Prosody may be a sufficient cue for differentiated bilingual learning

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Introduction: The bilingual development literature has shown that children can differentiate between language varieties when they acquire both simultaneously. We can therefore assume that, for aspects of language acquired through statistical learning, bilingual learners must acquire statistics of two languages from cues in their input. However, studies using artificial languages have generally failed to show acquisition of two languages without some explicit cue, such as voice (Weiss, Gerfen, & Mitchel, 2009), or substantially increasing the amount of exposure for one of the languages (Gebhart, Aslin, & Newport, 2009). Such findings contradict what we observe in the real world. *What linguistic cue(s) support differentiated learning?* Given that both children and adults are sensitive to prosodic cues when discriminating between languages (Vicenik & Sundara, 2013; Chong, Vicenik, & Sundara, 2018), *the current study manipulates intonational prosody between two artificial languages in order to test whether prosody can support bilingual learning.*

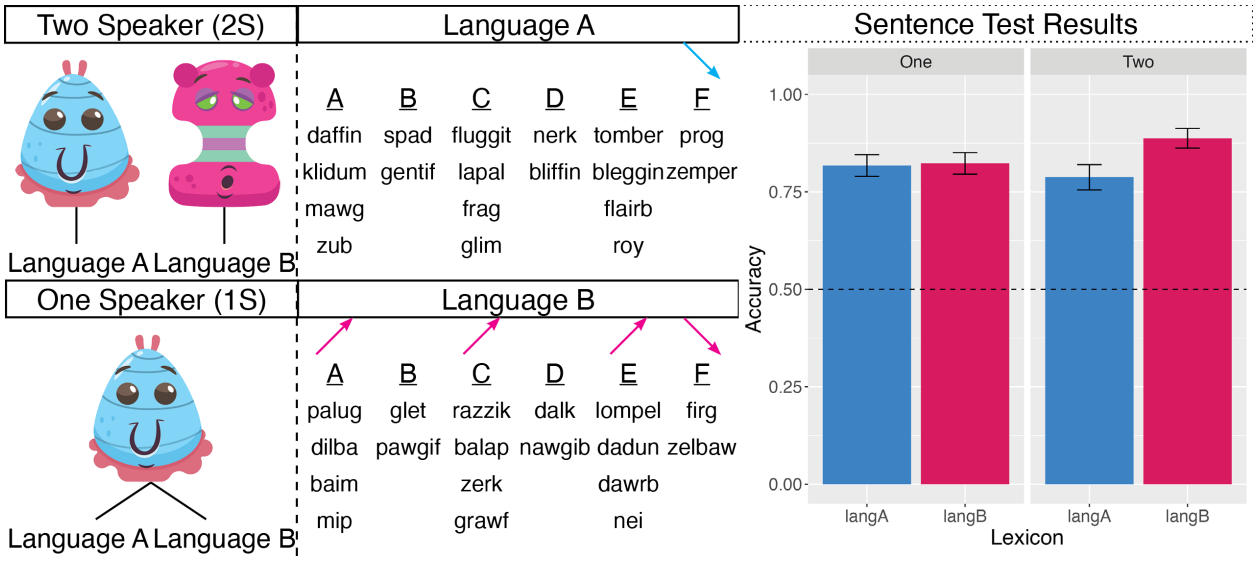
Methods: Participants were randomly assigned to one of two learning contexts: two speaker ("2S") condition, and one speaker ("1S") condition. 2S participants saw a different alien speaker for each language; 1S participants saw one alien speaker for both languages. In both conditions, participants received the same two languages (langA, langB) with equal amounts of exposure. Input corpora for both langA and langB were derived from the phrase structure language used by Thompson and Newport (2007), but differed in their lexical items and intonational prosody. Participants received 5 exposure sessions, lasting about 30 minutes per session, as well as a phrase test after sessions 1 and 5 and a sentence test after session 5.

Both the phrase test and the sentence test asked participants to select the sequence that "sounded better." The phrase test for each language consisted of a two-alternative forced choice task where participants heard a two word sequence with high transitional probability between the words (e.g., A$\rightarrow$B=100%) and a two word sequence with low transitional probability between the words (e.g., B$\rightarrow$C=33%). Selecting the sequences with high transitional probability (which we consider phrases) were considered accurate. Prosodic markings were not present in the phrase test. The sentence test for each language also consisted of a two-alternative forced choice task, in which participants chose between a novel six-word sequence that adhered to the grammatical and prosodic rules of the language versus a novel six-word sequence that violated either the grammatical or prosodic rules of the language. Selecting the licit sequences were considered accurate. Prosodic markings were present in the sentence test.

Preliminary Results: 2S participants (n=10) and 1S participants (n=12) performed well above chance for both Language A and B on the sentence test. Results from a two-sample t-test revealed no difference in performance for Language A ($t(330.81)=0.71$, $p=0.48$) but a trending difference in performance for Language B ($t(349.99)=-1.73$, $p=0.08$). On the phrase tests, both groups show improvement for Language A between sessions 1 and 5 but perform at chance for Language B.

Discussion: While data collection is still ongoing[1], preliminary results suggest that adult learners are sensitive to prosodic differences such that they can acquire both languages without an indexical cue (speaker). Participants in both the 2S (with prosodic and indexical cues) and 1S (with only prosodic cues) conditions learned both languages successfully based on their sentence test performance. Phrase test performance differences between language A and language B further support this because of the lack of prosodic cues (unlike the sentence test). Future work will add prosodic cues in the phrase test to further test this post-hoc hypothesis.

[1] A power analysis determined that we need 25 participants per group to achieve 80% power for determining a large effect size.



References

Chong, A. J., Vicenik, C., & Sundara, M. (2018). Intonation plays a role in language discrimination by infants. Infancy, 23(6), 795-819.

Gebhart, A. L., Aslin, R. N., & Newport, E. L. (2009). Changing structures in midstream: Learning along the statistical garden path. Cognitive Science, 33(6), 1087-1116.

Thompson, S. P., & Newport, E. L. (2007). Statistical learning of syntax: The role of transitional probability. Language Learning and Development, 3(1), 1-42.

Vicenik, C., & Sundara, M. (2013). The role of intonation in language and dialect discrimination by adults. Journal of Phonetics, 41(5), 297-306. doi: https://doi.org/10.1016/j.wocn.2013.03.003

Weiss, D. J., Gerfen, C., & Mitchel, A. D. (2009). Speech segmentation in a simulated bilingual environment: A challenge for statistical learning? Language Learning and Development, 5(1), 30–49. doi: 10.1080/15475440802340101