

Appendix 5. Results of mixed-effects modeling, Euclidean distance to centroid

Euclidean distances to speaker-specific centroids were calculated for *all* data points, and these data were subjected to linear mixed-effects modeling using the same tools as described in section 3.2 (using only the five vowels that appear across stress conditions, [i e a o u]). The model's fixed factors were position (stressed vs. pretonic), SpeakerQ, and their interaction, with random intercepts for Speaker and Word. The results, in Table A.5.1, confirm a larger Euclidean distance value for stressed vowels ($\beta = 0.54688$). In addition they illustrate a significant interaction between Position and SpeakerQ, showing that the amount of centralization across stress conditions varies among vowels; however, this effect is driven by [o], the only vowel whose regression weight is significantly smaller than that of the default [a].

Table A.5.1. *Results of linear mixed-effects modeling, Euclidean distances from individual data points ($N = 8264$) to speaker-specific global centroids across stress conditions. The default level of Position is [Pretonic], and the default level of SpeakerQ is [a].*

Fixed factor	β Estimate	Std. Error	t	p
Intercept	1.25052	0.02951	42.370	< 0.001
Position[Stressed]	0.54688	0.03577	15.289	< 0.001
SpeakerQ[e]	-0.54690	0.04350	-12.572	< 0.001
SpeakerQ[i]	0.16527	0.03647	4.532	< 0.001
SpeakerQ[o]	-0.38060	0.03937	-9.668	< 0.001
SpeakerQ[u]	-0.31265	0.03891	-8.035	< 0.001
Position[Stressed] \times SpeakerQ[e]	-0.04072	0.05046	-0.807	0.420
Position[Stressed] \times SpeakerQ[i]	-0.03761	0.04913	-0.766	0.444
Position[Stressed] \times SpeakerQ[o]	-0.33647	0.05026	-6.694	< 0.001
Position[Stressed] \times SpeakerQ[u]	-0.01786	0.05102	-0.350	0.726