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MALE AND FEMALE REACTIONS TO TYPICAL AND ATYPICAL SPEECH WITH AND WITHOUT DISCLOSURE OF A COMMUNICATION DISORDER

By

Courtney Bull

A thesis

Submitted in partial fulfillment of

the requirements for the degree of

Master of Science in the Department of Communication Sciences & Disorders

Idaho State University

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Committee Approval

To the Graduate Faculty:

The members of the committee appointed to examine the thesis of Courtney Bull find it satisfactory and recommend that it be accepted.

____
Dr. Daniel Hudock,
Major Advisor

____
Dr. John Anthony Seikel,
Committee Member

____
Dr. Nicholas Altieri,
Committee Member

____
Dr. David Mercaldo,
Graduate Faculty Representative

IDAHO STATE UNIVERSITY

Office of Research
921 South 8th Avenue,
Stop 8130
Pocatello, Idaho
83209-8130

Physical Address:
1010 South 5th St.
Bldg 11, Room 205

October 29, 2012

Daniel Hudock, PhD
MS 8116
CSD
Pocatello, ID 83209

RE: Your application dated 10/26/2012 regarding study number 3826: Reactions to typical and disordered speech

Dear Dr. Hudock:

I have reviewed your request for expedited approval of the new study listed above. This is to confirm that I have approved your application.

Notify the HSC of any adverse events. Serious, unexpected adverse events must be reported in writing within 10 business days.

Submit progress reports on your project in six months. You should report how many subjects have participated in the project and verify that you are following the methods and procedures outlined in your approved protocol. Then, report to the Human Subjects Committee when your project has been completed. Reporting forms are available on-line.

You may conduct your study as described in your application effective immediately. The study is subject to renewal on or before 10/29/2013, unless closed before that date.

Please note that any changes to the study as approved must be promptly reported and approved. Some changes may be approved by expedited review; others require full board review. Contact Patricia Hunter (208-282-2179; fax 208-282-4529; email: humsubj@isu.edu) if you have any questions or require further information.

Sincerely,

Ralph Baergen, PhD, MPH, CIP
Human Subjects Chair

Phone: (208) 282-2714
Fax: (208) 282-4529
www.isu.edu/research

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Abstract

Background: Fluent and disfluent speakers self-report negative emotional states and experience autonomic arousal when viewing disfluent speech. However, researchers have yet to investigate gender as a factor of how males and females react to individuals with communication disorders. Additionally, many Speech-Language Pathologists teach their clients to offer disclosure statements, about having a speech disorder, to their communication partners. The affect of a speaker offing a disclosure statement to a listener has yet to be readily examined, especially in terms of the affect it has on listener's self-reported emotional state and level of physiological arousal.

Aims: To examine self-reported emotional state and autonomic arousal between genders when observing typical and atypical speech with and without disclosure of a speech disorder.

Methods & Procedures: 40 participants viewed 30-second audiovisual recordings of two fluent and four disfluent speakers (i.e., two speakers with dysarthria secondary to Parkinson's Disease, and two speaker who stutter) while their skin conductance, electrocardiogram, and electromyography of the right masseter reactions were recorded. To control for speaker effects, 20 participants (10 male and 10 female) viewed one set of videos while the other 20 participants viewed a second set that alternated the speakers who used a disclosure statement. Participants group (i.e., video set one or two) was randomized and presentation sequences were randomized. In between video presentations, participants completed state-emotion questions. Difference values for physiological data were calculated by subtracting relative baseline physiological data from 30-seconds prior to stimulus presentation from physiological data collected during stimulus presentations.

Outcomes & Results: Results revealed no significant differences between male and female participants. Self-reported responses revealed differences between patience and interaction. Participants experienced a decrease in heart rate and slight increase in skin conductance, as well as increases of overall muscle tension averages and force of jaw clenching when viewing the disfluent speakers.

Conclusions & Implications: Participants reported less patience when viewing PWS and less willingness to interact, however reported more patience when viewing speakers with dysarthria. Listeners also experienced increased physiological arousal when viewing disfluent speakers, which occurred to greater extents when viewing PWS speaking. Additionally, these negative self-reported and physiological reactions decreased when a disclosure statement was offered. Clients offering a disclosure statement as simple as "hi my name is ____ and I have a speech disorder" positively affects listeners self-reported and physiological reactions.

Chapter 1: Introduction

The purpose of this study is to identify differences in reactions between genders when viewing typical and atypical speech. Communication follows a flow between a sender and receiver, in which the sender encodes a message verbally and nonverbally, and then the receiver decodes the intended message. Additionally, males and females experience the communicative process differently. When verbally communicating, men are typically more dominant and direct, while women are apt to use a more emotionally expressive style of verbal communication (Haas, 1979; Hall & