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The redeployment of attention to the mouth of a talking face during the second year of life

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ABSTRACT

Previous studies have found that when monolingual infants are exposed to a talking face speaking in a native language, 8- and 10-month-olds attend more to the talker's mouth, whereas 12-month-olds no longer do so. It has been hypothesized that the attentional focus on the talker's mouth at 8 and 10 months of age reflects reliance on the highly salient audiovisual (AV) speech cues for the acquisition of basic speech forms and that the subsequent decline of attention to the mouth by 12 months of age reflects the emergence of basic native speech expertise. Here, we investigated whether infants may redeploy their attention to the mouth once they fully enter the word-learning phase. To test this possibility, we recorded eye gaze in monolingual English-learning 14- and 18-month-olds while they saw and heard a talker producing an English or Spanish utterance in either an infant-directed (ID) or adult-directed (AD) manner. Results indicated that the 14-month-olds attended more to the talker's mouth than to the eyes when exposed to the ID utterance and that the 18-month-olds attended more to the talker's mouth when exposed to the ID and the AD utterance. These results show that infants redeploy their attention to a talker's mouth when they enter the word acquisition phase and suggest that infants rely on the greater perceptual salience of redundant AV speech cues to acquire their lexicon.

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Introduction

The acquisition of speech and language during infancy is a protracted developmental process. On the perception/processing side, it consists of months of tuning to the sounds and sights of the native language(s). The tuning is driven by learning and differentiation as well as by perceptual narrowing. The former process results in the acquisition of novel speech and language skills, whereas the latter process results in a decline in responsiveness to non-native categories of information (Lewkowicz, 2014; Lewkowicz & Ghazanfar, 2009; Maurer & Werker, 2014). On the production side, acquisition of speech and language consists of the emergence of increasingly more complex and functionally flexible vocalizations. This includes squeals, vowel-like sounds, and growls at around 3 or 4 months of age (Oller et al., 2013), canonical babbling sounds at around 6 months (Oller, 2000), single words at the start of the second year of life, and multiple words by 17–20 months (Fenson et al., 1994; Nelson, 1974).

What factors might contribute to the growth of speech perception and speech production capacity during infancy? Studies of infant–adult interaction have found that infant perception and production of speech is affected by the cues that infants' interlocutors provide to them during social interactions (Goldstein, King, & West, 2003; Goldstein & Schwade, 2008; Kuhl, 2007). Many such interactions consist of face-to-face contact between infants and their interlocutors. This raises the possibility that selective attention to different parts of a social partner's face—especially the interlocutor's mouth—contributes to the acquisition of speech and language. Indeed, this possibility is supported by findings indicating that infants begin to deploy their selective attention to a talker's mouth sometime between 6 and 8 months of age (Hillairet de Boisferon, Tift, Minar, & Lewkowicz, 2016; Lewkowicz & Hansen-Tift, 2012; Merin, Young, Ozonoff, & Rogers, 2007; Pons, Bosch, & Lewkowicz, 2015; Tenenbaum, Shah, Sobel, Malle, & Morgan, 2013; Tenenbaum et al., 2015).

In one of the studies examining infant selective attention to talking faces, Lewkowicz and Hansen-Tift (2012) investigated the relative amount of time that 4-, 6-, 8-, 10-, and 12-month-old monolingual, English-learning infants and adults attend to a talker's eyes and mouth and whether such selective attention is affected by language familiarity and/or manner of speech. To do so, they measured eye gaze while participants watched videos during which an actor could be seen and heard uttering a monologue either in the participants' native language or in a non-native language spoken in either an infant-directed (ID) or adult-directed (AD) manner. Findings indicated that, regardless of manner of speech and language spoken, 4-month-olds attended more to the talker's eyes, 6-month-olds attended equally to the eyes and mouth, and 8- and 10-month-olds attended more to the mouth. Findings also indicated that 12-month-olds did not attend more to the mouth in response to native speech but that they attended more to the mouth in response to non-native speech. Finally, the findings showed that adults attended more to the talker's eyes regardless of language spoken. Lewkowicz and Hansen-Tift (2012) drew three conclusions from these results. First, they concluded that the initial attentional shift to the talker's mouth by 8 and 10 months of age reflects the emergence of an endogenous selective attention mechanism and noted that the shift occurs at around the same time that canonical babbling begins emerging. Second, they concluded that the attentional shift enables infants to gain direct access to synchronous, redundantly specified, and thus highly salient audiovisual (AV) speech cues. Finally, they concluded that access to redundant AV speech cues is likely to facilitate acquisition of initial native speech forms (i.e., native-language phonological representations as well as motor speech forms) because multisensory speech cues are known to be perceptually more salient than unisensory speech cues.

A study by Pons et al. (2015) provided additional evidence that multisensory redundancy plays a role in infant selective attention to AV speech. These investigators compared monolingual and bilingual infants' response to talking faces and found that, overall, bilingual infants attended more to the mouth than did monolingual infants. Specifically, they compared Spanish- and Catalan-learning monolingual infants' response to native and non-native AV speech with bilingual (Spanish–Catalan) infants' response to native (i.e., dominant) and non-native speech. Results paralleled the results

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