

EXAMINING VISIBLE ARTICULATORY FEATURES IN CLEAR AND CONVERSATIONAL SPEECH

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clear speech to be greater for tense vowels which involve greater articulatory movement than lax vowels. While lip-tracking and face-detection algorithms have been applied to various computer-vision problems, the present study is the first to apply them to speech production [7].

2. METHODS

2.1. Experimental setup & data acquisition

Eighteen native speakers of Western Canadian English (10 females) aged 17-30 were recruited. The speakers reported no hearing or speech

greater in clear ($M=1.0$) than in conversational speech ($M=0.94$) [$F(1, 354)=7.48, p=0.007$]. Additionally, males employed greater jaw movement in clear than in conversational speech ($M=0.12$ vs. $M=0.09$) [$F(1,298)=7.15, p<0.001$], but no such difference was observed in females.

To test the hypothesis that differences in style can be observed in terms of lip protrusions for the rounded vowels “cood” and “could”, a $2 \times 2 \times 2$ ANOVA was performed on the extracted side-view measurements. The results show a significant main effect of Style and a significant Style and Gender interaction. Subsequent one-way ANOVAs for each gender with Style as the within-subject factor revealed a greater lip protrusion in clear speech ($M=0.105$) than in conversational speech for males ($M=0.084$) [$F(1,309)=40.64, p<0.0001$]. To a lesser degree, a greater degree of lip protrusion for clear ($M=0.065$) versus conversational style ($M=0.052$) in the female speakers was also observed [$F(1,402)=26.22, p<0.0001$].

In sum, when speaking in clear compared to conversational style, all speakers employed longer duration, greater vertical lip stretch and jaw movement in all three pairs of words, as well as a greater degree of lip-protrusion for the words involving rounded vowels. Additionally, relative to female speakers, male speakers employed greater speech style differences, particularly greater degrees of horizontal lip stretch (for key/kid) and jaw movement (for cod/cud, cood/could) in clear than conversational speech.

4. DISCUSSION

This study makes use of dual-view video sequences to examine articulatory features between clear and conversational speech, involving a representative set of vowels embedded in English monosyllabic words. Our overall results support and may be positively correlated with previous findings of the acoustic features of vowels in clear speech [e.g., 1, 2, 4] in that expanded acoustic vowel space

5. REFERENCES

- [1] Bond, Z. S., Moore, T. J. 1994. A note on the acoustic-phonetic characteristics of inadvertently clear speech. *Speech Commun.* 14, 325–337.
- [2] Bradlow, A. R., Torretta, G. M., Pisoni, D. B. 1996. Intelligibility of normal speech I: Global and fine-grained acoustic-phonetic talker characteristics. *Speech Commun.* 20, 255-272.
- [3] Ferguson, S. H., Kewley-Port, D. 2002. Vowel intelligibility in clear and conversational speech for normal-