Biofeedback and Parkinson's Disease

- Hypokinetic dysarthria
- Imprecise articulation
- Impaired speech rate
- Difficulty initiating speech
- Hypophonia

- 80 – 90% with Parkinson's Disease speech voice issues

Hypophonia

- Reduced vocal volume
- Monotone and monoloudness
- Breathiness
- Hoarseness
- Difficulty modulating vocal parameters due to impaired internal cueing

Feedback

- Impaired perception regarding the physical effort required to generate adequate vocal volume
- Reduced ability to monitor and regulate or self adjust vocal volume

Comments from patients

- I don’t talk as much now because no one can hear me
- I can’t be heard on the phone
- I listen to others speak, but I don’t join in the conversation anymore

Quality of Life

- Frustration
- Isolation
- Depression
- Communication breakdown
- Reduced quality of life

Proposal

- iPhone app or iPad app
- Captures sound as it is produced by the speaker; processes the information and displays it through a variety of options.
- Provides instant feedback which offers speakers internal cuing and independence required to monitor and self correct their speech output

Components

- Real time processing of sound/voice
- Voice detection sensor activates background noise or Delayed Auditory Feedback (DAF)
- Channels to track pitch, volume, and expiratory muscle effort during speech
- Displays visual, auditory, kinesthetic feedback of vocal parameters

Components

- In the ear piece to provide background noise or DAF
- Program allows Speech Language Pathologist (SLP) to link to a server where SLP sets thresholds, collects utilization data, generates reports, changes displays

Laryngeal microphone

Respiratory sensors

- Monitors abdominal chest movement and respiration rate

Modality	Acronym	Measures	Sensor
electrocardiograph	ECG/EKG	cardiac conduction, heart rate, HRV	
electrodermograph	EDA, GSR, SC, SP	eccrine sweat gland activity	
electroencephalograph	EEG	cortical postsynaptic potentials	
electromyograph	SEMG	muscle action potentials	
feedback thermometer	TEMP	peripheral blood flow	
photoplethysmograph	PPG	peripheral blood flow, heart rate, HRV	
pneumograph	RESP	abdominal/ chest movement, respiration rate	

Masking modes

- Ambient background noise
  (people talking, restaurant, etc)
- White noise
- Altered pitch
  (speaker's hears his or her own pitch slightly higher or lower than their actual speaking pitch as they talk)

Computer interface

- Biofeedback device interfaces with the clinician's office based computer

Display Options

- Colored lights, tones, vibration, bar graph