

Interaction between prosody and syntactic position: Evidence from focus types in Bangla

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Aim: This paper investigates the effect of the syntactic position of a focused constituent on the prosodic marking of different focus types (new-information focus vs. corrective focus) in Bangla. Previous studies have shown that different focus types -- new-information focus vs. corrective/contrastive focus -- are marked distinctly using prosody. For example, Pierrehumbert (1980) and others argue that two distinct pitch accents mark new-information focus (H*) and contrastive focus (L + H*) in English. Along similar lines, experimental work on English e.g. Katz & Selkirk (2011) found different prosodic encoding for new-information and contrastive focus in English: Constituents in contrastive focus have a higher pitch (f0) than constituents in new-information focus. In this paper we use Bangla to investigate whether this prosodic distinction of the two focus types is impacted by the syntactic position of the focused constituent.

Bangla: Bangla has relatively free word order, but SOV is regarded as the canonical/default word order. According to Choudhury (2010), Bangla uses three strategies to mark focus: (a) syntactic position; (b) morphological marking, and (c) prosody. In positional focus marking, the focused constituent is in the default focus position, immediately preceding the verb (ex.1,2). In addition to the focus position, some focus constituents can also occur in sentence-initial position (ex.3-4 below). In our experiments, we used canonical SOV order with the following interpretations, which are all felicitous in Bangla:

- (1) S [O]_{NewInfo} V - New-information focus on **object**; subject is unfocused
- (2) S [O]_{Contr} V - Contrastive focus on **object**; subject is unfocused
- (3) [S]_{NewInfo} O V - New-information focus on **subject**; object is unfocused
- (4) [S]_{Contr} O V - Contrastive focus on **subject**; object is unfocused

Experiments: We conducted two sets of experiments - Experiment 1 and Experiment 2. Both experiments are a combination of a production study followed by a perception study, where the production study recordings were used as stimuli for the perception study. Experiment 1 uses 'plain' SOV sentences: The subject is at the **sentence initial position** and the object is at the **default focus position** (pre-verbal position).

In Experiment 2, we added adverbs at the sentence-initial position to create **AdvSOV** sentences. Now, the subject is no longer at the sentence initial position, but the object is still at the default focus position. The main idea behind using an adverb at the sentence initial position is push the subject away from that position. Bangla has a downstep pitch pattern and any constituent at the sentence initial position will have a high f0 which may mask subtle information-structurally driven changes in prosody.

The design for both the experiments was the same: A 2x2 design with four conditions (ex.1-4). For the production studies, participants saw a question followed by an answer on the screen (ex.5), and they said the answer out loud. Wh-questions were used to elicit new-information focus (ex.5a,b) and yes/no questions to elicit corrective focus (5c,d). Five (different) native Bangla speakers participated in each production study. Their answers were recorded. For the perception studies (Exp 1 n=12, Exp 2 n=20), participants saw a wh-question and a yes/no question on the screen and heard a sound file elicited during the production phase. Their task was to choose whether the sound file is an answer to the wh-question or the yes/no corrective question – i.e., which question is most appropriate for the sentence they heard. This provides an measure of whether they interpret the sound file as exhibiting new-information focus or corrective focus. (The grammatical role focused by the questions matched the grammatical role focused in the sound files, so the key question is whether participants hear a difference between new-information and corrective focus.)

5) Elicitation phase (Question and answers were presented to speakers in writing, in Bangla)

- (a) *Subj wh (new-info focus)* Who bought a car? baba gaRi kinlo 'Father bought a car'
(b) *Obj wh (new-info focus)* What did father buy? baba gaRi kinlo 'Father bought a car'

- (c) *Subj y/n (corrective foc)* Did neighbor buy a car? **baba** gaRi kinlo ‘**Father** bought a car’
 (d) *Obj y/n (corr foc)* Did father buy a computer? baba **gaRi** kinlo ‘Father bought a **car**’

