<u>Information structure and prosodic focus in Bangla: Comparing production and perception</u>

This paper investigates the prosodic distinctions available in Bangla/Bengali to differentiate between focus-types and tests whether the availability of prosodic cues interacts with syntactic position. Bangla has canonical SOV order and sentence-initial elements tend to be topics. The immediately preverbal position is the *default focus position* for both new-information and contrastive focus, though focused constituents can also occur elsewhere. Contrastive focus can also be marked morphologically with *–i*. To broaden our understanding of the relationship between information-structure/prosody/syntax, we investigated production and perception of new-information focus and contrastive/corrective focus in Bangla. We conducted an **elicitation study** (N=5) followed by a **perception study** (N=12) to investigate **(i)** whether Bangla speakers distinguish new-information vs. contrastive focus prosodically and **(ii)** whether the position of the focused constituent matters. Since Bangla has a default focus position, we wanted to see whether prosodic distinctions between focus-types would be amplified in that position.

In both studies, we manipulated (i) *focus type* (new-information focus/contrastive focus) and (ii) the *grammatical role of the focused constituent* (subject/object). In the **elicitation phase**, new-information focus and contrastive-focus sentences were elicited from speakers using a question-answer paradigm (ex.1). *Wh-questions* were used to elicit responses with new-information focus (1a,b); *yes/no questions* to elicit contrastive focus (1c,d).

<u>Perception study</u>: Speakers' responses from the elicitation phase were used as stimuli for this study. For each grammatical role (subject/object), the listeners saw a wh-question and a yes-no question on the screen and heard a sound file that had been elicited either by a wh-question or a yes/no question of the same grammatical role (ex.2a,2b). Listeners were instructed to choose the question that the auditorily-presented file would be the most appropriate answer for. This allowed us to use human ears as our 'tool' to test whether the speakers were making a distinction between new-information focus and corrective focus. *If listeners make a distinction between the two focus types, we can attribute this to differences in the intonation/prosody produced by the speakers*, as the sentences were otherwise identical (ex.1).

<u>Perception results:</u> Listeners showed an overall preference for wh-questions (p's<0.05). However, in *object conditions*, this preference was lower with sound-files elicited as yes/no-questions than wh-questions (p's<0.05). In contrast, *subject conditions* showed no significant differences, triggering mostly wh-choices. Thus, *listeners are prosodically distinguishing between focus-types only when the focused constituent is an object, in the default focus position.*

We also conducted **acoustic analyses** to see what dimension encodes the difference in focus type. Prior work has shown that, crosslinguistically, pitch and duration are used to signal focus (Ladd 1996, Watson et al 2008), so we focused on these dimensions. (Due to the presence of an initial low tone (see Hayes & Lahiri 1991), mean F0 analyses were conducted on 10 time-normalized segments centered at the offset of the noun, using Yi Xu's *Prosody Pro* praat script). The results show that *new-information objects have lower mean F0 than contrastively-focused* objects (p's<.05). Furthermore, focused objects overall have higher mean F0 than unaccented objects (replication of Hayes & Lahiri 1991). Like objects, *new-information subjects have significantly lower mean F0 than contrastively-focused subjects* (p's<.05). Crucially, unaccented subjects do not differ significantly from contrastively-focused or new-information subjects: All subjects have relatively high F0s, unlike to objects, presumably due to initial prominence and F0 declination. (There were no significant differences in excursion or duration for subjects or objects.) Thus, we suggest that the asymmetrical behavior of subjects vs. objects – the fact that the difference between focus types is not reliably perceptible on subjects but is perceptible on objects – can be attributed to 'crowding': F0 height on a subject is not a reliable cue to focus type since unfocused subjects also have high F0.

As a whole, our findings indicate that Bangla, which has positional as well as morphological focus marking, also uses prosodic cues to differentiate new-information vs. contrastive focus, but that the availability of prosodic cues interacts with syntactic position such that prosodic differences between the focus-types are most apparent when the focused constituent is located in the default focus position.

