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### Speaker-specific patterns of token-to-token variability

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One explanation for token-to-token variability is neural noise corrupting the motor commands. In a previous study using a two-dimensional tongue model, adding neural noise to motor commands was able to account for shapes and orientations of the dispersion ellipses of tongue positions for non-high vowels only. It was concluded that additional sources shaping lingual variability patterns of vowels should be examined: (a) stabilization of the tongue by lateral palate contact, (b) palate shape and (c) perceptual constraints due to the crowdedness of the vowel space. Variability patterns of three speakers of German were analyzed by means of EMMA, EPG and formant frequencies. Only the most variable speaker used lingual-palatal contact to reduce lingual variability for high front vowels. The other two speakers achieved articulatory vowel targets in a very precise manner. A flat palate shape can explain the limited lingual variability of one of these two. Only for this speaker did the acoustic distance between vowel targets significantly limit acoustical variability with smaller Bark ellipsoid volumes in regions with closer neighbors. For the other precise speaker, neither palate shape nor perceptual demands were relevant. We conclude that the relative importance of the factors analyzed varies across speakers.