Metalinguistic judgments of phonotactics by bilinguals

Stefan A. Frisch, María R. Bréa-Spahn & Carla I. Orellana

Department of Communication Sciences and Disorders, University of South Florida, frisch@cas.usf.edu

Introduction

It is well-established that speakers’ metalinguistic processing directly reflect the statistical properties of the lexicon (e.g. Treiman et al., 2000; Hay, Pierrehumbert, & Beckman, 2004). Frisch, Large, & Pisoni (2000) found that speakers’ judgments of well-formedness was similar whether they were given a 7-point Likert scale to rate ‘wordlikeness’ or a binary ‘acceptable/unacceptable’ decision, so there may be no absolute cutoff for grammatical vs. ungrammatical novel phonological forms. Frisch (in prep) found that a measure of vocabulary familiarity predicted individual differences in well-formedness judgments in English speakers, such that participants with relatively larger vocabularies were more likely to accept low probability nonwords as well-formed. This paper demonstrates that a speaker’s judgments of well-formedness for novel forms is based on generalizations over lexical knowledge by showing individual differences in performance in metalinguistic processing of novel words by bilinguals.

Data

An experiment was conducted involving 30 fluent bilingual Spanish-English speakers using two tasks: 1) Well-formedness judgments for auditorily presented novel nonwords (Frisch, Large, & Pisoni, 2000), and 2) Familiarity judgments for orthographically presented real words (Nusbaum, Pisoni, & Davis, 1984). There were 120 multisyllabic nonword stimuli for each language, generated by random concatenation of onset and rime units using the probabilistic grammar model of Coleman & Pierrehumbert (1997). The probability distributions are created from a phonotactic analysis of words in a dictionary (the Webster’s dictionary of Nusbaum et al 1984 for English and a modified version of the LDC Callhome Spanish lexicon for Latin American Spanish, which excluded morphologically complex words as much as possible to create a lexicon similar to what is typically used for studies of English phonotactics). In the English word familiarity experiment, there were 50 word stimuli from the low to mid familiarity words in Nusbaum et al. (1984). The Spanish familiarity task used 100 randomly selected words from the low to mid frequency range in the LDC Callhome lexicon that were screened for specific dialect usage. It was not possible to make a Spanish familiarity task fully comparable to the English task as there is no database of word familiarity in Spanish that we are aware of.

Findings

A moderate significant correlation between log probability and mean word-likeness rating across participants was found in both English (r = .44) and Spanish (r = .42) nonwords. Within subjects, individual correlations between log probability and rating were generally positive and significantly greater than zero on average for both languages on a t-test. These findings replicate previous results with English speakers, and extend those results to bilingual speakers using English or Spanish.

Vocabulary effects within language

Individual correlations between word-likeness rating and participants’ vocabulary familiarity scores were correlated with phonotactic probability across the nonwords. A significant correlation was found for bilinguals in English (r = -.16), replicating previous work with English monolinguals (Frisch, in prep). A negative correlation means that there was more of a correlation between word-likeness rating and vocabulary familiarity for low probability nonwords compared to high probability nonwords. The correlation was not found for bilinguals in Spanish, which may reflect the fact that the Spanish vocabulary test is less well-developed. Post-hoc evaluation of the vocabulary test for Spanish found that when the vocabulary familiarity score is based on the 20 items that are most diverse across participants, a correlation in the predicted direction emerges, though it is still non-significant (r = -.05).
Effects across languages

Cross-language phonotactic influences were examined by creating blended grammars that mixed the probabilities of constituents across the two languages to various degrees. Where the two languages had similar categories (e.g. the /i/ vowel), the probabilities of the constituents in each language were blended by taking a weighted average of the probabilities in the two languages. In cases where one language was missing the appropriate category (e.g. the /ɪ/ vowel), the probability for one language was zero, and the effect of blending languages was to reduce the probability of constituents that occurred in one language but not the other, relative to constituents that occurred in both. Language blends were created for each individual participant in order to best fit their performance in the well-formedness task for each language separately. Overall, probability predictiveness was highest within each language separately.

There were 9 of 30 participants where the fit to Spanish nonwords improved if some effect of English probabilities was included. Overall, this effect was negatively correlated with Spanish vocabulary (so those with higher Spanish vocabulary were less likely to benefit from mixing in English probabilities). There was almost no effect of English vocabulary, but all of the participants with high Spanish vocabulary and low English vocabulary did not benefit from mixing English with Spanish to predict Spanish nonwords.

There were 10 of 30 participants where the fit to English nonwords improved if some effect of Spanish probabilities was included. Overall, this effect was positively correlated with Spanish vocabulary (so those with higher Spanish vocabulary were more likely to benefit from mixing in Spanish probabilities). There was also a small negative correlation with English vocabulary (so those with higher English vocabulary were less likely to benefit from mixing in Spanish probabilities). Also, all of those with a high English vocabulary and low Spanish vocabulary did not benefit from mixing Spanish with English to predict English nonwords.

Conclusion

This study provided novel data on well-formedness performance by bilinguals. While the bilinguals, for the most part, performed similarly to monolinguals in each language, some evidence for cross-language effects in well-formedness judgments was found. The presence of cross-language influences appears to reflect individual experience. Individual differences in performance on well-formedness judgments for novel nonwords across languages (as well as effects observed within each language) provides strong evidence for a theory of phonotactic knowledge based on emergent constraints derived from individual lexical experience.

References


