

Three-month-old Infants Recognize Faces in Unimodal Visual but not Bimodal Audiovisual Stimulation

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Introduction

Under what conditions do infants show memory for faces? Research has demonstrated that young infants are exceptional perceivers of faces. However, most research has tested perception of silent, static images of faces and little research has assessed infants' perception of faces in the context of dynamic, multimodal events, such as audiovisual speech. Furthermore, it is unclear as to what conditions enhance or attenuate face recognition in early infancy.

The Intersensory Redundancy Hypothesis (IRH) posits that in early development, experiencing an event redundantly across two senses (bimodally) facilitates the perception of amodal properties (e.g., tempo, rhythm, and synchrony; Bahrick & Lickliter, 2000, 2002). In contrast, experiencing an event in one sense modality (unimodally) facilitates the perception of modality specific properties (e.g., color, pattern, and timbre). Face perception requires attention to modality specific properties such as facial features and their configuration. Thus, perception and recognition of faces in early development should be enhanced in unimodal visual stimulation (e.g., silent moving face) and attenuated in bimodal audiovisual stimulation (e.g., speaking moving face). Bahrick, Lickliter, Vaillant, Shuman and Castellanos (2004) found support for these predictions. Following habituation to a video of a woman speaking a nursery rhyme in natural, bimodal, audiovisual speech, or in unimodal, visual, silent speech, 2-month-old infants discriminated the familiar from a novel face only in silent unimodal speech, whereas, 3-month-old infants discriminated faces in both bimodal and unimodal speech conditions.

The current study extended the above research to the domain of memory. Recognition memory was assessed for faces of women under unimodal visual and bimodal audiovisual speech conditions. Three-month-old infants were habituated to a woman speaking a nursery rhyme silently (unimodal visual condition) or with natural, synchronous speech (bimodal audiovisual condition). Memory was assessed after a 15-minute delay in a 2-choice visual preference procedure in which the familiar face was paired with a novel woman's face, both speaking silently. It was hypothesized that since face discrimination is enhanced under unimodal visual conditions and attenuated under bimodal audiovisual conditions, then face recognition and memory should follow the same pattern. Infants were expected to demonstrate a preference for the novel face after a 15-minute delay in the unimodal visual but not the bimodal audiovisual condition.