1) Elicitation phase (Question and answers were presented to the speakers in writing)

Sample questions: **Sample answer (target sentence)**
(a) *Subject wh question (new-information focus)*
    gaRi ke kinlo?   **baba** gaRi kinlo   **S**OV
    Who bought a car?   'Father bought a car'

(b) *Object wh question (new-information focus)*
    baba ki kinlo?   baba **gaRi** kinlo   S**O**V
    What did father buy?   'Father bought a car'

(c) *Subject yes/no question (corrective focus)*
    protibeshi gaRi kinlo ki?   **baba** gaRi kinlo   **S**OV
    Did neighbor buy a car?   'Father bought a car'

(d) *Object yes/no question (corrective focus)*
    baba kOmpyuter kinlo   ki?   baba **gaRi** kinlo   S**O**V
    Did father buy a computer?   'Father bought a car'

(2a) **Perception study, Object conditions:** [L/R position of questions counterbalanced]
Screen showed: baba ki kinlo?   baba computer kinlo ki?
                What did father buy?   Did father buy a computer?

Participants heard: *baba **gaRi** kinlo*
                Father bought a car (elicited by object wh-question or object yes/no question)

(2b) **Perception study, Subject conditions:** [L/R position of questions counterbalanced]
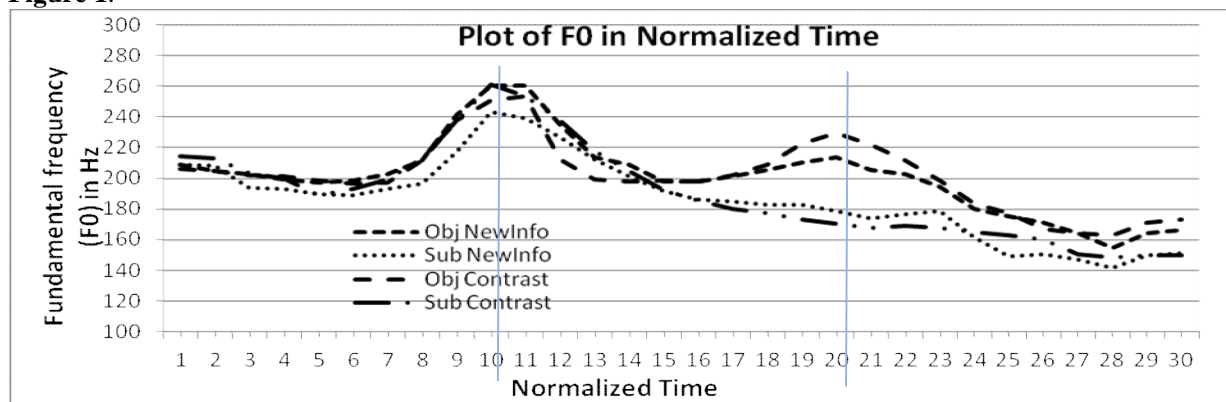Screen showed: gaRi ke kinlo?   protibeshi gaRi kinlo ki?
               Who bought a car?   Did neighbor buy a car?

Participants heard: ***baba*** gaRi kinlo
                Father bought a car (elicited by subject wh-question or subject yes/no question)

Figure 1.

[Normalized time: Time segments 1-10: *subject*, segments 10-20: *object*; segments 20-30: *verb*]

Selected References • Hayes & Lahiri (1991). Bengali intonational phonology. Natural Language and Linguistic Theory 9, 47-96 • Watson, D.G, Tanenhaus, M.K. and Gunlogson, C.A. (2008). Interpreting Pitch Accents in Online Comprehension: H* vs. L+H*. *Cognitive Science* 32:1232–1244. • Xu, Y. (2005-2011). ProsodyPro.praat. Available from: *http://www.phon.ucl.ac.uk/home/yi/ProsodyPro/*