

The Development of Face Perception in Dynamic, Multimodal Events: Predictions from the Intersensory Redundancy Hypothesis

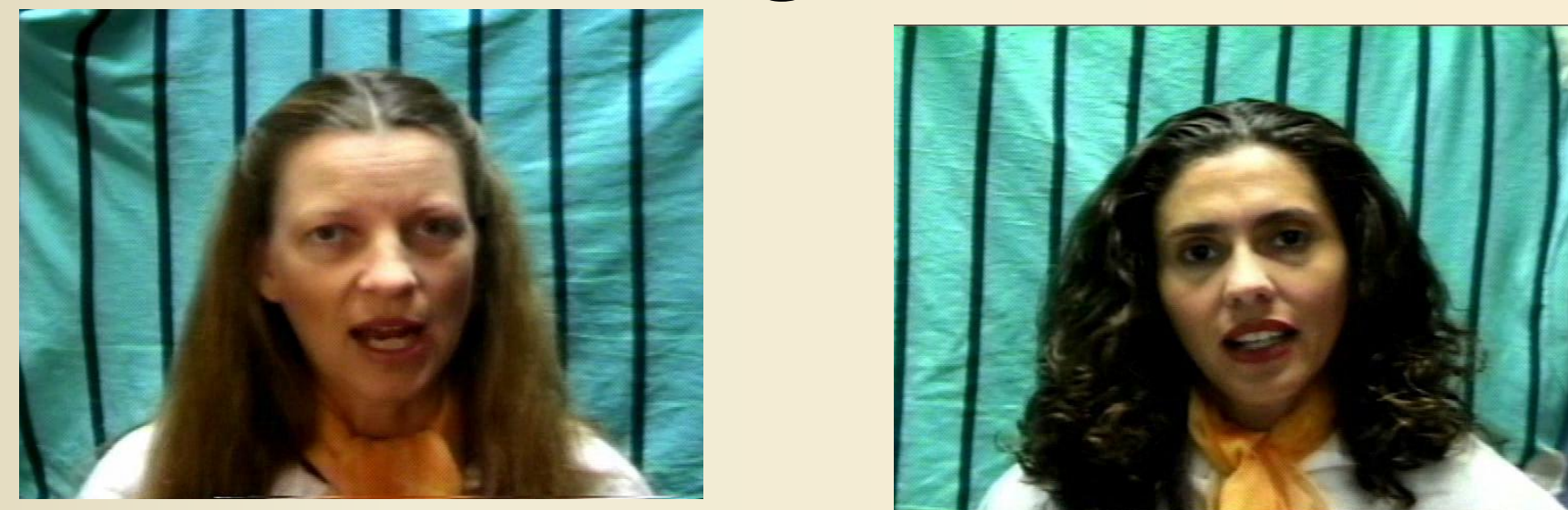
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Introduction

Research demonstrates that young infants are excellent perceivers of faces, however, little is known about their perception of faces in the context of naturalistic, dynamic, multimodal events such as audiovisual speech. 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 such as synchrony, tempo, and rhythm (intersensory facilitation). In contrast, experiencing an event in one sense alone (unimodally) facilitates perception of modality specific information such as color, pattern, and the configuration of facial features (unimodal facilitation). Furthermore, according to the IRH, with experience, attention becomes more flexible allowing infants to perceive modality specific properties in bimodal and unimodal stimulation.

A prior study (Bahrick, Vaillant, Shuman, & Castellanos, 2004) demonstrated unimodal facilitation of face perception in 2-month-old infants. Infant discrimination of faces was enhanced in unimodal stimulation (silent speech) and attenuated in bimodal stimulation (audiovisual speech). According to the developmental prediction of the IRH, older infants should be able to discriminate modality specific properties such as configuration of facial features under bimodal as well as unimodal conditions. The present study tested this developmental prediction by exploring 3 ½-month-old infants’ discrimination of the faces of two women speaking a nursery rhyme under bimodal, audiovisual and unimodal visual (silent) conditions, in methods just like that of our prior study.

