Idaho State UNIVERSITY

Reactions to Typical and Disordered Speech

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Introduction

The purpose of this pilot study was to identify differences in self-reported and physiological reactions when fluent speakers observe typical and disordered speech samples. Further, the researchers attempted to correlate participants empathy quotient categorical scores with self-reported and physiological reactions. During communication there is a particular ebb and flow that results from a speaker's rate, naturalness, intonation, gaze direction, facial posturing, and many other verbal and nonverbal factors. As senders transmit information, receivers decode emotional intent and attempt comprehension of the intended messages. A receivers state emotion, or anxiety, may be altered depending on some of the aforementioned factors.

When viewing stuttered speech, receivers exhibit negative self-reported and physiological arousal (Guntupalli, et al., 2007), along with eye gaze aversion (Bowers, et al., 2009; Hudock, et al., *under review*; Zhang & Kalinowski, 2012*). Researchers showed fluent participants 30-second audiovisual speech samples of unique fluent speakers and speakers who stutter while their skin conductance (SC) and heart-rate (HR) were recorded (Guntupalli, et al., 2006; Guntupalli, et al., 2007). During the observation of people who stutter (PWS), participants exhibited increased SC with decreased HR, or autonomic arousal. Participants reported feeling anxious, tense, nervous, and uneasy when viewing the videos of people who stutter (PWS) as compared to the fluent speakers (Guntupalli, et al., 2007). Interestingly, PWS exhibit similar states of arousal when viewing similar stuttered stimuli (Zhang, et al., 2010).

Stuttering can be a very overtly conspicuous disorder, not only due to the auditory disruptions, but compounded by the secondary stuttering behaviors, or eye blinks, gaze aversion, head jerking, and extremity movements. Contrarily, dysarthria primarily affects a sender's auditory speech characteristics. Characteristics of dysarthric speech are an altered speech rate, effortful productions, and decreased intensities. There has yet to be a comparative exploration of observers self-reported and physiological reactions to speakers who stutter (i.e., auditory and visual disruptions) compared to speakers with early onset of Parkinson's Disease (PD) who exhibit dysarthric speech. By examining reactions to audiovisual disruptive characteristics in stuttering with secondary stuttering behaviors, to primarily auditory disruptions of speakers with dysarthria, researchers hope to better understand the communicative process from the receivers perspective. Understanding influences to the communicative process better enables clinicians to treat clients on factors that will more effectively increase communication naturalness in the presence of a speech disorder.

Researchers hypothesized that participants would exhibit increased self-reported and physiological arousal during the observation of stuttered stimuli as compared to both the fluent and dysarthric samples. Additionally, it was hypothesized that participants with higher total empathy quotient scores would exhibit more polarized self-reported and physiological reactions during both the stuttered and dysarthric samples.

