Phonotactic cues are necessary for infant morphological decomposition

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Recent research [1] has shown that 6-month-olds relate novel words suffixed with *-s* like *babs* and *teeps* that are embedded in passages, with just the stem *bab* and *teep*, demonstrating an early sensitivity to morphological relatedness. Previous research has identified two potential sources of information that may be used to succeed in this task. First, distributional information from sentence context alone can be sufficient for infant learners to extract linguistic categories (e.g., [2]). Second, as infants are discovering morphology, they are also becoming sensitive to phonotactics (for a meta-analysis, see [3]). In two experiments using the Headturn Preference Procedure [4], we evaluated whether monolingual English-learning 6-month-olds use phonotactic well formedness in detecting morphological relatedness. In Experiment 1, distributional cues from the surrounding sentence frames and phonotactic cues consistently signaled morpheme boundaries, whereas in Experiment 2, they conflicted - distributional cues signaled morpheme boundaries, however phonotactic cues did not.

In **Experiment 1**, monolingual English-learning 6-month-olds (*n* = 30) were familiarized with 2 of 4 suffixed phonotactically legal nonce verbs embedded in passages (e.g. /bæbz/ & /kɛlz/) until they accumulated 45s of listening time to each. All nonce verbs were in common verb frames preceded by mommy/mama - a highly frequent word which has been shown to assist in segmentation of adjacent words [5]. Then, in the test phase, they were presented with all 4 bare stems (/bæb/, /kɛl/, /dɑp/ and /tip/) in infant-controlled trials. If infants decompose the suffixed nonce verbs, then two stems (/bæb/ and /kɛl/) are expected to be familiar. Significantly different listening times to the potentially-familiar stems compared to the novel stems was used as evidence of morphological decomposition. Analysis using linear mixed effects models confirmed that infants listened longer to novel compared to familiar verb stems (Figure 1) demonstrating that they can decompose verb+z sequences at 6-months when provided with consistent phonotactic and distributional cues. Note that sequences like /bæbz/ and /kɛlz/ are phonotactically illegal in English, except when -z is a morpheme. These results cannot be explained as onset matching as infants do not relate *babsh* with *bab* [2], showing that they do not simply relate forms with phonological overlap.

In **Experiment 2**, monolingual English-learning 6-month-olds (*n* = 30) were familiarized with 2 of 4 nonce verbs (e.g. /gɪz/ and /dɛz/) embedded in passages, using the same verb frames as in Experiment 1. Then, they heard all 4 stems (/gɪ/, /dɛ/, /tʊ/, and /bæ/). Without the final [z], these stems are phonotactically ill-formed because English words cannot end in lax vowels. We found no difference in listening time to potentially familiar (e.g., /gɪ/ and /dɛ/) and novel stems, that is, there was no evidence that 6-month-olds decompose novel verbs when the resulting stem would be phonotactically illegal (Figure 1), despite distributional evidence for the morpheme -z. In Experiment 3, we are now testing whether infants are able to decompose CV stems when the stem is phonotactically legal.

In conclusion, distributional cues alone are not sufficient - phonotactic cues are necessary for English-learning 6-month-olds to decompose complex words into morphemes. We will discuss the implications of our findings for infants' emerging sensitivity to phonotactics and its interaction with developing morphology.

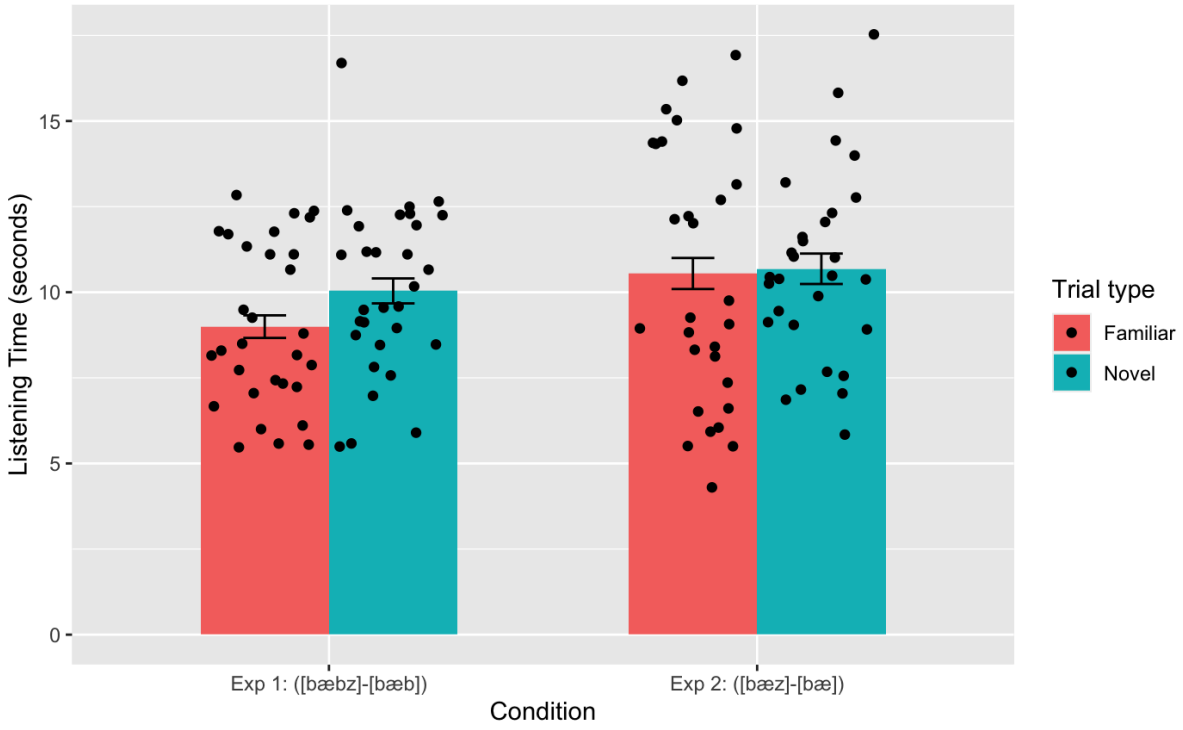

Fig 1. Mean listening times (in seconds) split by experiment and trial type

References

[1] Kim, Y. J., & Sundara, M. (2021). 6–month–olds are sensitive to English morphology. *Developmental science*, *24*(4), e13089.

[2] Aslin, R., Newport, E., & Reeder, P. (2009). The role of distributional information in linguistic category formation. In *Proceedings of the Annual Meeting of the Cognitive Science Society* (Vol. 31, No. 31).

[3] Sundara, M., Zhou, Z. L., Breiss, C., Katsuda, H., & Steffman, J. (2022). Infants' developing sensitivity to native language phonotactics: A meta-analysis. *Cognition, 221*, 104993.

[4] Jusczyk, P. W., & Aslin, R. N. (1995). Infants′ detection of the sound patterns of words in fluent speech. *Cognitive psychology, 29*(1), 1-23.

[5] Bortfeld, H., Morgan, J. L., Golinkoff, R. M., & Rathbun, K. (2005). Mommy and me: familiar names help launch babies into speech-stream segmentation. *Psychological science, 16*(4), 298–304.