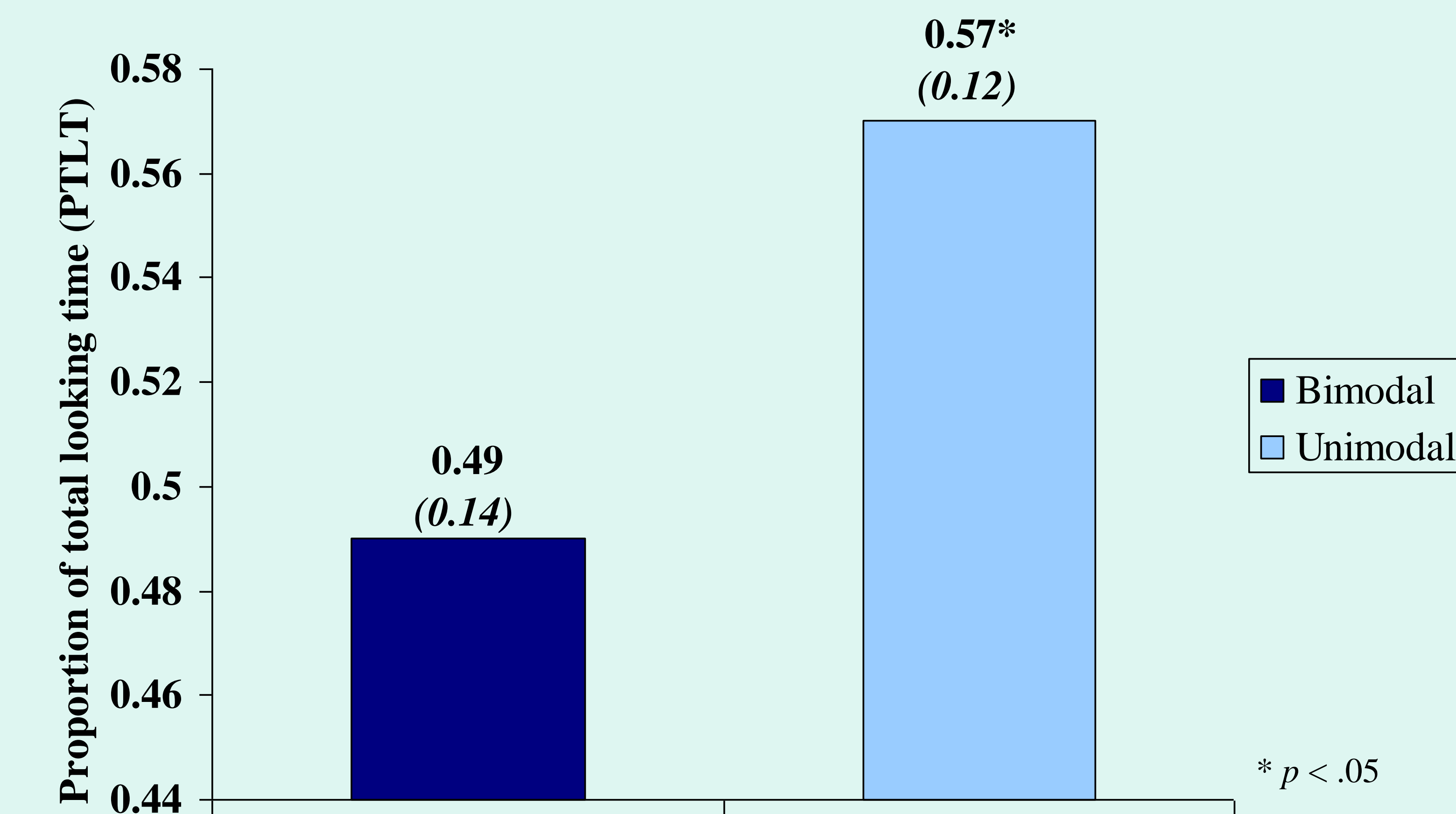
Method

Forty-seven 3-month-old infants ($M = 90.04$ days, $SD = 3.98$) were habituated, in an infant controlled procedure, to a video of one of three women speaking a nursery rhyme (see Figure 1). Twenty-three infants received a bimodal audiovisual display (synchronous speech) and twenty-four infants received a unimodal visual display (silent speech) during the habituation procedure. Following habituation (a decrease in looking time of 50%), memory was assessed after a 15-minute delay. The memory test consisted of 8-20 second trials of the familiar woman's face speaking silently paired side by side with a novel woman's face speaking silently. The lateral positions were counterbalanced across two blocks of four trials. Proportion of total looking time (PTLT) to the novel woman's face was the dependent measure.

Figure 1



Figure 2: Mean proportion of total looking time (and standard deviation) to the novel face for bimodal audiovisual versus unimodal visual displays



Results

Results (depicted in Figure 2) support our predictions and demonstrate that infants who were habituated to the unimodal visual display showed a significant PTLT to the novel face according to a single sample t-test against the chance value of .50 ($t(23) = 2.64$, $p < .05$). In contrast, infants who were habituated to the bimodal audiovisual display showed no preference for either face ($t(22) = -0.50$, $p > .05$). Further, those in the unimodal visual condition showed a significantly greater PTLT to the novel face than infants in the bimodal audiovisual condition ($t(45) = 2.10$, $p < .05$).

Conclusions

Together, these findings indicate that in early infancy, attention and memory for faces is enhanced when faces are experienced in the context of dynamic visual events (unimodally) and attenuated when they are perceived in the context of dynamic multimodal events such as audiovisual speech. These findings are consistent with predictions of the IRH: attention to modality specific properties (such as facial features and their configuration) is facilitated in unimodal stimulation and attenuated in bimodal stimulation, in part, because intersensory redundancy attracts attention to amodal properties, such as rhythm, tempo, and prosody in bimodal speech. These findings extend previous research on the perception of faces and reveal new information about the conditions that enhance versus impair face memory.

References

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