Motor Speech Conference
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Mouthpiece Noninvasive Positive Pressure Ventilation: Effects on Speech

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PURPOSE: To quantify the changes in speech produced by people with neuromuscular disorders who use mouthpiece noninvasive positive pressure ventilation (M-NPPV).
METHODS: Six participants with neuromuscular disorders performed speaking tasks under three conditions: natural use of M-NPPV, cued to use M-NPPV for each breath, and cued to avoid using M-NPPV. Participants were audio/video recorded and speech was transcribed and analyzed.
RESULTS: In the natural condition, two participants never used M-NPPV, three always used it, and one used it for half his inspirations. When cued to inspire with M-NPPV, participants exhibited lower inspiratory frequency, longer utterances with slower articulation rate, and longer inspiratory pauses. No differences were found in average SPL across conditions.
CONCLUSION: Individuals vary in their use of M-NPPV while speaking. M-NPPV can increase the amount of speech per breath group; but longer inspiratory pauses may lead to communicative interruption.

Motor Speech Disorders in Progressive Supranuclear Palsy

H. Clark

Bulbar symptoms are well-documented in progressive supranuclear palsy (PSP), the most common Parkinson-Plus syndrome. This proposal summarizes motor speech findings from 77 participants with PSP. Dysarthria was present in 84% of participants. Hypokinetic and mixed hypokinetic dysarthria were most common.Dysarthria severity was moderately correlated with disease severity. AOS was noted in 15% of participants. Mean anterior tongue elevation strength was reduced and correlated with dysarthria severity when spastic features were present. Severity of apraxia of speech correlated strongly with severity of nonverbal oral apraxia (NVOA).Motor speech disorders and oral motor function varied across PSP variants. Dysarthria was common across variants, except for in PSP-CBS. AOS was present in all cases of PSP-SL and at least one case of each of the other variants of PSP, except for PSP-P. NVOA was observed most frequently in the SL variant and was often severe.

Unpredictable speech degradation inhibits adaptation to dysarthric speech

K. Lansford, S. Borrie, T. Barrett

Listener-targeted perceptual training paradigms leverage the mechanism of perceptual learning and show strong promise for improving intelligibility in dysarthria, by offsetting the communicative burden from the speaker onto the listener. Theoretical models of perceptual learning underscore the importance of acoustic regularity (i.e., signal predictability) for listener adaptation to degraded speech. Importantly, though, not all speakers with dysarthria exhibit consistent, or predictable, speech degradations (e.g., variable rate, excess loudness variations, pitch breaks, inappropriate silences, and irregular articulatory breakdowns). The primary goals of the proposed presentation is to discuss i) recent findings from a pair of experiments related to the influence of signal predictability on perceptual learning of dysarthric speech, ii) the clinical implications of these findings, and iii) the importance of integrating signal predictability into theoretical models of perceptual learning

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A link between energy metabolism and developmental stuttering
H. Ming Chow, N. Boley, S. Patil, E. Garnett, S-E. Chang

In our previous study, we found significant positive correlations between the spatial patterns of the gray matter volume (GMV) alteration associated children with persistent stuttering (pCWS) and the expressions of genes linked to stuttering. Moreover, gene enrichment analysis of other genes exhibited such relationship suggested that energy metabolism may be involved in the development of structural anomalies in pCWS.
To provide direct evidence to this hypothesis, we compared regional GMV differences between pCWS and controls to fluoro-deoxyglucose (FDG) uptake in the brain measured by positron emission tomography (PET) in a previous study. FDG uptake reflect the level of glucose metabolism in the brain. Consistent with our hypothesis, we found a significant positive correlation between regional GMV differences and FDG uptake in the left hemisphere. This result show that the magnitude of the structural changes is in general higher in the brain regions with high metabolic rate.

Effects of attentional focus on articulatory control in adults who stutter and its relationship to social anxiety
K. Bauerly

The proposed research sought to establish whether attention plays a mediating role to the elicited changes in articulatory variability in adults who stutter (AWS) when under social evaluative threat. Twenty AWS and 20 controls completed social anxiety questionnaires and performed a speaking task under four different conditions varying in attentional focus and social evaluation. Skin conductance levels were used to track sympathetic nervous system activity in response to social stress and four sensors attached to the tongue and lips tracked articulatory variability. Kinematic spatiotemporal indexes (STI) were calculated based on lip aperture and posterior tongue movement. Preliminary data showed a trend for the AWS to decrease their across sentence variability when speaking under an internal focus of attention and when under social evaluation, a trend not found in controls.

The Neural Circuitry Underlying the “Rhythm Effect” in Stuttering
S. Frankford, S. Cai, J. Tourville, A. Nieto-Castanon, M. Masapollo, E. Heller Murray, F. Guenther

Stuttering is characterized by intermittent speech disfluencies which are dramatically reduced when speakers synchronize their speech with a steady (“rhythmic”) beat. To better understand the neural underpinnings of this phenomenon, we used functional magnetic resonance imaging to compare brain activity between adults who stutter (AWS) and adults who do not stutter (ANS). Subjects read sentences under two conditions: one in a normal speaking style and one paced to a metronome. Activation and functional connectivity were compared between groups and conditions. Consistent with prior studies, AWS produced fewer disfluent trials in the rhythmic condition than in the non-rhythmic condition. Rhythmic speech was also associated with increases in functional coupling between the cerebellum and orbitofrontal cortex for AWS. These findings provide corroborating evidence that increases in speech fluency are associated with enhanced connectivity between motor and cognitive areas of the brain.