SC

HR
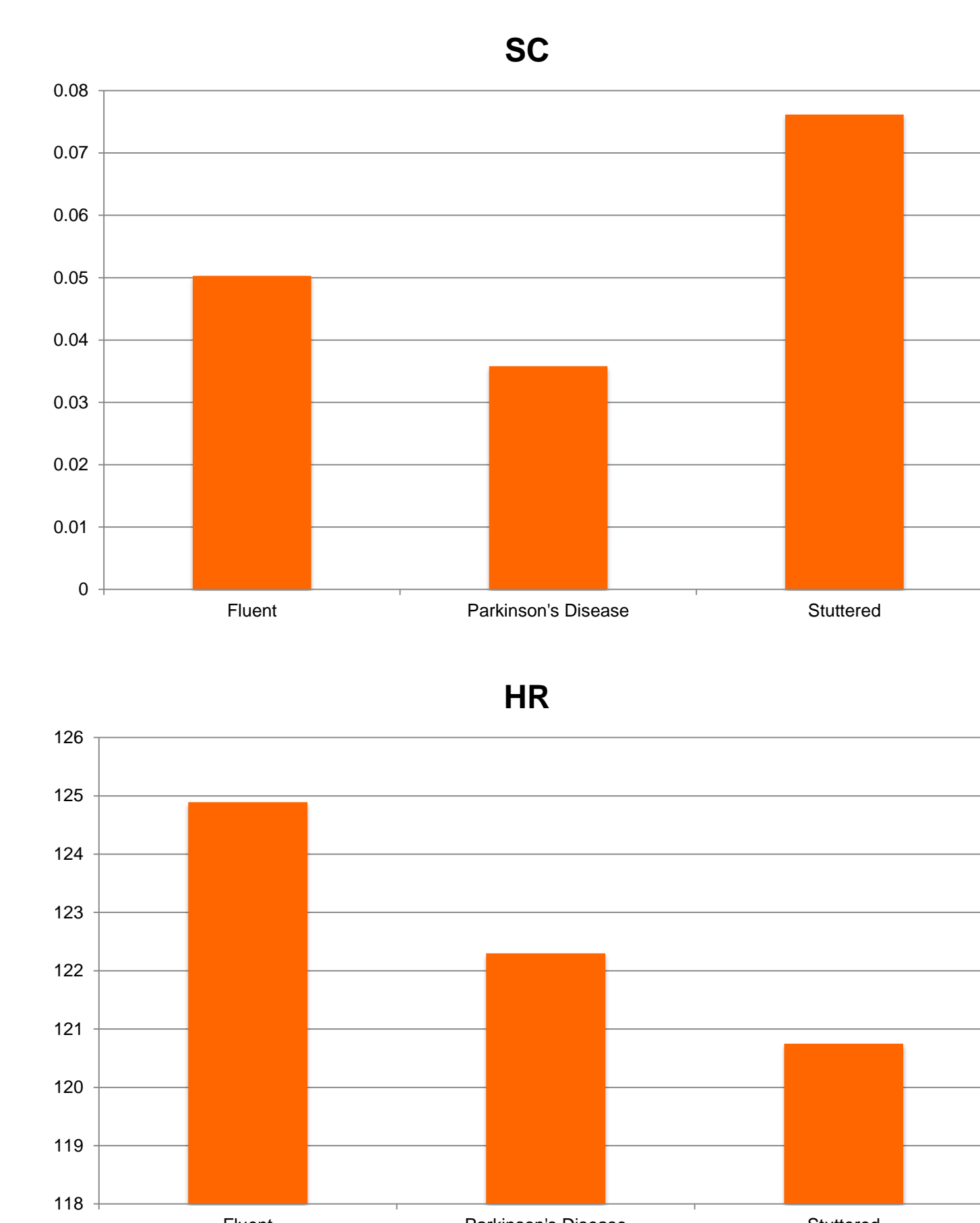
Empathy Scale Subcategories
- General
- Suffering
- Positive Sharing
- Responsive Crying
- Emotional Attention
- Feelings for Others
- Emotional Contagion

Six-item State Arousal Questions
(Retrieved from Guntupalli, eet al., 2007)
Please rate your current:
- *level of anxiety* (Very Anxious 1 – 6 Very Calm)
- *level of comfort* (Very Comfortable 1 – 6 Very Uptight)
- *level of tension* (Very Tense1 – 6 Very Relaxed)
- *mood* (Very Pleasant 1 – 6 Very Displeased)
- *level of interaction* (Very Avoiding1 – 6 Very Approaching)
- *level of patience* (Very Patient 1 – 6 Very Annoyed)

Methods

Participants
20 English speaking adults participated in the current study.

