Articulatory differences between true and assimilated stop geminates in Bengali(Poster)

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Introduction: Bengali exhibits "true" lexical geminates (TGs), e.g. ʃɔt̪t̪o- 'juice/ extract' and assimilated geminates (AGs), e.g. ʃɔrt̪o> ʃɔt̪t̪o- 'condition', argued to be derived through total assimilation of a rhotic /ɹ/ and a voiceless dental stop /t̪/ [2]. Earlier acoustic analysis found no difference between TGs and AGs, suggesting that assimilation results in *complete neutralization*, represented as feature spreading from the dental stop and delinking of rhotic features as shown in Fig. 1. [2]. We investigated tongue position and velocity in order to assess whether articulatory data indicates complete neutralization in AGs. While similar in duration and tongue displacement, AGs in our study were produced with larger peak velocity toward the target than TGs. We interpret this result as stemming from an initial flap-like articulation in AGs which has greater stiffness than a stop gesture.

Background/Method: Bengali dental stops are produced with contact between tongue tip or blade back of the teeth [3]. Rhotic approximant /ɹ/ has been described as having an apico-alveolar constriction location with the tongue coming close to (but not touching) the palate. Rhotics can be realized as a tap [ɾ] in the environment of a dental consonant [1]. Taps have been found to be produced with greater velocity/higher stiffness than stops in some Indian languages [4]. We hypothesized that, if neutralization in /ɹ/+/t̪/ AGs is not complete (rhotic articulation remains), timing of maximum tongue tip displacement towards the palate would be later for the sequence (in the event of approximant-like initial articulation), or gestural stiffness would be greater, as indicated by greater peak velocity toward the target (in the event of tap-like initial articulation). Electromagnetic Articulography (EMA) data was collected from 2 native speakers of Bengali (1 male; data collection ongoing) using the NDI Wave Speech production system. Sensors were attached to Tongue Tip, Tongue Blade, and Lower Incisor, reference sensors Nasion and Mastoids. We analyze data from the Tongue Blade (TB) sensor here, since TB movement was the most reliable across speakers during geminate production. Stimuli consisted of five two-syllable words with word medial TGs and AGs resulting in 10 words in total. Each target word was placed in two different carrier sentences, yielding 20 words/block, with 10 blocks/repetition, for total of 200 tokens. Sentences were presented in randomized order. Data was analyzed using MVIEW [6]. Gestural onset of the consonant were determined using a 20% threshold of peak velocity (cm/s). TIME OF MAXIMUM CONSTRICTION (MAXCTIME; in ms) and DISPLACEMENT (DISP; in mm) of the tongue blade at the trajectories of vertical movement were measured, as was PEAK VELOCITY (PVEL; in cm/s) toward the target. No significant difference was seen between AGs and TGs for MAXCTIME ($t=0.588$, $p>0.05$). A significant difference ($t=-2.067$, $p<0.05$) in average PVEL between TGs and AGs is seen for both subjects (Fig.3& Fig. 4), with higher values for AGs. No difference in DISP was found for either subject (Fig.5 & Fig.6) ($t=1.266$, $p>0.05$). In line with previous studies, no difference is observed in acoustic durations (Fig. 2.) of geminates ($t=1.084$, $p>0.05$).

Results/Discussion: Greater peak velocity for AGs despite a similar displacement profile to TGs suggests that the former may be articulated with greater gestural stiffness. A similar articulatory profile has been reported for more flap-like rhotic articulations in Tamil [4], as well as for some speakers of English [5]. Results suggest that, despite overall similar acoustic and articulatory patterning, there are some key differences which distinguish AGs from TGs, indicating

neutralization in assimilated geminates in Bengali is incomplete, and a feature-spreading account involving total assimilation is not adequate to explain our results.

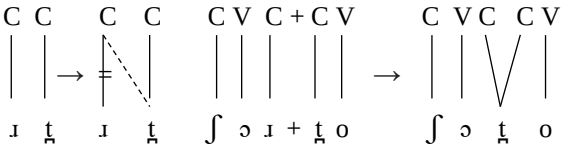

Fig. 1: /ɹ/ assimilation via spreading and delinking: /ʃɔrt̪o/ [2]

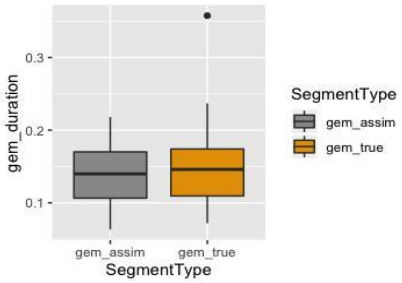

Fig. 2. Acoustic duration of Geminate closure.

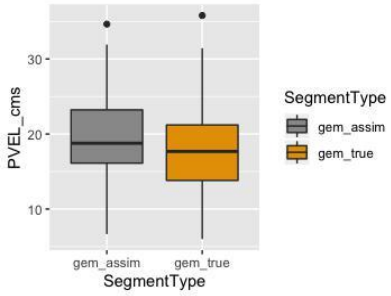

Fig. 3. Peak velocities of TB (Male).

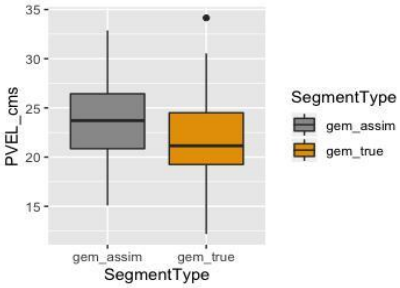

Fig. 4. Peak velocities of TB (Female)

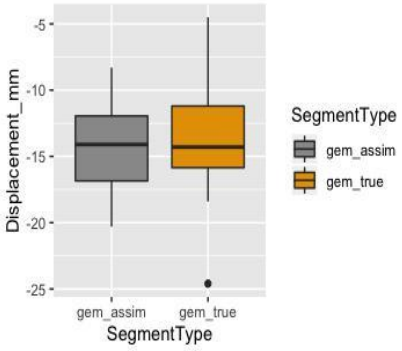

Fig. 5. TB Displacement (Male)

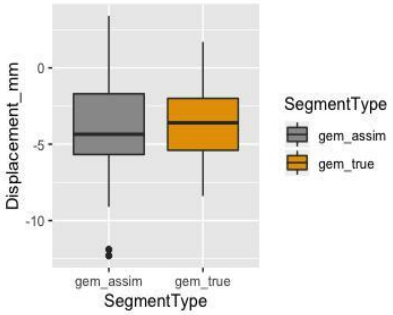

Fig. 6. TB Displacement (Female)

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