

**Toddlers recognize native-accented words faster than nonnative-accented words:
A timecourse analysis of eye movements during spoken word recognition**

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Associating an acoustic input to a (word) meaning can be a complicated task given the richness of phonetic cues that are present in speech, especially for young learners whose representations are still being acquired. Furthermore, in multilingual contexts, children are exposed to a variety of accents in their native language. How children cope with accent variability during word recognition is still being discovered. For instance, the process appears to be hindered when children are asked to recognize words in an accent that is not spoken by the parents (Bent, 2014); however, the development of these abilities is still unknown. Thus, using a preferential looking study, we investigated the word recognition abilities of toddlers aged between 18 and 30 months-old, while varying speaker accent. We performed a statistical timecourse analysis, an innovative method to investigate at what point in time toddlers activate the target items, to observe how toddlers recognize native-accented accented and nonnative-accented words.

In the current procedure, 22 Canadian-English monolingual toddlers (between 18 and 30 months old, $M = 23.5$, $SD = 3.8$) were presented with 16 auditory words while viewing pairs of images on a display, and their eye movements were measured. For example, children heard “Look at the cat” while being presented with images of a (target) *cat* and a (distractor) *duck*. All the stimuli were spoken in English, but half the stimuli were presented in a native Canadian-English accent, and half the stimuli in a non-native Canadian-French accent. We compiled the fixations to the targets in 20-ms time bins, and evaluated the impact of speaker accent (English-native VS. French-accented) on fixation patterns using Generalized Additive Mixed-Effects Models (GAMMs). GAMMs enable one to model nonlinear curves through time, such as eye tracking data, considering and correcting for auto-correlation of time series (i.e., one data point in the time series is necessarily correlated to the preceding point). The time window of analysis included fixations that occurred between 300 ms (to account for the eye movement planning delay) and 2000 ms.

The raw fixation curves (Fig. 1) and results of the timecourse statistical analysis (difference curve between English-native speech and French-accented speech, Fig. 2) both suggest that at the beginning of the trial (between 300 and 1250 ms), children fixated to the target significantly more in the English-native condition. However, between 1350 and 2000 ms, children fixated significantly more to the target in the French-accented condition than in the English-native condition. This suggests that in both speech conditions, children were able to recognize the target. However, children were faster at directing their gaze to the target in the English-native condition than in the French-accented condition.

By using a timecourse analysis technique, we were able to determine that toddlers were faster at reaching maximum fixations to the target in the English-native condition than in the French-accented condition. However, we also found that children were able to fixate on the correct target in the French-accented condition with high accuracy. This thus suggests that lexical access is not necessarily compromised by speaker accent. However, speed of lexical access depended on fine-grained phonetic differences, such as speaker accent that corresponds or not to the child’s native accent, and thus that this type of information is considered by toddlers when recognizing known words. Ongoing data collection includes English-French bilingual toddlers in order to investigate if exposure to French-accented speech on a regular basis, which is expected to occur in bilinguals, impacts word recognition speed based on speaker accent. We expect this research to provide a more detailed and nuanced picture of word processing abilities through development, in a variety of populations and acquisition contexts.

Reference

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

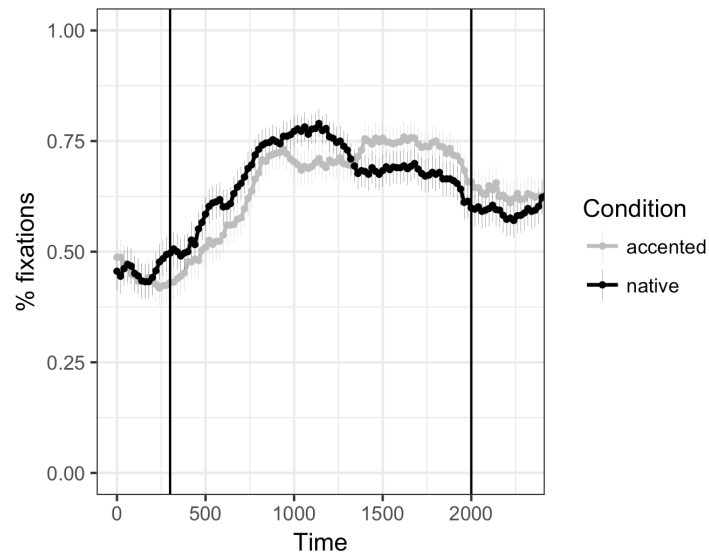


Figure 1. Toddlers' fixation curves to the target in the English-native and French-accented conditions.

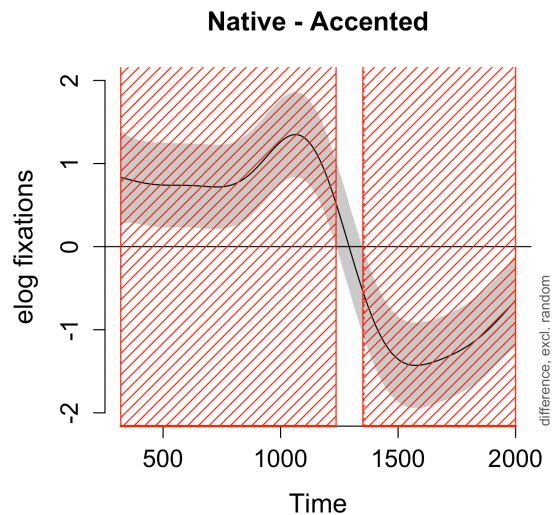


Figure 2. Results of the Generalized Additive Mixed-Effects Model (GAMM), plotting the difference curve in fixations between the English-native (black curve in Fig. 1) and French-accented (grey curve in Fig. 1) conditions. The red areas represent a significant difference from 0 in the curve, which shows a significant difference between the English-native and French-accented conditions through time. The difference curve above 0 (considering the grey confidence intervals; 95%) signifies that toddlers fixated to the target more in the English-native condition, and below 0 that they fixated more to the target in the French-accented condition. Please note that the y-axis represents the empirical-logit transformed proportions of fixations to the target, a necessary transformation to make the fixations data unbounded for the non-logistic GAMM.