Results for Experiment 1 (plain SOV sentences): The perception study data was analyzed in two different ways: (i) ‘**matching responses**’- percentage of trials where the question chosen matches the context of sound file elicitation and (ii) ‘**wh-responses**’: percentage of trials where the participants chose the wh-question, irrespective of the sound file presented. A **linear mixed-effect regression analysis** of the wh-responses show a main effect of focus type ($\beta = 1.3161$, Wald $Z = 3.380$, $p < 0.05$), and no significant effect of grammatical role ($\beta = -0.3466$, Wald $Z = -0.908$, $p = 0.364$) and a marginal interaction between focus type and grammatical role ($\beta = -1.1248$, Wald $Z = -1.474$, $p = 0.100$). *The main effect of focus type shows that participants are sensitive to the distinction between new-information focus and corrective focus. An interaction between the focus type and grammatical role shows that the grammatical role has an effect on the distinction of the two focus types.* Further, paired sample t-tests reveal a significant difference in the rate of wh-question choices in the two object focus conditions ($t(11) = 2.399$, $p < 0.05$, $t(19) = 4.33$, $p < 0.05$), but no significant differences in subject focus conditions ($t(11) = 0.876$, $p = 0.40$, $t(19) = 1.396$, $p = 0.179$). *This suggests that participants are able to distinguish new-information focus and corrective focus for focused objects, but are less capable of doing so for focused subjects.*

For the **production study** we did ANOVAs on time normalized f_0 . We found a main effect of focus type ($F(1,4) = 7.850$, $p < 0.05$), and grammatical role ($F(1,4) = 8.735$, $p < 0.05$), but no interaction ($F(1,4) = 0.914$, $p = 0.393$). However, paired comparisons show that the mean f_0 's of the focus types for the objects differ significantly from each other ($t(4) = 4.019$; $p < 0.05$), although the mean f_0 's of the focus types for the subject differs only marginally ($t(4) = 2.148$; $p = 0.098$). *Therefore, the distinction between focus types is more prominent for objects at the default focus position, and less for subjects at the sentence initial position.*

Results for Experiment 2 (Adv-SOV sentences): For the **perception study**, linear mixed-effect regression analyses on the proportion of **wh-responses** show a main effect of focus type ($\beta = 1.1158$, Wald $Z = 2.869$, $P < 0.05$), and no significant effect of grammatical role ($\beta = -0.790$, Wald $Z = -0.247$, $p = 0.8$), and an interaction between focus type and grammatical role ($\beta = -1.594$, Wald $Z = -2.433$, $P < 0.05$). Further, planned comparisons (paired T-tests) reveal that there is a statistically significant decrease in the choice of wh-questions for corrective sound files for the object ($t(19) = 2.781$, $p < 0.05$). However, in case of the subjects, the decrease is not significant ($t(19) = 1.088$, $p = 0.29$). *Therefore, it seems that even with the presence of a sentence-initial adverb, participants are able to distinguish new-information focus and corrective focus only on objects, but not on focused subjects.*

For the **production study**, ANOVAs on the by-subjects means of the time normalized fundamental frequency (f_0), showed a main effect of the grammatical role, $F(1,4) = 24.485$, $p < 0.05$, such that the focused subjects have a significantly higher f_0 than focused objects; and a main effect of focus type, $F(1,4) = 43.773$, $p < 0.05$, such that contrastively focused constituents have significantly higher f_0 than new-information focused elements. There is also marginal interaction between the grammatical role of focused constituents and the focus type ($F(1,4) = 3.365$, $p = 0.1$). Planned comparisons show the mean f_0 's of new information and corrective focus for the objects differ significantly from each other ($t(4) = -4.850$; $p < 0.05$), but mean f_0 's of the focus types for the subject differs only marginally ($t(4) = -1.946$; $p = 0.124$). Therefore, the results of Experiment 2 show that even though the subject is not at sentence-initial position, the prosodic distinction between new-information focus and contrastive focus on subjects does not appear to be as clear as on objects.

Conclusions: Both Experiment 1 and Experiment 2 indicate that Bangla speakers encode the distinction between new-information focus and contrastive focus using prosodic cues – f_0 in particular – and that listeners are sensitive to this information. *Crucially, the findings show that the encoding of information structure can be dependent on the structural position of the focused constituent, such that the distinction between the two focus types is clearer at the default focus position than in a linearly preceding position.* This ‘amplification effect’ raises interesting questions about the properties of the default focus position in Bangla (as well as other languages like Hungarian), which we will explore in our presentation.