The Organization of Articulator Gestures: A Comparison of Swedish, Bulgarian and Greenlandic

Sidney A. J. Wood

Department of Linguistics, University of Lund, Helgonabacken 12, 22362 Lund, Sweden

Abstract: The organization of speech articulator gestures in Swedish, Bulgarian and Greenlandic, analysed from X-ray motion films of speech, is examined in order to study universal and language-specific components in articulation. The case of velar obstruents is reported, with and without palatalization. The palatalization of velar obstruents was implemented similarly, the palatal tongue body gesture of an up-coming front vowel being launched during the velar constriction of the consonant. A model of gesture programming based on these and previous results is proposed (assimilation gestures are first shifted earlier or later for anticipation or perseveration, then conflicting gestures are resolved into a queue according to serial order in the utterance, finally the timing of local coproduced coarticulation is set up for all articulator gestures).

A GREENLANDIC EXAMPLE

This report continues from previous work (1-7), where articulator movements were seen to be organized similarly by all subjects (articulator gestures were executed in approach, hold and withdrawal phases, four tongue body gestures were used, all gestures were available for vowels and consonants, gesture conflicts were resolved by gesture queuing and not by tug-of-war, coarticulation and assimilations were implemented by coproduction). Language-specific principles appeared in assimilations such as palatalization of alveolar stops by the Bulgarian subject and uvularization of vowels by the Greenlandic subject, and the avoidance of palatalization of alveolars by the two Swedish subjects. One assimilation, palatalization of velar obstruents, is common to all three languages. This presentation continues with one example: [axçi] (Greenlandic).

The Greenlandic palatalization hides two processes. Firstly, geminated non-nasal approximant sonorants (/rr æ uŋ/ w w/) are produced as voiceless fricatives [ x x k f ] respectively. Secondly the velar pair are further palatalized to [ksi] before /l/. This is illustrated here by the word /tauqi/ [tæxçit].

![Diagram of tongue body movement during [axçi]. Left: during the vocoid segment of /a/, (b) pharyngeal tongue body withdrawal of /a/ and (d) velar tongue body approach of /uŋ/ (x) hiss from frame 160. Right: during the hiss segment of the fricatives, (c) velar tongue body withdrawal of /uŋ/, (a) palatal tongue body approach of /l/. The velar posture was held in frames 160-161 at the beginning of the hiss segment; final hiss in frame 173.](image)
Figures 1, 2 and 3 record the timings of the respective gestures. For [axçi], there are potential conflicts between each tongue body gesture (pharyngeal for /d/, velar for /q/ and palatal for /i/). The conflicts were resolved by implementing each gesture in turn, once the preceding gesture had culminated. Palatal movement for /i/ appeared once the velar constriction had been established. The [ç]-like timbre came towards the end of the tongue body movement along the palate, as expected from quantal theory (8).

Launching the palatal tongue body of gesture of /i/ early during the velar constriction of /umu/ demonstrates assimilation by coproduction rather than by allophone substitution or segment transformation.

REFERENCES