Evidence for gender-specific differences in undershoot from the production of diphthongs

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Previous studies have hinted at gender-specific differences in the degree of undershoot (Weirich & Simpson 2014, Simpson 1998). While Weirich & Simpson (2014) found the expected larger articulatory vowel spaces in males than females in a temporally privileged context, these gender-specific differences were missing in the coarticulatory more vulnerable /gV/-sequence (in a control and an accented condition) or even reversed (in an unaccented condition).

Based on that finding and analogous to the study of Simpson (2002) the present study investigates the diphthong /au/ in male and female German speakers. Articulatory (EMA) and acoustic recordings of 11 speakers were conducted. The diphthong was part of a family name embedded in a carrier sentence (“Herr Thomas Beyer arbeitet in seinem Büro”) produced in three accent conditions: 1) control (reading from a list) , 2) accented and 3) unaccented (in response to questions from the experimenter with an accentuation of the name or of the preceding word). Articulatory trajectories of the tongue mid (TM) and formant transitions were analyzed. Euclidean distances (EDs) were calculated between 50-60 measurement points of the articulatory trajectory starting from the lowest to the highest vertical position of the tongue mid. The traversed acoustic distance (ED in F1/F2 space, in Bark) was measured over five points starting from the highest to the lowest value of F1.

For the statistical analyses LMMs with articulatory or acoustic distance as dependent variable were run in R (R Core Team 2012) with a random intercept for speaker and by-speaker random slope for the effects of repetition and accent. While for the acoustic distance (left plot) the expected significant main effects of accent condition (a > c > u) and gender (f > m) were found, for the articulatory distance (right plot) the model with the interaction of accent and gender showed the best fit to the data. While females show a tongue movement that already seems to reach its maximum (with respect to their articulatory space) in the control condition, males reveal even larger distances in the accented condition. The results thus provide further indication of a tendency for males to produce more undershoot.

References: