LSVT Global® Virtual SLP Mini-Conference

Title: **Building a Data Base for Automatic Speech Recognition in Parkinson's Disease**

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Bob MacDonald, PhD

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LSVT Global's Virtual SLP Mini-Conference

Building a Data Base for Automatic Speech Recognition in Parkinson's Disease

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Video and Photography Restrictions

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Thank you for respecting the contribution of these clients for allowing their videos to be shared.

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Logistics

✓ Handouts are available in control bar

✓ Microphones are all muted

✓ You can type in questions at any time, we will answer at the end

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**Polling Question:
Who is joining us today?**

- LSVT LOUD certified professional or student
- SLP professional, not LSVT LOUD certified
- SLP student, not LSVT LOUD certified
- Other

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BUILDING A DATA BASE FOR AUTOMATIC SPEECH RECOGNITION IN PARKINSON'S DISEASE

Lorraine Ramig, Ph.D., CCC-SLP, Bob MacDonald, Ph.D., Heather Hodges, M.A., CCC-SLP, Pan-Pan Jiang, Ph.D., Ona Reed, M.A., SLP-CF, Jennifer Spielman, M.M., M.A., CCC-SLP, and Julie Cattiau, M.S.

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Speaker Introductions

Lorraine Ramig, Ph.D., CCC-SLP
Dr. Ramig is Chief Scientific Officer (CSO) and Co-Founder of LSVT Global, Inc. She is a Research Professor at the University of Colorado-Boulder and an Honorary Adjunct Professor at Columbia University-Teachers College, NYC and a Research Scientist at the National Center for Voice and Speech-Denver. Her research has been funded by the National Institutes of Deafness and Communication Disorders (NIH-NIDCD) for over 20 years. She has received ASHA Honors. Dr. Ramig and her colleagues pioneered LSVT LOUD, an evidence-based treatment for Parkinson's Disease with application to other neurological disorders.

Bob MacDonald, Ph.D.
Dr. MacDonald manages partner relationships and data collections for Project Euphonia. He also works on projects applying machine learning to medical images for applications such as cancer diagnostics.

Heather Hodges, M.A., CCC-SLP
Ms. Hodges received her master's degree from the University of Colorado. She been part of Dr. Ramig's research team since 2004. In addition to studying neurogenic voice and speech disorders and being LSVT LOUD faculty, Ms. Hodges also worked at National Jewish Health in Denver, CO treating a variety of speech, language and swallowing disorders in adult and pediatric populations with specialty expertise in upper airway disorders for 13 years.
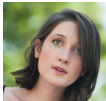
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Pan-Pan Jiang, Ph.D.
Technical Program Manager for Google's Project Euphonia

Jennifer Spielman, M.M., M.A., CCC-SLP
Jennifer Spielman, is an expert in the area of voice and speech disorders associated with Parkinson disease and worked for over 10 years as a Research Associate for the University of Colorado-Boulder and the National Center for Voice and Speech. She is currently the director of Front Range Voice Care, a private voice therapy practice in the Denver, Colorado area.

Ona Reed, M.A., SLP-CF
Ona received her master's degree from Hofstra University. She has been a general assistant to Dr. Ramig since 2015 and is currently completing her CFY with Aveanna Healthcare treating a speech, language, and swallowing disorders in the pediatric population.

Julie Cattiau, M.S.
Julie is a Product Manager in Google AI. In her current role, she focuses on building speech recognition technologies that could help people with speech impairments communicate more easily. Julie has a master of science in computer science from French engineering school Telecom ParisTech.

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DISCLOSURES

Non-financial relationships include a preference for the LSVT LOUD as a treatment technique.

