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Articulatory comparison of spoken and sung vowels based on MRI

Pierre Badin^a, Nathalie Henrich^a and Laurent Lamalle^b

^aDépartement Parole & Cognition, GIPSA-lab, 46, avenue Félix Viallet, 38031 Grenoble Cedex, France

^bPlateforme régionale IRM 3Tesla, IFR n° 1, RMN Biomédicale : de la cellule à l'homme, CHU de Grenoble, BP 217, 38043 Grenoble Cedex 9, France

Understanding the differences of articulatory strategies between spoken and sung vowels is of interest to both speech and singing research. We have thus used MRI to record midsagittal images from three subjects producing sustained vowels with various characteristics. The subjects were a professional lyric soprano, a semi-professional soprano, and a semi professional bass. They were instructed to produce combinations of (1) the ten French or the five Italian oral vowels, (2) speaking, amateur singing, or professional singing modes, (3) chest or falsetto registers, (4) pitch levels varying from B2 (120 Hz) to F5 (700 Hz). Any combination that the subject would not feel comfortable with was excluded from the corpus. The midsagittal contours of the vocal organs (jaw, lips, tongue, velum, pharyngeal wall, hyoid bone, etc.) were manually traced on each image, and a number of articulatory measurements (jaw or hyoid bone height, lip aperture, tongue position, etc.) were automatically derived. Our contribution analyses the influence of the various production conditions on these articulatory characteristics, such as the jaw aperture increase related to pitch increase, or the lower position of the larynx for singing in comparison to speech. Some acoustics considerations will be discussed as well.