Lexical and acoustic factors in the progressive anticipation following perception of assimilated speech.

Cheyenne Munson and Bob McMurray
Department of Psychology, University of Iowa
Special session preferred

Processes of phonological modification during speech production, such as place assimilation, may create ambiguity during speech perception, but may also paradoxically serve as a source of information to the listener. In place assimilation coronal sounds partially adopt the place of following labial or velars (e.g. green boat becomes green/m boat). Gow (2001) has shown that this facilitates perception of phonemes following assimilated speech, as listeners are able to anticipate upcoming sounds. However, this leaves a number of issues unanswered. What acoustic cues do listeners use? Is this process of anticipation perceptual or lexical? What is the timecourse over which it unfolds?

In response to these questions we conducted a series of experiments using eye-tracking to investigate how lexical and acoustic factors may influence this progressive effect. The eye-tracking methodology was used because it is sensitive to the temporal dynamics of processing, can provide a measure of lexical activation, and allows observation of small effects such as those due to manipulation of fine-grained acoustic detail. Stimuli were constructed from natural speech in which we manipulated the presence or absence of assimilation as well as the "legality" by manipulating the context word. The task for the participants was to view a computer screen showing four images, one of which they were told to click on with the mouse. On every trial one of the object names began with a coronal, one with a non-coronal, and the remaining two images were fillers. Eye-movements were monitored as participants were told to select one of the objects.

In the first experiment, participants were faster to look to the target object (the non-coronal) when they heard the assimilated instead of non-assimilated adjective, a progressive effect. In subsequent experiments we manipulated lexical competition by using adjectives that became other words when assimilated (e.g. cat box became cat/p box). We observed a later progressive effect when assimilation created lexical ambiguity, even though no images of lexical competitors were ever shown. Faster looks to the target objects were still made following assimilation, but this effect was delayed. Acoustic measurements and analyses showed that lexically ambiguous and unambiguous stimuli were not significantly different. Finally, we used a range of different instantiations of assimilation for each adjective and measured F1-F3 along with the vowel centroid to determine if the degree of assimilation was predictive of the timing and degree shown for the progressive effect.

Results indicate that what are traditionally thought of as low-level speech perception processes may be part of an interactive process of word recognition, in which lexical processes such as lexical competition interact in real time with phonological and perceptual processes that are highly sensitive to continuous acoustic detail.

References:

Gow, D. W., Jr. (2001). Assimilation and anticipation in continuous spoken word recognition. *Journal of Memory and Language, 45*, 133-159.