Putting the pieces together: Two-year-olds hearing an unfamiliar accent recognize known words and learn new words, but do not use known words to learn new words

Alexander LaTourrette (University of Pennsylvania), Cynthia Blanco (Northwestern University), Sandra Waxman (Northwestern University)

By their second birthdays, infants process speech efficiently in their native language and are expert word-learners. They also successfully recognize familiar words and learn new words spoken in unfamiliar accents (Best et al., 2009; Schmale et al., 2011). Here, we ask whether subtler difficulties in processing remain and can affect word learning. Prior work reveals that in native-accented speech, 2-year-olds use known words to infer the meaning of novel words: if infants hear “The dax is sleeping,” they infer “dax” refers to an animal (Ferguson et al., 2018). However, if processing unfamiliar accents remains a challenge for 2-year-olds, as for older children (Bent, 2014), infants may struggle to infer meanings solely from linguistic context.

To test this question, we adopted the eye-tracking paradigm established by Ferguson et al. (2018) with native-accented speech. However, we presented sentences in Spanish-accented speech, an unfamiliar accent for our participants. See Figure 1. Infants (n=48) heard dialogues between two speakers featuring familiar nouns (6 trials) and then novel nouns (6 trials). No referents were shown during dialogues. For novel nouns, we varied whether they were presented in an Informative linguistic context with an animacy-restricted verb (e.g., “The dax is sleeping”) or a Neutral linguistic context (“The dax is clean”). At test, infants viewed an animate and inanimate object and were prompted to look to the target noun’s referent. If infants used the Informative verb’s selectional restrictions to infer the referent of the novel noun, they should look more to the animate referent. If the unfamiliar accent posed too great a processing challenge, then performance should resemble the Neutral condition.

In Experiment 1, 24-month-olds (M=23.79 mo, SD=.71) successfully identified the referents of familiar nouns in Spanish-accented speech, $p<.01$. However, they did not use familiar verbs to learn novel nouns. A cluster-based permutation test revealed that 24-month-olds failed to use the Informative context to learn novel nouns: unlike previous native-accent conditions, looking patterns in the Informative and Neutral conditions did not significantly diverge, $p>.5$ (Figure 2).

To assess whether infants’ difficulties with the unfamiliar accent truly stemmed from the challenge of using the linguistic context, not simply learning words, we conducted Experiment 2. The task was identical to Experiment 1’s Informative condition, except the referent for each novel noun was present during the dialogue. Two-year-olds (n=24) in this Co-present Referent condition successfully learned novel words: performance diverged from the Neutral control condition, $p=.01$, with infants looking more to the animate referent 550ms to 1250ms after noun onset. Thus, infants learned novel words in an unfamiliar accent when a co-present referent was available. Infants’ performance in the Co-Present Referent condition was also predicted by their preference for the target on familiar noun trials, $r(20)=.46$, $p=.032$. Success in comprehending familiar words across accents is thus associated with success in learning new ones.

These findings reveal a nuanced developmental trajectory for processing unfamiliar accents. While 2-year-olds both recognize and learn words in unfamiliar accents—and these skills are inter-related—they still struggle in using known words to learn new ones. This may reflect difficulties in online sentence processing in unfamiliar accents or limits on infants’ willingness to make semantic inferences from unfamiliar accented speech. These findings also cohere well with older children and adults’ continued difficulties in processing unfamiliar accents.

References

Bent, T. (2014). Children's perception of foreign-accented words. *J. Child Lang, 41*(6), 1334-1355.

Best, C. T., Tyler, M. D., Gooding, T. N., Orlando, C. B., & Quann, C. A. (2009). Development of phonological constancy: Toddlers' perception of native-and Jamaican-accented words. *Psychol. Sci., 20*(5), 539–542.

Ferguson, B., Graf, E., & Waxman, S. R. (2018). When veps cry: Two-year-olds efficiently learn novel words from linguistic contexts alone. *Lang. Learn. Dev., 14*(1), 1–12.

Schmale, R., Cristia, A., & Seidl, A. (2012). Toddlers recognize words in an unfamiliar accent after brief exposure. *Dev. Sci., 15*(6), 732–738.

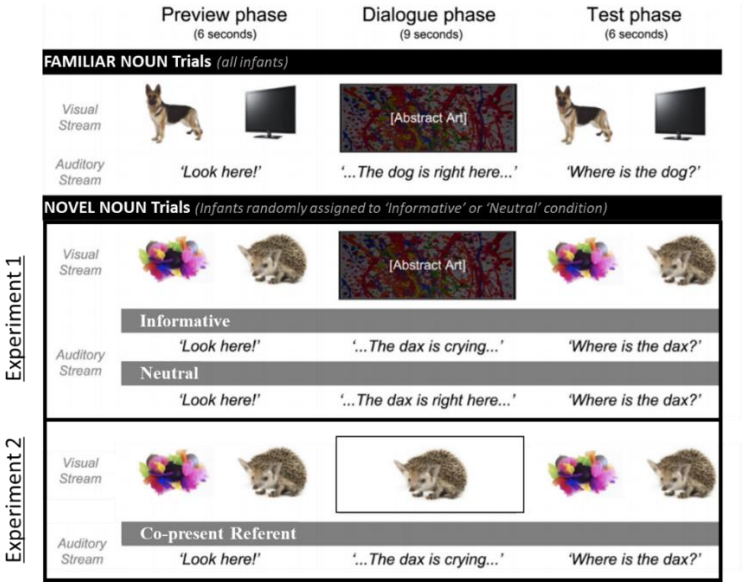

Figure 1. Experimental design. All infants began with 6 Familiar Noun trials, featuring known objects and words. This also provided 2 minutes of exposure to the unfamiliar accent. Next, infants saw 6 Novel Noun trials, with the learning context determined by condition. The dependent variable was the proportion of looking directed to the target object during test.

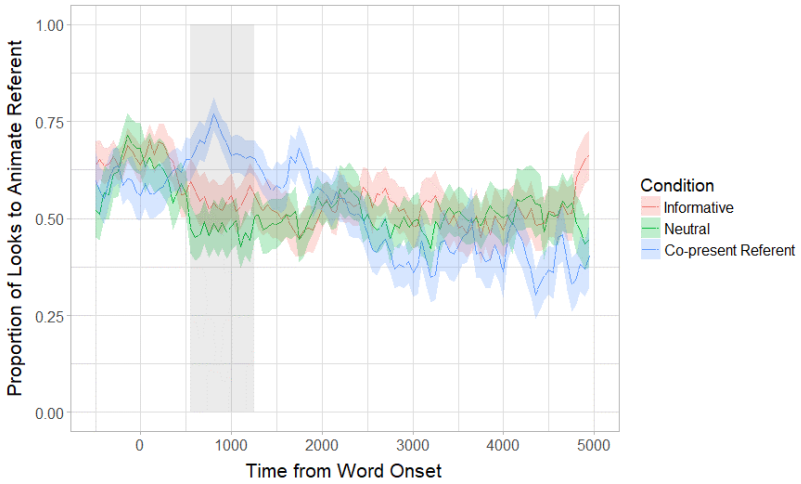

Figure 2. Test timecourse. In the Informative and Neutral conditions, looking patterns did not significantly differ, $t_{cumulative} < 5$, $p > .5$. However, the Co-Present Referent condition significantly diverged from the Neutral condition 550ms to 1250ms after word onset, $t_{cumulative} = 38.05$, $p = .01$.