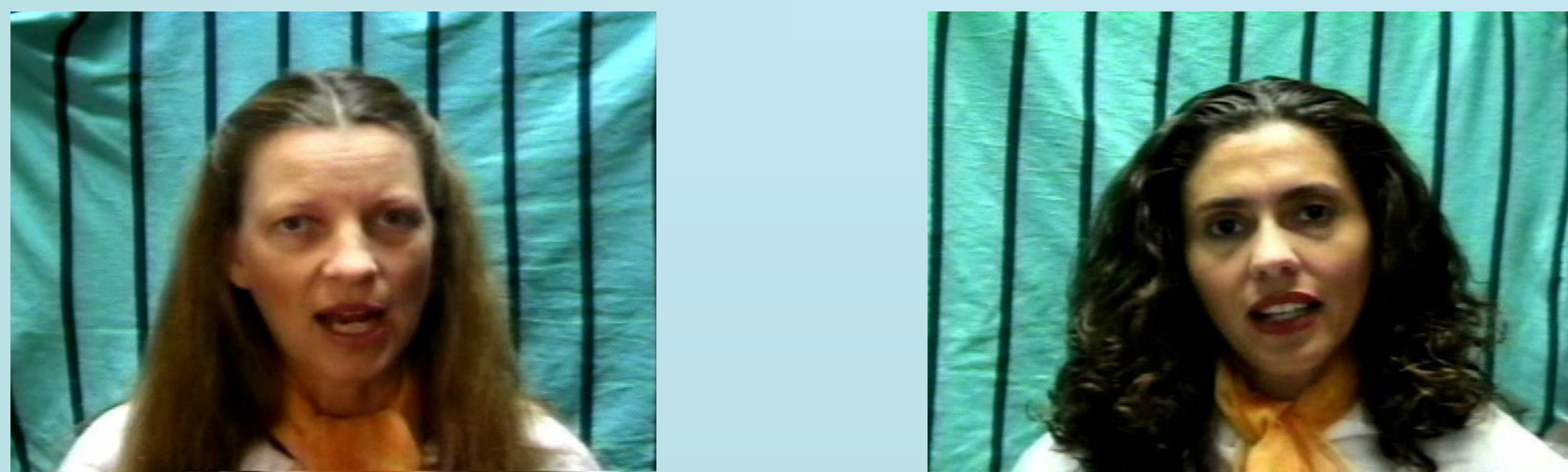
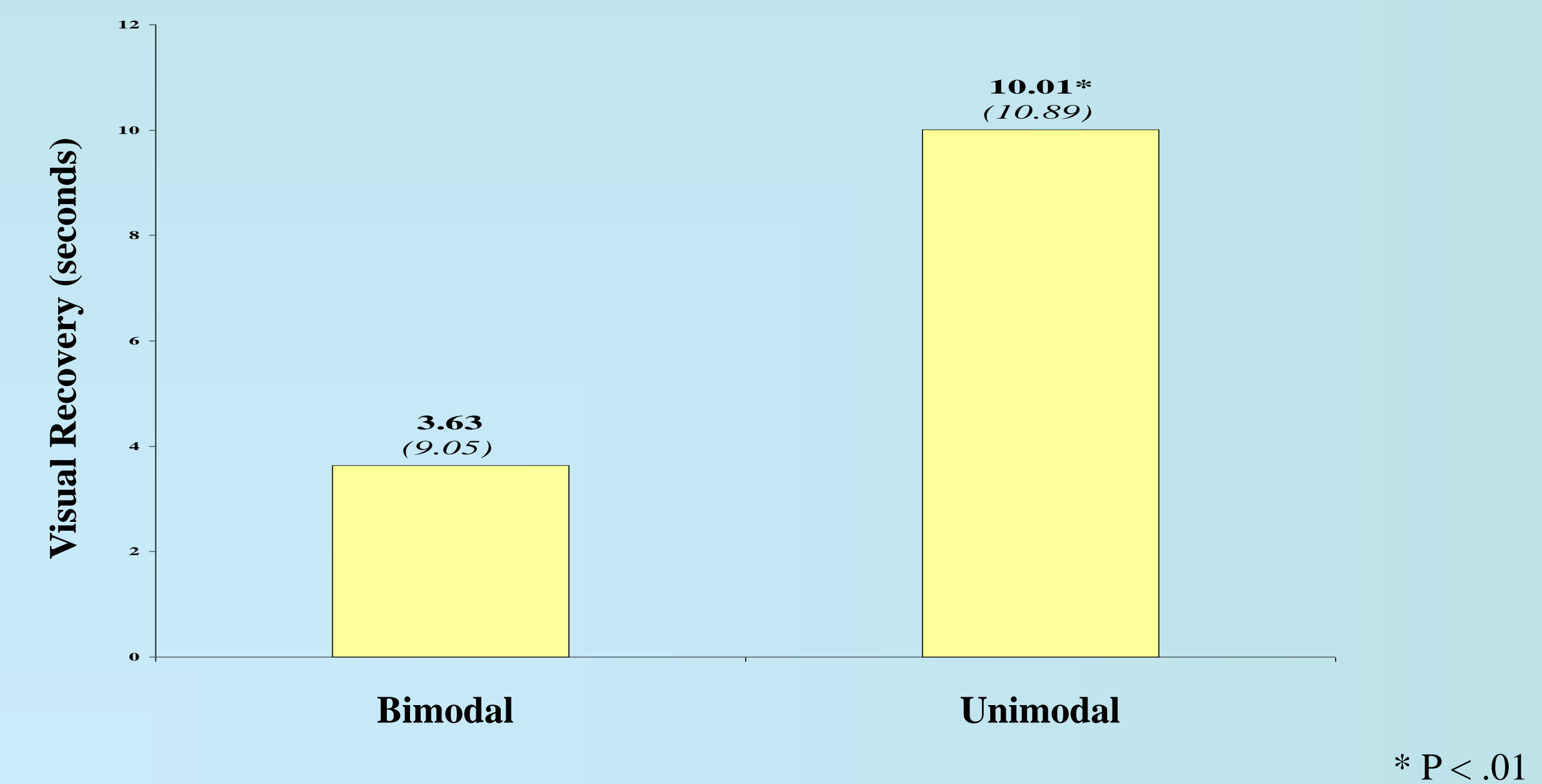


