

Head movement and tongue compression with a fixed ultrasound probe but a free head

Naoya Horiguchi and Ian Wilson
University of Aizu

With recent growth in the number of ultrasound speech laboratories, a variety of data collection settings can be observed. In some labs, head restraints are used. These are potentially expensive, space-consuming, and may make some speakers' speech unnatural. In other labs, the head may move freely, but special equipment is used either to track head movement relative to the probe and then compensate for that movement, or to keep the head at a fixed orientation with respect to the probe. Gick, Bird and Wilson (2005) found that the simplest, most effective way to limit head movement with a reasonably high degree of accuracy is to provide a rear headrest for the subject. They also found that tongue compression was minimal for the one subject they measured. In this research, we investigate head movement relative to probe position in a cost-effective experimental set-up and we measure tongue compression in 20 subjects. A Vicon MX460 motion capture system records head and probe movement while ultrasound records tongue movement. Japanese and English data are provided by 10 native speakers of each language. Subjects are seated on a stool with their heads leaning against a wall and with the ultrasound probe on a tabletop microphone stand. Stimuli consist of 60 sentences (about 5 minutes) for each of the 20 subjects. Results will be presented showing head movement relative to sound segment and language being produced, and the degree of tongue compression during data collection. Recommendations will be made for future experimental set-up and analysis.

Gick, B., Bird, S., & Wilson, I. 2005. Techniques for field application of lingual ultrasound imaging. *Clinical Linguistics & Phonetics* 19: 503-514.