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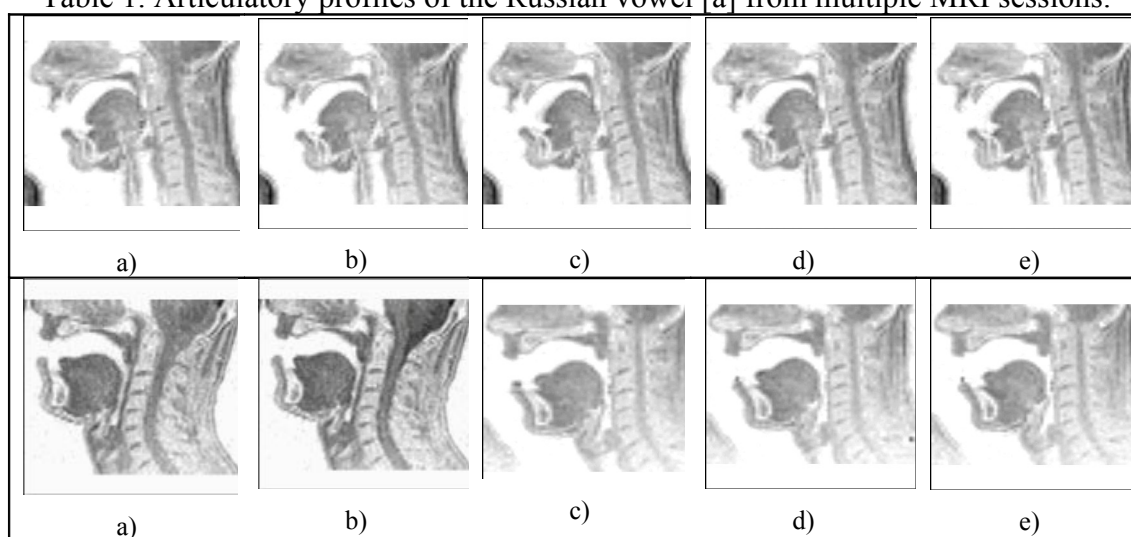
Diversity and stability in individual speech articulation patterns

While the basic theme of G. Fant's last overview of phonetics and phonology in the past 50 years has been the concept of the speech code as the ultimate goal of phonetic science, understanding the nature of individual invariance and variability has thus become one of the primary targets in phonetics. G. Fant states that "invariance ceases to be a problem if we systematically develop rules for structuring variability of all kinds, not only language, dialectal and contextual variations, but also variations specific to speaker, speaking style and emotions" (1). Direct observation and experimental investigation of individual speech articulatory behaviors could be very helpful either for understanding variety and stability in the speech production phenomenon, or for testing main assumptions on underlying motor-, neuro-physiological and psychological mechanisms.

Modern MRI facilities provided phoneticians with relevant information to this purpose. Some basic results of an original MRI investigation of vocalic articulatory patterns in the speech of 3 native speakers of the Russian language with no perceptual evidence of articulatory decrease or of any kind of pronunciation accent (either dialectal, or of foreign language) are presented for discussion. The series of experiments dealt with pronunciation of Russian sustained cardinal vowels [a], [o], [u], [e], [i] produced both in isolated position and in 2-syllable pseudo-phrases of the VCCV type (where C was a geminated consonant from the Russian language consonantal phoneme inventory). The experimental method of MRI investigation relied on gated and time-related MR-scanning of numerous repetitions of the same speech sequence for further reconstruction of articulatory movement(s) progressing in time being plotted from MR-images across several repetitions within a session (2). The data were collected from all the three experimental subjects in the course of several experimental sessions with a time gap of one and three months and one year. Reference subjects have been reproducing each vowel phoneme in isolated position up to 33 times and up to 23 times within a pseudo-phrase in every experimental session, the aggregate total of relevant MR-images being up to 868 items for a speaker.

An example of articulatory profile of the vowel [a] taken during several MRI experimental sessions and various phonation series is presented in Table 1. The upper row of images presents speech production practices of the female speaker (of non-Moscow origin); the bottom one presents speech production practices of the male speaker (of Moscow origin). List of reference: a) 1st series of MRI-experiments, 1st series of repetitive phonation activity; b) 1st series of MRI-experiments, 2nd series of repetitive phonation activity; c) 2nd series of MRI-experiments (carried out after one year), 1st series of repetitive phonation activity; d) 2nd series of MRI-experiments (carried out after one year), 2nd series of repetitive phonation activity; e) 2nd series of MRI-experiments (carried out after one year), 3rd series of repetitive phonation activity.

Table 1. Articulatory profiles of the Russian vowel [a] from multiple MRI sessions.



Discussion

In all experimental sessions the highest/considerable degree of MR-image matching within each speaker's various performances of a particular vowel produced several times in different vocal and consonant contexts within a session as well as through various sessions was observed. We considered those results as another evidence supporting the hypothesis of "sound of language" (or phoneme) stability in the interpretation of J. Baudouin de Courtenay (3). This concept was later elaborated in more detail in the works of V. Bogoroditsky and L. Ščerba, who insisted on an objective reality of the notion "sound of a language" which was defined as a "psychomotor, or motor-sensory complex (pronouncing and auditory linkage) formed via association of contiguity through phonation practising in the early childhood of every native speaker" (4). However, distinct inter-speaker differences (for example, major discrepancies in the overall shape of back/front cavity volumes for the articulation of the vowel [a] between the one and the other two speaking subjects) were also presented in the experimental dataset. We suggest these variations being caused by different dialectal backgrounds of the experimental subjects. Some other important evidences from MRI investigation of the Russian articulatory base support our hypothesis.

References

- (1) Fant, G. 2004. Phonetics and Phonology in the last 50 years. Speech Research in a Historical Perspective. (On-line).
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- (4) Bogoroditsky, V. 2004. *Očerki po jazykovedeniju i russkomu jazyku*, Moscow: URSS.