

Adjustable wave tube stand for Acoustic Reflection Technique

- Week:** September 28 – October 5
- Client:** Erin Douglas, MS-CCC-SLP
430 Waisman Center
Phone: 608-263-5610
Email: edouglas@waisman.wisc.edu
- Advisor:** Dr. Willis J. Tompkins
2134 Engineering Centers Building
Phone: 608-263-1581
Email: tompkins@engr.wisc.edu
- Team:** Ryan Carroll – Team Leader
Jeremy Glynn– Communications
Andrew Bremer – BWIG
Ben Engel – BSAC

Problem Statement

The Vocal Tract Development lab (VT Lab) plans to compare anatomic measurements secured from Acoustic reflection technology (ART)- also known as acoustic pharyngometry with measurements secured from imaging studies (MRI & CT). ART is new to our lab and for the purpose of measurement reliability we need to have a stand developed for the ART wave tube. Please see description of the technology below. ART is a non-invasive, objective assessment of the vocal tract, which provides the cross-sectional area and volume of the upper airway. Acoustic Reflection Technique (ART) entails for the participant to exhale slowly into a wave tube. The wave tube has a mouth piece that keeps the subject's tongue in position not blocking the airway - and ensures that all exhaled air passes through it. Sounds waves are emitted and the system's microphone captures the acoustic reflections of the airway. The system then measures the amplitude of the reflections and time of arrival at the microphone and constructs a plot of airway area and distance from the lips/teeth (0 point on x-axis) to the glottis (Xue & Hao, 2006). Although ART has been available for about two decades (Fredberg et al, 1980; Hoffstein & Fredberg, 1991), only a limited number of studies that have examined the actual anatomic correlates of ART. Of those studies, only select ART measurements have been studied and those are reported to match with anatomic measurements obtained through MRI (Tameem & Mehta, 2004) and CT (D'Urzo et al, 1987; D'Urzo et al., 1988). Currently, researchers in the VT Lab need to hold the wave tube in their hands which is presenting variability in the data. It is difficult to hold the wave tube at the same angle during each trial within subjects and across subjects. Hood Laboratories, the company who makes AR technology, reports that they will not be offering an adjustable stand at this time or in the near future to keep the wave tube stable while testing in the upright and supine position. We are requesting for the BME team to design and build a steady stand for the ART wave tube. The stand should be adjustable so that it may be used by individuals of different ages -- young children to adult. Also, the stand must allow the

patient's head to remain in a standardized position in the upright and supine position. Another important criterion is that the stand/unit should be easy to clean and disinfect.

Last Week's Goals

- Complete three designs by the end of the week.
- Each design member will research two articles and take notes for background information.
- Solidworks imaging (possibly).
- Design evaluation.

Accomplishments

- Switched to design component matrix. The components are all thought out.
- Contacted a company for the stand. The company is not doing a very good job in responding to our calls although the stand appears to be exactly what we need.
- Some solidworks imaging was done, we are still not sure if it will be used in our presentation.
- Design focus shifted to the device holder. A lot of brainstorming is done and we have good ideas about the material and how to build.

This Week's Goals

- Design presentation.
- Ordering the MB1 stand if it does, in fact, fit our design.
- Finishing solidworks for the holder piece so that it can be milled with the C & C

Difficulties

- Contacting this company about the stand.

Team Effort

Team Member	Accomplishments	Time (Hrs)	Running Total (Hrs)
Ryan Carroll	Progress Report, Brainstorming,	3	12
Ben Engel	BSAC meeting Overview, Brainstorming	3	12
Jeremy Glynn	Research, Brainstorming, Setting up Meeting with Client	3	12
Andrew Bremer	Team Building, Brainstorming, Research, Website	3	12

Project Schedule

TASK	SEPT			OCT				NOV					DEC			
DATES	14	21	28	5	12	19	26	2	9	16	23	30	7	14	21	28
WORK																
Brainstorming																
Research																
Designing Prototype																
Selecting Prototype																
Obtaining Materials																
Building Prototype																
Testing Prototype																
Modifications																
DELIVERABLES																
PDS																
Mid-Sem. Report																
Mid-Sem. Presentation																
Final Report																
Final Presentation																
Weekly Reports																
Notebooks																
MEETINGS																
Team Meetings																
Client Meetings																
Advisor Meetings																
BSAC Meetings																
OTHER																
Web Page																
Special Lectures																

Expenses to Date:

- No expenses to report at this time