Instrumentation	Conditions
- Samsung 32-inch widescreen monitor - E-Prime - Biopac MP150 (remote electrodermal activity module) - Multi-Dimensional Emotional Empathy Scale (Caruso & Mayer,1998)	- Fluent Speaker 1 (F1) - Fluent Speaker 2 (F2) - Speaker with Parkinson's Disease 1 (PD1) - Speaker with Parkinson's Disease 2 (PD2) - Speaker who Stutters 1 (S1) - Speaker who Stutters 2 (S2)

Videos
Videos were recorded at Idaho State University in the university's sound treated television studio. Speakers read scripts (retrieved from *Narrative Flash Cards)* that were presented on a teleprompter. The videos were shot with a shoulder-wide level of focus, and a unidirectional microphone below the viewpoint of the camera captured the audio.

Procedures
A researcher verbally briefed participants prior to signing informed consent documents (*approved through Idaho State University's Human Subjects Committee).* Participants then completed the empathy scale and were connected to the Biopac MP 150 remote SC and HR transducers. Stick-on electrodes were placed on the palmer surfaces of the medial portion of the second and third phalanges of the left hand for SC and on wrist and clavicle placements for HR. The researcher then started E-Prime stimuli presentation software where participants answered a six-item state arousal questionnaire. Participants were instructed to remain still and clear their mind for 30-seconds *(see above).* They were presented with one of the six videos in random order and answered the six-item questionnaire after each video. After completion of the questions another 30-second baseline period was administered before presentation of the next randomized video.

Analysis
Researchers analyzed the middle 20 seconds of each baseline and condition for SC and HR measures. In order to obtain a relative baseline for each condition the researchers subtracted each condition average from its preceding baseline average. Difference results per video were compared across participants. Researchers then investigated relationships between the questions and empathy categorical scores to the physiological data.

Results

A multivariate analysis of variances (ANOVA; SPSS 21.0 for Mac) was conducted to examine the effect of speaker category on SC and HR. A significant main effect was revealed for speaker category for SC [$F_{(2, 8.452)} = 11.017$, $p = 0.000$)] and HR [$F_{(2, 2424.603)} = 16.157$, $p = 0.000$)]. Contrast comparisons revealed SC differences between Fluent to Stuttered conditions ($p = 0.000$), PD to Stuttered conditions ($p = 0.001$) and differences of HR between Fluent and Stuttered conditions ($p = 0.000$) and PD to Stuttered conditions ($p = 0.037$). No differences were revealed between Fluent to PD conditions ($p > 0.05$).

Additionally, significant correlations were found between PD2 (*r = 0.777, p = 0.000)* and S2 (*r = 0.727, p = 0.000)* to the Baseline Patience question, PD2 to the patience question following his video (*r = 0.662, p = 0.001)*, and the S2 to the patience question following his video (*r = -0.572, p = 0.008)*. The significant correlations indicate that participants reported increased patience relative to baseline conditions after watching P2, but had a reversed effect of decreased patience after watching S2 relative to baseline responses. It should be noted that PD2 spoke with a slow speech rate and decreased intensity due to his dysarthria, whereas S2 exhibited severe stuttering and accompanying secondary stuttering behaviors. This altered emotional state was also seen in physiological measures, with an increase in SC for the stuttered condition as compared to a decreased noted in the PD condition.

Discussion

Results from the current pilot study support previous findings that observers exhibit self-reported and physiological arousal when observing video presentations of PWS. The results that self-reported responses of state attributes did not change supports previous work in the field that level of autonomic arousal can be easily decreased over repeated exposure (Guntupalli*, et al.,* 2007), but self-reported perceptions are much more difficult to alter (Crawcour, *et al., under review;* Guntupalli, *et al., 2007*). An unexpected result was that empathy category scores did not significantly correlate to polarity of SC data. In other words, none of the empathy subscales, low or high, related to how much a participant's SC increased or decreased.

Future Investigations:
- SC with HR and facial EMG covariates
- Self disclosure of a speech disorder
- Gender differences of reactions
- Other speech disorders
- Reactions to a naturalistic communication exchange (i.e., a video of a communication interaction taking place instead of reading from a teleprompter)