

Chapter 22

Do You See What I'm Saying? Ultrasound Technology as a Tool for Pronunciation Instruction

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ABSTRACT

Ultrasound technology aids pronunciation training because it makes visible what ordinarily is not. Ultrasound technology produces a real-time visual image of speech articulations that take place inside of the mouth; thus, it contributes visual input to an instructional context. This chapter first reports on investigatory applications of ultrasound within the context of second language instruction. Two pilot studies have been conducted which, although they did not return statistically significant results, pointed to high potentials for pedagogical efficacy in instructional settings. Ongoing use of the ultrasound in language classrooms at the University of Arizona underscores the ultrasound's applicability to pronunciation training settings. In light of the positive results in the language classroom, the implications for ultrasound applications to speech language pathology are considered. Two broad areas of potential application are diagnosis and treatment practices. Challenges facing ultrasound-enhanced pronunciation instruction are subsequently discussed, and future directions are suggested for continued research into ultrasound technology as an instructional aide.

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INTRODUCTION

One central difficulty to pronunciation training is the issue of visibility. In short, we cannot see much of what is going inside of the mouth during speech. And this is a seemingly insurmountable difficulty since the problem is a physiological one. The complex set of articulations that take place in the mouth region are not visible due to the lips, teeth, and skin that hide the inner mouth from external view. What this means is that evaluators of pronunciation (e.g., teachers and speech-language pathologists) are largely restricted to auditory information alone and to what they are able to observe externally.

BACKGROUND: ULTRASOUND

At the University of Arizona, the Arizona Phonological Imaging Lab (APIL)¹ has been experimenting with the utilization of ultrasound technology for pronunciation instruction in the context of second language learning. In two pilot studies and ongoing application to language classrooms, APIL has touched on a practical place for ultrasound technology in language learning contexts. Before discussing the benefits that Arizona Phonological

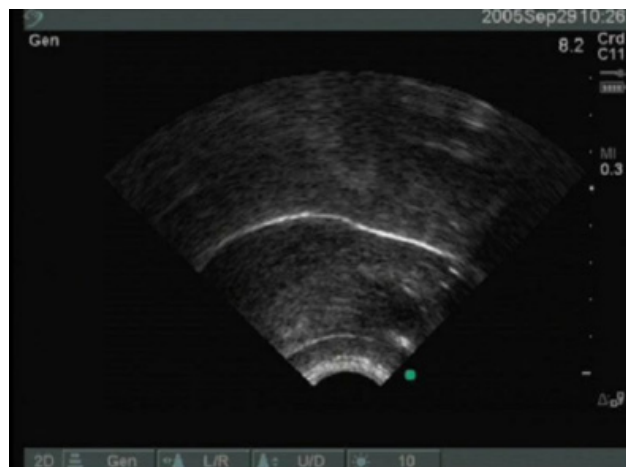
Imaging Lab (APIL) has demonstrated thus far, it will be useful to first consider how the ultrasound works.

When one places the ultrasound transducer (i.e., the ultrasound's "eye") underneath one's chin, a black-white image of the tongue appears on the ultrasound monitor. The image is a video image of the tongue in real-time, and the frame rate is fast enough to produce fluid images of tongue movements. The clarity of the tongue image depends on the distance between the tongue and the ultrasound transducer. As such, the tongue image is more opaque when it is positioned close to the palate.

In the two ultrasound screenshots above, Figure 1 is what one sees on the ultrasound monitor in real-time. Figure 2 features a superimposed profile frame which is not visible during ultrasound use, but is provided here to give the reader a means for better situating the tongue image that they are seeing in Figure 1.

The transducer functions as the ultrasound's eye. The transducer is a thin, plastic probe with a rounded edge that is held in the hand and attached to the ultrasound monitor via a cable. When one places the transducer against the body², the ultrasound monitor makes visible what is beneath the skin. More specifically, the ultrasound "works

Figure 1. Typical image of ultrasound. (© 2005, Diana Archangeli and Jeff Mielke. Used with permission.)



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