CATSS Newsletter - Center for Applied and Translational Sensory Science
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CATSS: Center for Applied and Translational Sensory Science

CATSS Newsletter
February 2020

FROM THE DIRECTOR

Welcome to 2020! It's hard to believe that the 21 st century is moving this quickly. "2020" sounds like a good year for the sensory sciences, and in fact, it's International Year of Sound.

Peggy Nelson

The laboratories are busy with multiple projects, and the NSF training grant is at the halfway mark. Our call for new trainees for Fall 2020 has just gone out. Click here or go to catss.umn.edu/opportunities for instructions). Please encourage terrific doctoral students to apply.

Liz Anderson recently spoke at the U of M Retirees meeting (URMA Feb 2020 Newsletter, Page 6). If you know of places where CATSS might do more outreach, please contact us. We would like to build our partnerships with the community.

As always, please come by the lab for a tour, or sign up to participate in one of our studies.

Watch for a new website very soon!

Peggy Nelson

UPCOMING CATSS SYMPOSIUM

Please mark your calendars for the 2020 CATSS symposium: **Thursday, April 30, 2020 from 11:30 am to 5 pm in the Lindahl Founders Room, Northrup Auditorium**.

This year's keynote speaker will be **Jennifer Groh, Ph.D., Professor, Department of Psychology and Neuroscience, Duke University**.

Further information on additional programming and a call for student posters will be coming soon.

A NEW NEUROMODULATION TREATMENT FOR A SPEECH DISORDER

Spasmodic dysphonia (SD) is a rare neurological disorder that develops spontaneously during midlife. Patients with spasmodic dysphonia experience involuntary spasms of the laryngeal musculature during speech, typically resulting in a strained or choked voice quality. It makes oral communication an exhausting task, negatively affecting a patient's personal and professional life. The disorder progresses gradually throughout the first year, and it usually remains a chronic condition for the rest of life.

At present, there is no cure for spasmodic dysphonia. It does not respond to available behavioral speech therapy. Current therapeutic options are limited and provide only temporary symptomatic relief. Standard treatment consists of periodic (every 2-3 months) clinic visits for botulinum toxin injection to the laryngeal muscles. However, approximately 60% of patients do not tolerate or poorly tolerate these injections, leading to some 30,000 patients in the US alone with no treatment options.

Arash Mahnan

VTS Device

A team of researchers in the Human Sensorimotor Control

Laboratory of Juergen Konczak showed recently that applying vibration to the skin above the voice box (Adam's apple) can improve the voice quality in SD within 30 minutes of stimulation. By measuring cortical signals while patients vocalize and receive vibro-tactile stimulation (VTS) to the larynx, the group could show this form of somatosensory stimulation modulates the neural activity of the brain area that controls speech. Arash Mahnan, a biomedical engineer and doctoral student in the lab, currently works on translating the laryngeal VTS approach into a wearable device. This technology has the potential to become a low cost, non-invasive treatment for SD that could potentially augment or replace existing standard therapy such as Botox injections to the larynx.

ASSOCIATION OF MUSICAL TRAINING WITH AUDITORY AND SPEECH NEURAL CODING AND PERCEPTION

A number of studies have suggested that intensive musical training is related to better perception and neural coding of sound. Published musician advantages range from enhanced speech perception in crowded environments to enhanced representation of a sound's frequency in the brainstem. Researchers in CATSS are collaborating with a team of over 20 scientists across 6 universities to replicate and extend 8 key published studies on musician advantages across a large sample of over 300 participants. The study, "Association of musical training with auditory and speech neural coding and perception" is led by UMN principal investigator, Dr. Andrew Oxenham, and project coordinator, Dr. Kelly Whiteford. This project regularly uses the equipment in CATSS, which has been a key resource for collecting data at UMN.

Why bother replication research?

Most previous studies on musician advantages are limited in several important ways: (1) They have used relatively small sample sizes (e.g., n=20 or n=30), (2) only compared professional musicians to non-musicians but not people with moderate amounts of training, and (3) have primarily tested college-aged listeners. These types of samples are useful in that they are likely to find group differences if they exist, but they are limited in that they are not generalizable to people outside the type of population tested. The present study will be able to more clearly assess both whether the musician advantage replicates and whether the musician advantage generalizes beyond young, professional musicians. This set of experiments is part of a National Science Foundation grant to support large-scale replication efforts in neuroscience.

Efforts toward open science

One unique aspect of this study is that all materials, including experiment code, de-identified data, and analyses, will be made free and accessible to the public via the project website on the Open Science Framework (OSF), with periodic updates posted on a study blog Sound Brain Science. The methods and direct replication analyses were preregistered prior to beginning data collection, meaning they were written and timestamped on OSF. Such transparency is important because it allows the public to have a more detailed view of the scientific process, including what decisions were made prior to data collection. Providing open access to the study data once the study is complete will give other scientists an opportunity to reproduce the study results or use the data in exploratory follow-up analyses.

Implementing a multi-site setup

A major challenge for multi-site studies is to ensure all experiments are working in the same manner across sites. The experimental code was written by Dr. Kelly Whiteford and Dr. Juraj Mesik at UMN and subsequently shared with all sites. Dr. Whiteford then traveled to each site, including Boston University, Carnegie Mellon University, Purdue University, University of Rochester, and University of Western Ontario, to help with experimental setup. This semester, Dr. Whiteford will finish the second round of travel to each site to ensure study protocols are followed uniformly across sites during data collection.

Kelly Whiteford

Engaging UMN students

UMN has so far collected data from 45 participants out of a planned total of 65 people, across two to three 2-hour sessions. The experimental protocol is complex and requires a group of well-trained researchers to implement data collection efficiently. Undergraduate research assistants Angela Sim and Kara Stevens are funded by NSF and have been a huge help in keeping the UMN team on schedule to finish data collection by June 2020.

Dr. Whiteford wears a 32-electrode EEG cap in one of the CATSS sound booths. Undergraduate research assistants

Angela Sim and Kara Stevens tested Dr. Whiteford on the full experimental protocol multiple times before study code was shared between sites.

For more information and updates, see Dr. Whiteford's study blog: www.soundbrainscience.com/blog

CATSS WELCOMES RACHEL GAGE TO ITS STAFF

Rachel Gage has served as lab manager for Gordon Legge's Lab for Low-Vision Research since 2010, after first beginning as his undergraduate research assistant in 2008. Rachel will share in CATSS front-office duties and assist with program management.

Rachel is originally from Madison, Wisconsin and currently lives in South Minneapolis. She plays ultimate frisbee competitively and enjoys watching movies and going to breweries.

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