Figure 2
Visual recovery (and SD) to a change in face



* P < .01

Method

Thirty-two 2-month-old infants were habituated in an infant-control procedure to videos of one of two women (see Figure 1) speaking a nursery rhyme. Infants were either habituated to an audiovisual (bimodal) display of the speaking woman’s face ($N=16$) or a visual (unimodal) display of the speaking woman’s face ($N=16$). Following habituation (and two no change posthabituation trials), infants received two test trials depicting the face of a novel woman speaking under their respective conditions. In the bimodal audiovisual condition, the novel face was seen speaking along with the familiar, synchronized voice during test trials. In the unimodal visual condition, the novel face was seen speaking silently during the test trials. The face used for habituation versus test was counterbalanced across infants within each condition. Visual recovery to the change in face (difference between fixation time during posthabituation versus test trials) served as the measure of discrimination.

Results

Results (depicted in Figure 2) supported our predictions and demonstrated that infants who received the unimodal, visual displays showed significant visual recovery to the novel face ($t(15) = 3.68, p = .002$), whereas infants who received the bimodal, audiovisual displays showed no evidence of visual recovery to the novel face ($t(15) = 1.60, p > .1$).

Conclusions

These findings indicate that in early infancy face perception is enhanced when faces are experienced visually (unimodally) and attenuated when the faces are perceived in the context of dynamic multimodal events such as audiovisual speech. Perception of modality specific properties, such as those that provide the basis for face discrimination, is facilitated in unimodal stimulation where attention can focus on modality specific properties such as facial pattern and configuration of features. In contrast, perception of modality specific properties is attenuated in bimodal stimulation, in part, because intersensory redundancy attracts attention to amodal properties of stimulation such as rhythm, tempo, and prosody of speech. Together with results of our prior studies of voice discrimination, these findings support predictions of the IRH and demonstrate that in early development, infants attend to different properties of events as a function of whether the events are experienced multimodally or unimodally.

References

- Bahrick, L. E., & Lickliter, R. (2000). Intersensory redundancy guides attentional selectivity and perceptual learning in infancy. *Developmental Psychology, 36*, 190-201.
- Bahrick, L. E., & Lickliter, R. (2002). Intersensory redundancy guides early perceptual and cognitive development. In R. Kail (Ed.), *Advances in Child Development and Behavior*, 30 (pp.153-187). New York: Academic Press.
- Bahrick, L.E., Lickliter, R., Shuman, M., Batista, L.C., & Grandez, C. (2003, April). Infant discrimination of voices: Predictions from the intersensory redundancy hypothesis. Poster session presented at the biannual meeting of the *Society for Research in Child Development*, Tampa, FL.