Prosodic Position Effects and Function Words in English: a pilot study

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Abstract

This study reports on the continuing investigation into the articulatory realization of function words in English. Using data from the Multichannel Articulatory (MOCHA) database, the consonant articulations in function and content words are examined as a function of position in an utterance. The preliminary results suggest that the word-class distinction is a vital factor in the interface between prosody and articulation.

Index Terms: function words, prosodic structure, EMA

1. Introduction

Position in the prosodic structure has been regarded as a linguistic factor generating variation in the consonant articulations [1]. If the prosodic hierarchy has direct phonetic correlates, how are function words related to positionally-conditioned articulatory variations? Monosyllabic function words in English, as opposed to content words, are commonly realized as a stressless weak form, but as a stressed strong form, when isolated or at the beginning of a sentence. This pilot study aims to assess the feasibility of integrating the word-class distinction into the prosody-articulation interface.

2. Method

The speech materials were drawn from the MOCHA database [2]. This comprises articulatory and acoustic data of 460 phonetically-balanced sentences read by native speakers of English: Carstens EMA (500Hz sample rate), laryngograph, and Reading EPG were used for articulatory data acquisition.

The consonant examined was [t]. The tongue tip movement was analyzed for the following three selected sentences spoken by three speakers of Southern British English (one token of each sentence per speaker): (i) Tim takes Sheila to see movies twice a week; (ii) To further his prestige, he occasionally reads the Wall Street Journal; and (iii) I took her word for it (target consonants are underlined).

Three measures of the EMA TT coil (placed at about 7-10 mm posterior to the tip) were used: vertical displacement (TTy), tangential velocity, and total duration. Time and position for consonantal activities were defined as: (i) closing, the tangential velocity maximum in the transition from the preceding context into [t]; (ii) target, the tangential velocity minimum as the articulator reached its target position for [t]; and (iii) opening, the tangential velocity maximum in the transition out of [t] into the following context. The interval (i)-(iii) was regarded as the total movement duration. Statistical comparisons were made between the word classes and between the prosodic positions (utterance-initial vs. -medial).

3. Results

Table 1 shows total duration and TTy displacement averaged across the three speakers. For total duration, a two-way ANOVA showed the significant effects of position $[F(1,8)=30.18, p<0.01]$, word-class $[F(1,8)=31.46, p<0.01]$ and position×word-class $[F(1,8)=8.56, p<0.05]$. The duration of the medial to is shortest $[Tim=To=took=to]$, by Scheffe’s test $(p<0.05)$. For TTy displacement at target (the distance from the upper-incisor reference coil), no significant effects were found: position $[F(1,8)=0.26, p=0.6]$, word-class $[F(1,8)=1.27, p=0.2]$, and position×word-class $[F(1,8)=0.39, p=0.5]$.

Figure 1 shows tangential velocity at closing, target and opening points averaged across the three speakers. The effects of position and word-class were examined by one-way ANOVAs and the results are summarized in Table 2.

4. Conclusions

The preliminary results revealed that the temporal and durational properties of the consonant gesture vary typically with prosodic position and word-class. The systematicity of the two factors and the interaction between various kinematic parameters will be substantiated by subsequent research.

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6. References
