The Role of Global and Local Pitch Levels in the Perception of Questions in Ede Chaabe

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Low-pitched 'Lax prosody' [5,6] is an areal feature found along the Sudanic Belt, presenting some or all of the following intonational cues for polar questions: final L% tone or falling intonation, final polar or mid tone, final lengthening, breathy termination and/or cancellation of penultimate lengthening [6, 5, 2, 1]. In particular, [1] added a raised register level (i.e. 'expanded pitch range') to these characteristics, which would counteract the effect of the presence of a final L% in questions, in line with Frequency Code predictions [4]. In Ede Chaabe (Niger-Congo), however, yes/no questions are systematically realized at a lower global pitch level than statements, as well as with a local final F0 fall (L%), as illustrated in *Figure 1*. This goes counter to Ede Yoruba with which it shares the same sub-family and which is an established non-lax-prosody language [11]. These production findings put into question the predictions of the Frequency Code, given that neither global pitch differences nor boundary tone marking would go towards a higher pitch level (Register) specification in questions. The aim of this study was hence to perceptually test the combined role of the terminal contour (presence vs absence of a fall) and global pitch level manipulation on the perception of polar questions in Ede Chaabe.

Based on the results of a production study [3], we hypothesized that global (Register) and local final fall (L%) would affect question identification, independent of lexical tone specification. Our prediction was that both lower global pitch level and the presence of a final falling edge tone would induce question perception, and that the effect would be additive. Two all-H utterance bases (*bíjɔ́ nɛ́wó.*/? *'Biyo spent money'*/'Did Biyo spend money?') were resynthesized with PSOLA [8] in PRAAT. After stylizing the pitch contours of each base, the global utterance register levels was modified in five level steps of 10 Hz each, while four IP-final F0 fall steps of 17 Hz were superimposed on the last syllable (L% fall). For the final fall, the magnitude of the difference between steps was fixed but the final L target values in each step varied as a function of the global register levels. The manipulation yielded a total of 120 stimuli which were presented in 3 blocks in subject-randomized order to native speakers of Ede Chaabe. 24 participants (11 females and 13 males) were instructed to perform a two-alternative forced choice labelling task (question vs. statement), via psychoPy3 [9]. A short training was provided to each participant at the beginning of each session. A generalized mixed-effects model was fitted to the question response data. We estimated all fixed main effects and interactions of the independent variables Register, Edge Tone Level and (stimulus) Base. Random effects for participants of the variables Register and Edge Tone Level were estimated as well. We controlled for the effect of Age and Gender (male/female participants) by including these two variables in the model.

There was a significant effect of Final Fall (coef=2.97, z=8.43, p<.001), in that stimuli were more readily identified as questions with lower steps of this variable (see *Figure 3*). That is, stimuli with a final fall of at least 40 Hz were perceived as questions, as opposed to stimuli with no (i.e 0 Hz) final or smaller F0 final fall. There was also a significant effect of global register level (coef=-.29, z=-2.53, p=.01), indicating that higher levels of global pitch led to a smaller proportion of question responses. A significant Base effect was also observed (coef=-.35, z=-2.93, p=.003), with more question responses for question base stimuli than for statement base ones.

Our findings support our hypothesis, since both the final fall and the overall register significantly cued questionhood, as predicted. These results add to the body of evidence showing that the Frequency code ([4]) is not a universal characteristic of questions, and, more importantly, they offer new data for the interaction of lexical tone register and intonation in perception for an understudied language.

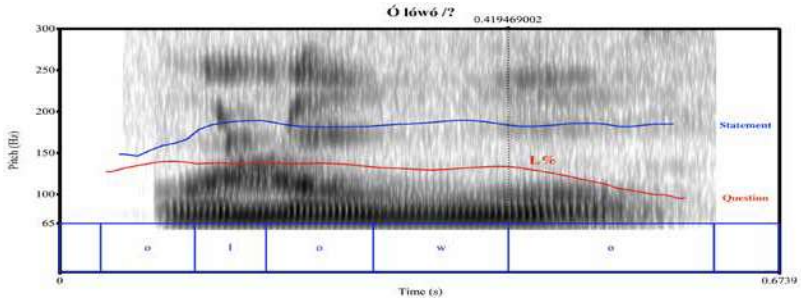

Figure 1. Utterance pair (ʔó lówó/? "He has money/Does he have money?"), including a *question (red, low) and a statement (blue, high) pitch track in Ede Chaabe*.

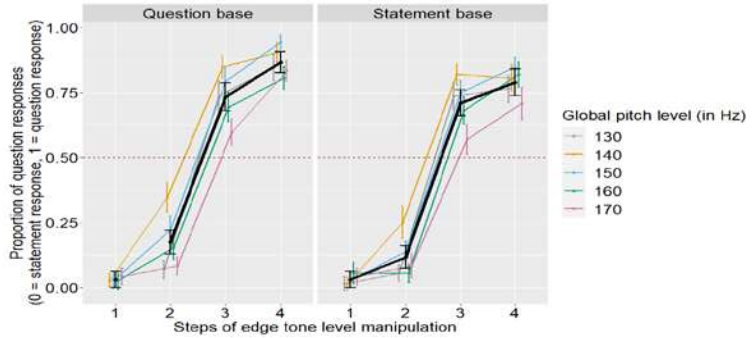

Figure 3. Proportion of question responses (with standard errors) to stimuli with different steps of edge tone level final F0 targets (steps on the x-axis, where 1= no fall; 2=17Hz fall; 3=34Hz fall and 4=51Hz fall) and different global pitch levels in colored lines, with steps of 130Hz, 140Hz, 150Hz, 160Hz and 170Hz. The black line shows the average of all pitch levels collapsed together. Question base stimuli are plotted in the left panel and statement base stimuli in the right panel.

References

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