

Is there Stress in Indonesian?

Angeliki Athanasopoulou, Nadya Pincus, Irene Vogel

University of Delaware

The status of stress in Indonesian is controversial, with some researchers claiming that it does not exist (1, 2, 3). Others claim that it does exist and falls on the penultimate syllable (4, 5) while still others claim it falls on the final syllable (6). Two primary causes of such divergent assessments of Indonesian stress are the influence of substrate languages (7) and methodological problems including small corpora due to small numbers of stimuli and speakers and a conflation of focus and stress. In this paper, we present the findings of an acoustic study that avoids the previous drawbacks by a) using large corpora consisting of recordings of 10 speakers producing 180 targets each, b) including only speakers of Jakarta Indonesian with minimal knowledge of other varieties, and c) systematically distinguishing between stress and focus. Based on our analyses of F₀, duration, intensity and vowel centralization, we conclude that there is no evidence of stress in Indonesian – at least the standard variety as spoken in Jakarta.

This study of Indonesian is part of a larger cross-linguistic analysis of the properties of prominence in which we use carrier dialogues designed to distinguish between stress and focus. Our speakers (5F, 5M), university students or graduates 18 - 28 years old, were recorded in Jakarta. They read short dialogues (presented with power point slides) that placed the targets, real CVCVCV words, in focus position and in pre-focal (i.e. non-focus) position. In each position, we examined 10 instances of [i, u, a] in each of the three syllables of the targets. The data were normalized using z-scores, and we first conducted a binary logistic regression (LRA) analysis using mean F₀, mean intensity, duration and a measure of vowel centralization. This allowed us to determine the extent to which the vowels in each of the three syllables could be distinguished from those in the other two positions with and without focus. We then converted the z-scores back to the appropriate units based on the mean and standard deviation of one of the speakers to examine the acoustic patterns themselves.

There was minimal success in the LRA classification of focused vs. non-focused vowels in all three syllables (Table 1). The classification of each syllable compared to the other two in both the focused and non-focused positions is somewhat better (Table 2).

Examination of the acoustic properties themselves also does not reveal consistent manifestations of focus on any of the three syllables. Focus usually appears as additional prominence on the stressed syllable in languages with stress (e.g. Greek, Hungarian). Although it is not possible to prove the absence of a phenomenon, we interpret the lack of differences in the main cues of prominence between focus and non-focus structures as a strong indication that Indonesian, in fact, is not a stress language.

Examination of the duration pattern shows that both the second and third syllables are longer when focused (Figure 1). While a longer final syllable could indicate a boundary phenomenon, greater duration on the second syllable could potentially be taken as an indication of focus on the penult. In our findings, however, the difference (i.e. 9 ms.) is minimal and unlikely to be perceptible. Mean F₀ shows a rise across the word, with the highest value on the final syllable, most notably when it is not focused (Figure 2). If higher pitch is indicative of prominence, it would thus seem that focus is not expressed on the final syllable. For additional information, Figure 3 provides the F₀ contour based on measurements at 4 points within the vowels of each of the three syllables. The only noticeable difference is again on the final syllable, where there is a drop in the focused context. While it is possible that the fall correlates with prominence on the final syllable, an alternative and more likely interpretation is that the fall simply indicates the presence of a stronger prosodic boundary following the focused target word. In this case, the fall would only signal the boundary type and not focus. Both mean intensity and vowel centralization show minimal variation in the different conditions.

In sum, the combination of the low success of the LRA classifications and the weak and inconsistent differences in the acoustic properties of the three target syllables supports the analysis of (Jakarta) Indonesian as not having stress. That is, since there is no clear manifestation of prominence on any of the syllables in the absence of focus, or of heightened prominence in the presence of focus, we conclude that the main cues to stress are absent in our data, although it is certainly possible that other dialects may exhibit different patterns.

+/- Focus (chance=50%)	
	Overall Classification
Syll 1	57%
Syll 2	60%
Syll 3	67%

Table 1. Overall LRA Classification of Focused vs. Non-focused Target Vowels in each Syllable.

		Overall Classification (chance=66%)	
	Compared to:	-Focus	+Focus
Syll 1	Sylls 2 & 3	75%	79%
Syll 2	Sylls 1 & 3	71%	66%
Syll 3	Sylls 1 & 2	79%	73%

Table 2. Binary Logistic Regression Analyses: comparison of each syllable position with the others combined.

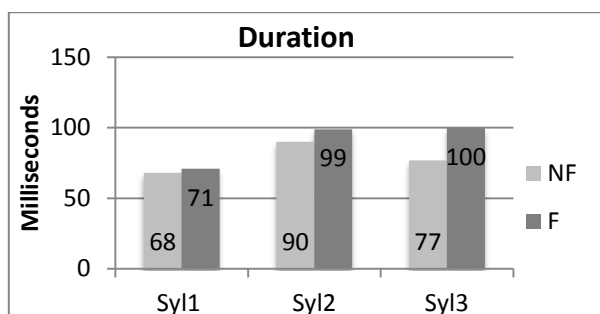


Figure 1. Duration.

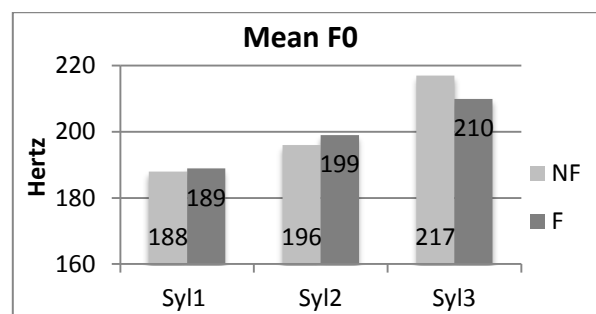


Figure 2. Mean F0.

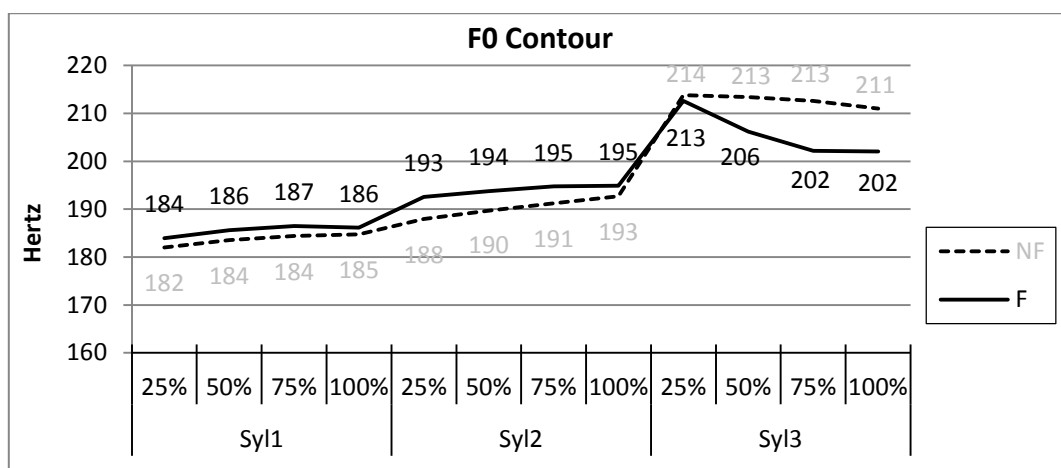


Figure 3. F0 Contour.

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