

Lexical stress from German in the ears of French and Spanish listeners: Cross-linguistic influence in foreign language segmentation

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We investigated whether first language (L1) prosodic experience shapes how adults segment an unfamiliar language when lexical stress conflicts with statistical cues. Spanish and French differ in the status of word stress: Spanish has lexically contrastive, predominantly trochaic stress, whereas French lacks lexical stress and relies on phrase final prominence[1, 2]. We tested whether these differences affect how listeners resolve conflicts between German-like lexical stress and transitional probabilities (TPs) in an artificial language.

Thirty native speakers of Spanish and twenty-nine native speakers of French listened to a 3-min continuous speech stream in an artificial language built from eight CV syllables combined into eight overlapping bisyllabic “words.” In the stream, bisyllabic trochaic words (stress-initial, TP = 0.33) systematically straddled bisyllabic statistical words (stress-final, TPs = 1.0), creating a conflict between stress-based (trochaic) and statistics-based segmentations. The stream was recorded by a native German speaker using naturalistic German-like trochaic prominence. In a subsequent test phase, participants heard isolated items from three conditions (trochaic words, statistical words, and nonwords that never occurred in the familiarization stream) presented in random order while their pupil responses were recorded as an index for familiarity[3] and then indicated for each item whether they recognized it from the familiarization phase.

Behaviourally, both groups showed a robust trochaic preference: trochaic items were accepted as familiar significantly more often than statistical items and nonwords in both L1 groups, whereas statistical items did not reliably differ from nonwords. We did not observe strong evidence for L1 differences or L1-by-condition interactions in the word-acceptance data, so any modulation of explicit cue use by L1 prosodic background, if present, was not detected.

Pupillometry, however, revealed clear cross linguistic differences in implicit processing. Cluster based permutation analyses of baseline-corrected proportional pupil size change showed larger dilations for trochaic than for statistical items and nonwords across the trial window, and these effects interacted with L1. Spanish listeners exhibited markedly greater pupil responses to trochaic items relative to statistical items and nonwords than did French listeners, despite comparable behavioral performance. This pattern suggests that German-like trochaic stress engaged processing resources more strongly in Spanish than in French listeners, in line with the higher functional weight of lexical stress in Spanish.

Together, the results indicate that when lexical stress and TPs conflict in foreign speech, adult listeners from both L1 backgrounds predominantly rely on stress-based segmentation at the overt decision level, while their underlying processing dynamics differ in ways that are consistent with their native prosodic systems. Cross-linguistic influence in foreign language segmentation thus emerges not only in behavioural preferences, but also in implicit processing, and appears to be shaped by the status of lexical stress in the L1.

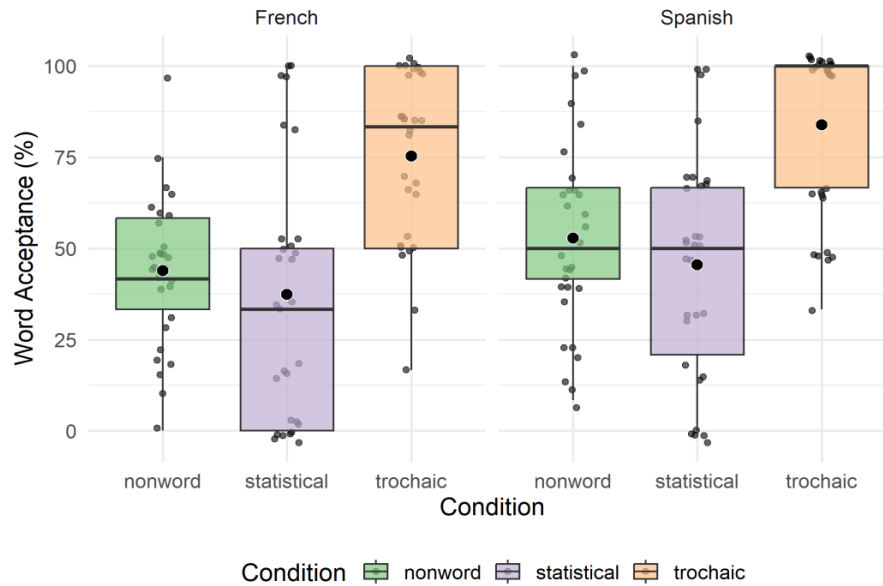


Figure 1: Word acceptance rates (%) for trochaic, statistical, and nonwords for the L1 French (left panel) and the L1 Spanish group (right panel) across frequency-balanced items. Individual participant scores are shown as open circles (jittered for visibility), overlaid on boxplots representing the distribution of scores per condition. Black points indicate the mean acceptance rate for each condition. Solid black lines indicate the medians, the colored box indicates the 1st (upper) and the 3rd (lower) quartiles, and the whiskers extend to 1.5 times the inter-quartile range.

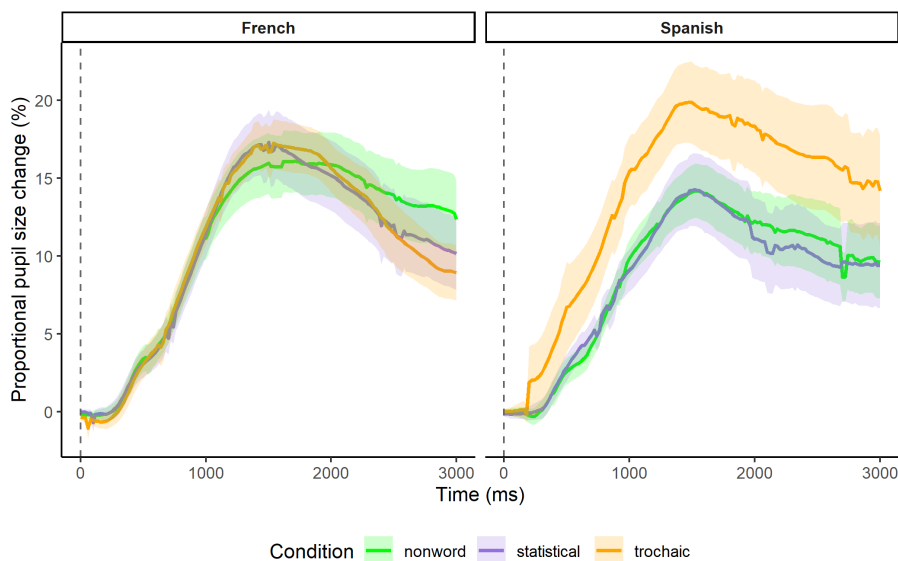


Figure 2: Mean proportional pupil size change (%) over time for trochaic, statistical, and nonword stimuli, shown separately for French (left) and Spanish (right) participants. Pupil responses were baseline-corrected relative to a pre-stimulus baseline. Lines represent condition-wise means averaged across participants; shaded ribbons indicate ± 1 standard error of the mean. Time is plotted relative to stimulus onset (dashed vertical line at 0 ms).

References

- [1] Jacobs, H. (2021). *The evolution of Latin stress into Romance with special consideration of French*. De Gruyter. <https://doi.org/10.1515/9783110550283-008>
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