Visual Language Discrimination in Infancy

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Talking faces are among the most dynamic and salient stimuli available to infants, and the facial movements accompanying speech influence adult (*1*) and infant (*2*) speech perception. Recently it was reported that facial speech information alone is sufficient for language discrimination in adults (*3*). Although it is well established that young infants can discriminate languages auditorily (*4*, *5*), it is unknown whether infants can discriminate languages visually. We examined whether 4-month-old infants can visually distinguish their native language (English) from an unfamiliar language (French). Because exposure to specific auditory and visual information in infancy is essential for maintaining many early-appearing native language, musical, and face perception sensitivities (*6*–*10*), we compared monolingual English infants to French-English bilingual infants at 6 and 8 months.

Discrimination was tested by using silent video clips of three bilingual French-English speakers reciting sentences in each language. Every trial contained a video clip of a different sentence by one speaker in one language (for example, movies S1 and S2). The infants (n = 36) were presented with video clips from one of the languages until their looking time declined to a 60% habituation criterion. Test trials using the same speakers but different sentences from the other language were shown to examine whether the infants' looking time had increased, indicating that they had noticed the language change. The test trials where the language was switched were compared with a control condition (n = 36) for which the test trials were always different sentences but in the same language as the habituation trials (*11*). A repeated-measures analysis of variance (ANOVA) including age (4, 6, or 8 months), condition (language switch versus control), and trial (habituation versus test) revealed only a significant three-way interaction [$F(2, 66) = 3.71$, $P < 0.05$]. Simple main effects analyses showed that the infants looked significantly longer at the language switch test trials (Fig. 1A), compared with the control trials, at 4 months [$F(1, 22) = 4.70$, $P < 0.05$] and 6 months [$F(1, 22) = 4.19$, $P = 0.05$] but not at 8 months [$F(1, 22) = 1.18$, $P = 0.29$].

The finding that infants can visually discriminate their native language from an unfamiliar language at 4 and 6 months but not at 8 months parallels declines in performance seen in other perceptual domains. Indeed, across the first year of life, infants' performance declines on the discrimination of nonnative consonant and vowel contrasts (*6*, *7*), nonnative musical rhythms (*8*), cross-species individual faces (*9*), and cross-species face and voice matching (*10*). Thus, it appears that specific experience is necessary for maintaining sensitivity to some initial perceptual discriminations. To determine whether regular exposure to both French and English confers an advantage in visual language discrimination, we compared bilingual French-English infants (n = 24) to their monolingual English counterparts. At an infant age of 6 months, a two-by-two repeated-measures ANOVA analyzing language group (monolingual versus bilingual) and trial (habituation versus test) yielded a significant effect for trial [$F(1, 22) = 6.65$, $P < 0.02$] with no interaction. A similar analysis at the age of 8 months yielded only a significant trial-by-condition interaction [$F(1, 22) = 6.92$, $P < 0.02$]. Simple main effects analyses of this interaction showed that, at 8 months, only the bilingual infants looked significantly longer at the change in language [$F(1, 11) = 7.1$, $P < 0.05$ (Fig. 1B)].

Traditionally, visual speech has been regarded as a redundant signal in verbal communication. The present research shows that visual speech information alone is sufficient for language discrimination in infancy. Moreover, this finding indicates that visual speech may also play a more critical role than previously anticipated in helping infants narrow their perceptual sensitivities to match the distinctions necessary in their language learning environment. Notably, bilingual infants advantageously maintain the discrimination abilities needed for separating and learning multiple languages.

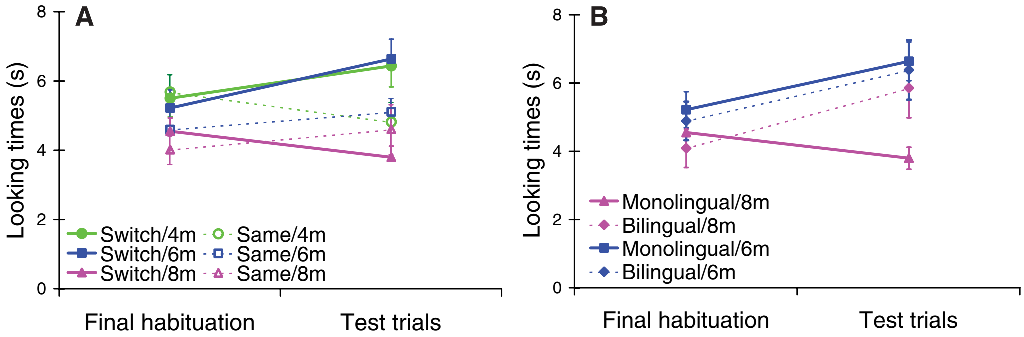

Fig. 1. Mean looking time in seconds to silent talking faces. The *y* axis represents infant looking time; the *x* axis represents the trials that the infant was shown (final habituation trials and test trials). Error bars represent the standard error of the mean. (**A**) Experimental (language switch) and control (language same) conditions for monolingual infants at 4, 6, and 8 months. (**B**) Experimental conditions for monolingual [replotted from (A)] and bilingual infants at 6 and 8 months.

References and Notes

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Materials and Methods
Movies S1 and S2

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