The weaknesses of the tongue arching model of vowel articulation

Abstract

In 1867 Alexander Melville Bell conceived the high-low front-back tongue position model for vowels, including the concept of central vowels. This model was rapidly accepted by the phonetics community, but it has never been validated. This article reports an examination of 38 sets of X-ray tracings of vowels from 15 different languages, published in the past half century. This corroborates the charges made against the Bell model of failing to prescribe tongue positions correctly. Other criticisms concern the acoustic theory underlying the Bell model, which is not only oversimplistic but also misleading since the position of the tongue arch is irrelevant for the tuning of vocal resonances. The implications of invalidation for speech production theory are discussed. The constancy of vocal tract configurations, compared with the ambiguity of tongue arch position, points to a more suitable type of model for vowel articulation in which individual gestures combine to shape the vocal cavities to the resonator configurations appropriate to the sound quality.