Financial Relationships include:
Dr. Ramig is employed as Chief Scientific Officer and has ownership interest in the for-profit company LSVT Global, Inc. She is in full compliance with Federal Statute 42 C.F.R. Part 50, Subpart F (see https://grants.nih.gov/grants/ policy/coi /index.htm). She has fully disclosed any conflict of interest and her conflict-of-interest management plan has been approved by the Office of Conflict of Interest and Commitment at the University of Colorado, Boulder and she is in full compliance. Dr. Ramig reports grants from the National Institutes of Health during the conduct of the study.
Dr. MacDonald is an employee of Google Inc. and owns Alphabet stock.
Ms. Hodges is a paid consultant for LSVT Global, Inc. She receives lecture honorarium and travel reimbursement for LSVT LOUD Training and Certification Courses and webinars.
Dr. Jiang is an employee of Google Inc.
Ms. Reed is an employee of LSVT Global, Inc.
Ms. Spielman has been a paid consultant for LSVT Global, Inc. since 2012. She currently receives consulting fees for research and training projects.
Ms. Cattiau is an employee of Google Inc.

All speakers are in full compliance.

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PROJECT EUPHONIA

Project Euphonia is an early-stage research project initiated by Google to increase accessibility to automatic speech recognition (ASR) by speakers with impaired speech associated with disorders such as Amyotrophic lateral sclerosis (ALS), Down Syndrome and Parkinson's disease (PD). The goal is to allow these speakers with disordered speech to interact with everyday technology (e.g., smart devices, computers, phones) to maintain their independence, safety and enhance communication and quality of life. Project Euphonia has a commitment to make technology work better for everyone.

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STEP ONE

The first step in this process is to teach speech recognition algorithms to understand disordered speech. While there is a vast literature on automatic speech recognition algorithms (**Ghahremani et al, 2014; Ortmanns, Ney, & Aubert, 1997**), to teach these algorithms to understand disordered speech, they need sufficient speech samples from disordered speakers (**Young & Mihailidis, 2010; Codreanu, 2019**).

TEACH

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COLLABORATION

Because of our over twenty years of research on speech and voice in PD (e.g., **Ramig et al., 1995; Ramig et al., 2001a, 2001b; Ramig et al, 2018**), including years of gathering acoustic data on patients with PD and training them to use technology, as well as having access to a large PD community, our research team at LSVT Global was invited to collaborate on Project Euphonia.

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1	2	3
Describe the rationale for acquiring speech data to contribute to increasing accessibility to speech recognition for patients with Parkinson's disease	Recognize challenges to improving patient participation and fidelity of data	Design an approach to improve patient participation and acquisition of speech data

OBJECTIVES

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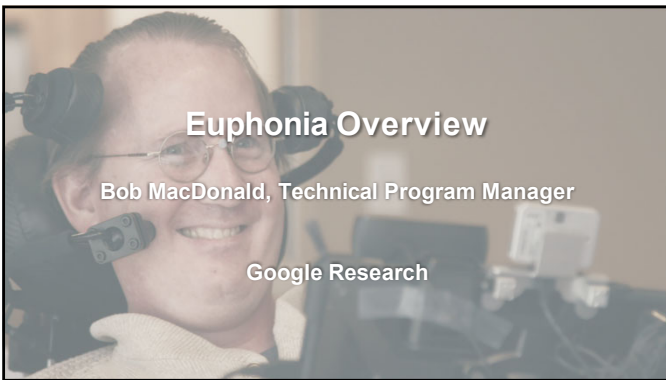
Euphonia Overview

Bob MacDonald, Technical Program Manager

Google Research

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For people who have difficulty pronouncing words due to disabilities, communication is an ongoing challenge.

Prevalence of neurologic conditions in the US

Parkinson's[4] 780k

ALS 20k

Stroke[2] 800k

Multiple Sclerosis[5] 400k

Cerebral Palsy[3] 750k

Traumatic Brain Injury[1] 5.3m

[1]Traumatic Brain Injury, Association of Neurological Surgeons
[2]Stroke Facts, Centers for Disease Control and Prevention
[3]Cerebral Palsy Facts and Statistics, Cerebral Palsy Guidance
[4]Prevalence of Parkinson's disease across North America, Nature Partner Journals
[5]Multiple Sclerosis Statistics, Multiple Sclerosis News Today

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Hey Google, play my Rise and Shine playlist

All right, your playlist called Rise and Shine. Playing on Google Play Music.

Voice activated technologies don't work well either for people with non-standard speech.

