Talking while chewing: Speaker response to natural perturbation of speech

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It is well known that speakers show fast compensation in response to mechanical perturbations during speech production (Abbs & Gracco 1984, Kelso & al. 1984). The present study asks whether speakers respond systematically to perturbations in a more natural task setting, namely while simultaneously talking and chewing gum. Tokens of /ʃ/, /s/, and /r/ were collected for both with-gum experimental conditions and without-gum control conditions from nine subjects. Video recordings of subjects' speech were made using both mid-sagittal lingual ultrasound and standard video. For /s/ and /ʃ/, frication duration and center of gravity were measured using Praat. Tongue shapes were measured from ultrasound frames extracted at fricative midpoints and compared using SS ANOVA tests (Davidson 2006). All subjects displayed significant articulatory differences between the conditions. Acoustically, three subjects displayed significant differences in COG between the gum and no-gum conditions in both /s/ and /ʃ/, four displayed no significant differences, one displayed significant differences in /s/, and one displayed significant differences in /ʃ/. The COGs were, with the exception of one subject, lower in the with-gum condition. However, the relative distance in Hz between the centres of gravity for /s/ and /ʃ/ is maintained across conditions. For /r/, f3 minima were measured using Praat, a lower f3 being one of the characteristic properties of /r/. Tongue shapes were measured from ultrasound frames extracted at those points. Six subjects showed significant differences in articulation, while three did not. Acoustically, seven subjects showed significant differences in f3 between conditions, while two did not. The three subjects who did not show significant articulatory differences in /r/ did show acoustic differences. As well, the f3 frequencies were lower in the with-gum condition, with the exception of one subject whose f3 frequency rose slightly. The compensatory strategies used across all sounds varied considerably, both within and across speakers, but typical strategies include tucking the bolus under the tongue or using the bolus as an artificial palate. These findings suggest that, although both articulatory and acoustic targets are compromised by speakers' compensatory strategies, acoustic distinctions between targets are maintained, in /s/ and /ʃ/ by maintaining relative acoustic distances, and in /r/ by maintaining a lowered f3.