

The relation between acoustic and articulatory measures is not always one-on-one (e.g. Scobbie and Sebregts 2010; Lawson et al. 2011a, 2014, 2015; Falahati 2013; Sebregts 2015; Strycharczuk and Scobbie 2017b). For example, a raising gesture of the tongue tip for /r/ has the acoustic effect of /r/ being heard in the acoustics, but sometimes an articulatory tongue tip gesture can be made for /r/ without having an acoustic effect, i.e. there is a covert articulation (Scobbie and Sebregts 2010). In Ooijselaar (2023), the relation between articulatory movements (Tongue Tip raising, Tongue Body lowering and Tongue Dorsum backing) and the acoustic measure (Center of Gravity) for voiceless alveolar rhotics in Dutch was also not always as expected. One measure for studying rhotics is Center of Gravity (CoG) when they are voiceless sounds (e.g. Nance and Kirkham 2022:430). CoG values are correlated with the size of the front cavity: higher CoG means smaller front cavity (e.g. Fant 1970; Cho et al. 2002; Gordon et al. 2002). CoG is typically used for studying fricatives, but can also be used for measuring laterals (Hawkins and Nguyen 2004) and plosives (e.g. Plug and Ogden 2003). Moreover, CoG of the final alveolar plosive is lower in words with preceding deleted /r/ (e.g. kaart ‘card’) than in words without underlying /r/ (Plug and Ogden 2003). Ooijselaar (2023) investigated the relationship between acoustic values for CoG and the articulatory values for Tongue Tip (TT) Height, Tongue Body (TB) Height, and Tongue Dorsum (TD) Backness for postvocalic /l, r, t/ sounds. The results showed that, in general, when CoG is higher, TT and TB are higher and TD is more front. However, for individual words, this relationship did not always hold: for some words, higher CoG corresponds with lower TB Height and a more back TD. One reason for Ooijselaar’s (2023) results could be that CoG was measured for the whole sound, while articulatory measures were taken at different points in time, i.e. at every ultrasound frame. In addition, the articulatory measures were normalized for speaker, while CoG was not. Therefore, the present study is designed to measure the CoG values at different points in time, normalize the CoG values, and compare the CoG values with the articulatory measures. In the current study, we analyse recordings of standard Dutch sentences as spoken by seven speakers from the Volendam dialect in the Netherlands. They produced sentences containing words with the mid vowels /e, ɪ, o, ɔ/ ending in /r/, /rt/, and /t/. Recordings of the acoustics and of the articulation were made with ultrasound to study the tongue movements. Measures

were taken at different points in time: at each ultrasound frame. Acoustic measures to be considered are Center of Gravity and articulatory measures are Tongue Tip (TT) Height, Tongue Body (TB) Height and Tongue Dorsum (TD) Backness. The findings of this study will be discussed in the context of Quantal Theory (Stevens 1989, 2000).

Etske Ooijevaar¹, Reza Falahati²

¹Meertens Instituut, Amsterdam, Netherlands. ²Leiden University, Leiden, Netherlands

Title

A dynamic comparison of Center of Gravity with articulatory measures for alveolar rhotics in Dutch