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Project Euphonia

Use AI to help people who have difficulty speaking because of disabilities **communicate** and **gain independence**

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An example of an outreach campaign we did
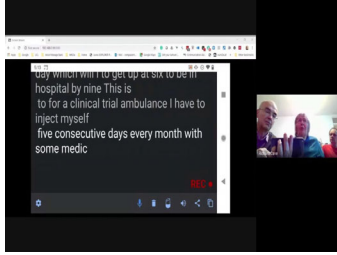
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We also work with individuals who have neurologic conditions like ALS, to develop prototypes useful to them

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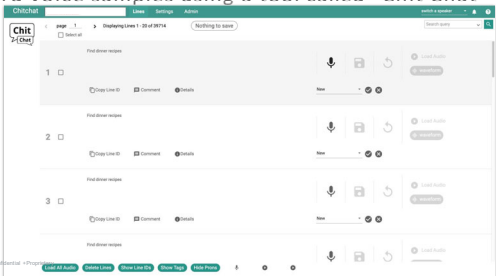
We also work with individuals who have neurologic conditions like ALS, to develop prototypes useful to them

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We are looking for volunteers with atypical speech to record voice samples using a tool called "Chit Chat"

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Participants are asked to read a series of short sentences. This can be done in as many sittings as needed.

Examples of phrases that we may ask participants to read

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In 2019, **1000+** participants have signed-up to our data collection program thanks to our outreach efforts.
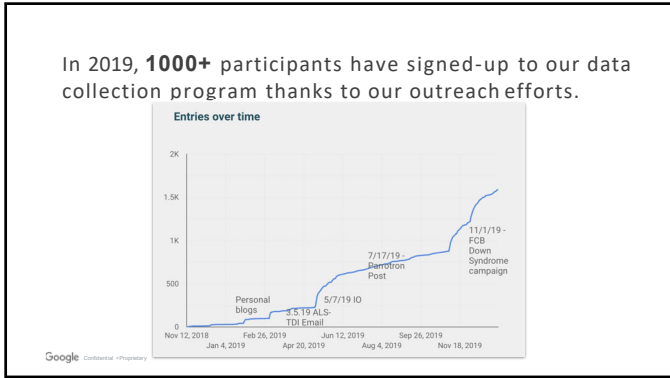
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Ultimately our goal is to improve ASR and make Google products work better for people with impaired voices.

| Google Home | Voice Access | Google Assistant | Google Search |

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Anyone 18 or older can record samples. The first step is to fill out a form so Google can get it touch: interest form

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Learn more by visiting our website!

g.co/Euphonia

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FIGURE 1

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PILOT SUMMARY

- Six (6) out of 25 participants were successful
- **INDEPENDENT** use of Chit Chat was NOT successful
- Mentors were needed

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PHASE 1 SUMMARY

- Data successfully collected on **24 out of 25** participants.
- 29 initial phrases that were short in length was not enough to really determine usability (esp. for more mild pts)
- BUT! Many participants' data were **too good**!! Performance!!
- Need to modify protocol (more challenging)
- **Recruit patients with more severe speech disorders**

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PHASE 2 SUMMARY

- Recruited individuals with more severe speech disorders by reaching out to organizations who support these participants (total 8 major PD organizations)
- Majority of participants were diagnosed with PSP, MSA, and CBD
- Mentors trained and motivated participants throughout the project
- As of today, **58,719** phrases of usable speech have been recorded

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RECRUITMENT

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- Go through the research process from a speech-language pathologist point of view as well as through the lens of a participant
- Screening participants was similar to screening clinically
- Strategies for teaching the program to participants matched what we do as clinicians: Modeling, Scaffolding, Practicing, Patient Demonstration, and Assigning "homework"
- Being Proactive was key to head off issues before they happen
  - i.e. Registration, Multiple Exposures, Joining in for 1st session +
- Humanize the technology experience

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THANKS PARKINSON'S COMMUNITY!

- Eli Pollard, World Parkinson Coalition
- Carol Walton, Parkinson Alliance
- Joanna Teters and David Kemp, Cure PSP (PSP, MSA, CBD)
- PMD Alliance
- Davis Phinney Foundation
- Michael Okun, MD, U Florida Health

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