Figure 1



Method

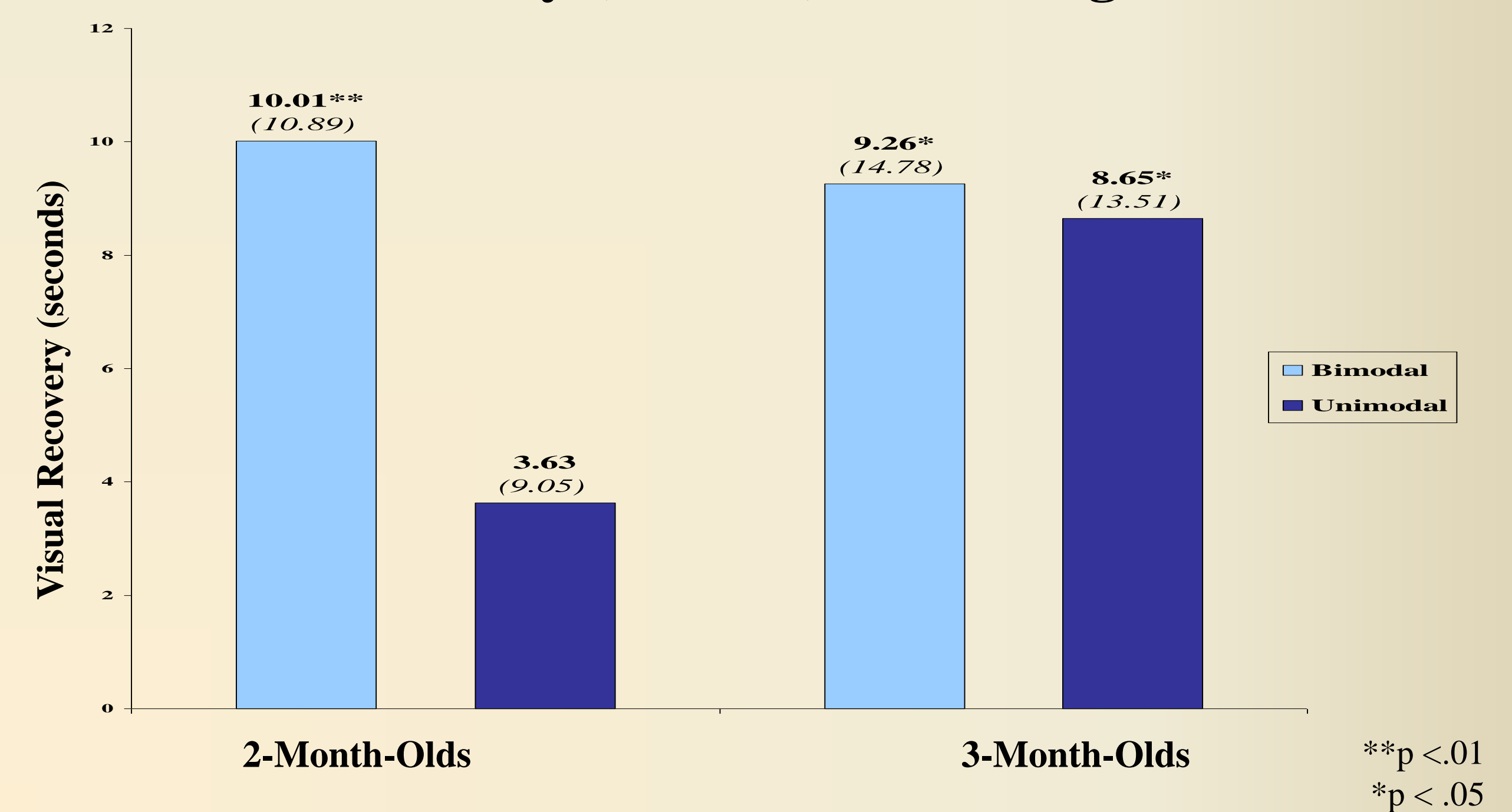
Thirty-two 3 ½-month-old infants were habituated in an infant-control procedure to videos of one of two women (see Figure 1) speaking a nursery rhyme under a bimodal (audiovisual speech) or a unimodal (visual speech) condition ($N=16$ each group). Following habituation, infants received two test trials depicting the face of a novel woman speaking under their respective conditions. In the bimodal condition, the novel face was shown speaking along with the familiar, synchronized voice during test trials. In the unimodal visual condition, the novel face was shown speaking silently during the test trials. The faces used for habituation and test were counterbalanced across infants within each condition. Visual recovery to the novel face served as the measure of discrimination.

Results

Results (depicted in Figure 2) supported our predictions and demonstrated that 3 ½-month-old infants who received both the bimodal, audiovisual displays and the unimodal, visual displays showed significant visual recovery to the novel face ($t(15) = 2.56, p = .022$; $t(15) = 2.51, p = .024$, respectively). These findings contrast with those of the 2-month-old who showed significant visual recovery to the novel face in the unimodal but not the bimodal condition ($t(15) = 3.68, p = .002$; $t(15) = 1.60, p = .129$, respectively).

Figure 2

Visual recovery (and SD) to a change in face



Conclusion

These findings indicate that as infants gain experience, attention to modality specific properties of events, such as those that support face discrimination, becomes more flexible and extends from unimodal to bimodal, audiovisual context. In early infancy face perception is enhanced when faces are experienced visually (unimodally) and attenuated when the faces are perceived in the context of multimodal events, such as audiovisual speech. With experience, infants are able to discriminate faces in both multimodal and unimodal stimulation. Together with results of our prior studies of face and voice discrimination, these findings support predictions of the intersensory redundancy hypothesis and demonstrate that early in development infants attend to different properties of events as a function of whether the events are experienced multimodally or unimodally. Later in development, infants’ attention is allocated more flexibly to different properties of events under multimodal and unimodal contexts.

References

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