A Perceptual Study of Stress Insensitivity in Speakers of Lio

It has been suggested that Lio, an understudied Austronesian language spoken in Flores, Indonesia, has fixed word-initial stress (Elias 2018), but recent phonetic work has shown that penultimate syllables bear word stress. Stress is encoded by increased vowel duration and intensity, but not changes in f0, a common cross-linguistic correlate of stress (Mayro 2024). These conflicting findings prompted us to develop a perception study using an ABX discrimination task. If Lio is in fact a fixed stress language, we would expect Lio speakers to demonstrate a perceptual insensitivity to stress contrasts, a phenomenon known as "stress deafness."

The stimuli for this experiment were synthesized from five naturalistic Lio recordings available on PARADISEC (Yanti 2019), each recording of a different native Lio speaker. Four of the speakers were male and one was female. Five disyllabic words of the form CVCV were used. Two were real Lio words, [bebo] 'not know' and [ŋala] 'can'; three were nonwords: [ᵐbasa], [ŋasa], and [male]. Each nonword was synthesized by splicing two real words in Praat (Boersma & Weenink 2024); [male], for example, was synthesized from [manu] 'chicken' and [lele] 'hear'. Two stimuli were created for each word using PSOLA resynthesis: one with stress on the penultimate syllable and one with stress on the final syllable, resulting in minimal pairs like [ŋála] ~ [ŋalá] and [mále] ~ [malé]. Stressed syllables were made prominent in accordance with the average values demonstrated in the production study described in Mayro (2024); stressed vowels were made 50% longer and 3 dB greater in intensity than unstressed vowels. Since f0 was not found to correlate with stress in the production study, we ensured that neither syllable of the experimental stimuli was lent prominence by f0 movement, flattening f0 contours when necessary.

This resulted in 30 total tokens: 5 words x 2 stress locations x 3 speakers per word. These words were organized into stress triplets. Each triplet consisted of three variations of the same word, each spoken by a different speaker. Word 1 and Word 2 differed in stress location, and Word 3 matched the stress location of either Word 1 or Word 2. This resulted in triplets like [mále] ~ [malé] ~ [mále] and [ŋalá] ~ [ŋála] ~ [ŋála]. In every triplet, Word 1 and Word 2 were spoken by male speakers and Word 3 was spoken by a female speaker.

Filler stimuli—a.k.a segmental triplets—were created alongside the stress triplets. Three words were used for the segmental triplets: [ŋasa], [ᵐbasa] and [ŋala]. Like the stress triplets, each segmental triplet consisted of three words, each spoken by a different speaker. Unlike the stress triplets, Word 1 and Word 2 differed in the identity of one segment, not stress location, hence the name 'segmental triplets.' This resulted in triplets like [ŋása] ~ [ŋála] ~ [ŋása]. Each triplet represented a phonemic contrast native to Lio, so the contrast was expected to be very salient to Lio speakers. All words in segmental triplets were given penultimate stress, ensuring that they contrasted only segmentally, not in stress location.

The experiment was administered using Qualtrics. For each trial, participants played an experimental triplet—either a stress triplet or a segmental triplet—and were then asked to identify whether Word 3 was the same as Word 1 or Word 2. They could play each triplet up to two times, but following the second play, the link to the audio file disappeared. Number of plays was restricted because "stress deafness" is an insensitivity to stress contrasts, not an inability to perceive stress contrasts; with unlimited plays, even stress-insensitive participants should be able to perceive stress contrasts.

Participants included 32 Lio speakers (22F, 10M) between the ages of 18 and 57. The average accuracy rate across all participants on the stress triplets was 50.27%. In other words, participants were able to accurately match Word 3 to either Word 1 or Word 2 of the stress triplets 50.27% of the time. Participants performed better on the segment triplet filler items. On average, participants were able to accurately match Word 3 to either Word 1 or Word 2 of the filler items 67.90% of the time.

The accuracy rates of Lio speakers is consistent with the accuracy rates demonstrated by speakers of other languages with predictable stress (i.e. French and Finnish). In other words, the Lio speakers exhibited an insensitivity to stress contrasts, as we would expect for speakers of a fixed stress language. This result supports the findings of the production study run by Mayro (2024), for if Lio did not have fixed stress, we would expect a smaller "stress deafness" effect in participants, which would translate to higher accuracy on the stress triplet ABX task.

SELECTED REFERENCES

Boersma, P., Weenink D. 2020. Praat: Doing phonetics by computer [computer program]. Version 6.1.32. • Elias, Alexander. 2018. Lio and the Central Flores languages [MA thesis]. Leiden, The Netherlands: University of Leiden. • Mayro, Michelle. 2024. Lexical stress and Lio [Poster]. 98th Annual Meeting of the Linguistic Society of America, New York, New York.