Using Ultrasound Speech Imaging to Investigate Within- and Cross-Language Interference in Word Production

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Much psycholinguistic research into language production focuses on naming latencies: That is, the time between the presentation of a stimulus and the recording of the onset of acoustic sound. Motor variability is treated as "noise": by-condition differences in response latency are assumed to be expressed only at an abstract cognitive level. However, instrumental acoustic analysis of speech output has revealed many speech errors to be non-categorical in nature. Articulatory imaging confirms that, far from being noise, some of the variability in the speech motor realisations of even perceptually correct responses is systematically related to the presence of representations which compete during the speech production process.

Here, we investigate the tongue movements that generate the responses in picture-naming experiments, using a novel ultrasound imaging technique to investigate speech motor movement during the naming latency period. We show differences in degree of tongue movement over time, across differing participants and experimental conditions. Experiment 1 is based on a classical picture-word interference paradigm, and demonstrates that participants make more tongue movements in conditions in which the superimposed word mismatches the named image. Experiment 2 demonstrates that tongue movements in bilingual image naming can be affected by knowledge of another language. In both cases, the differences in tongue movements occur early relative to stimulus presentation, implicating a language production system in which information cascades quickly from thought to action.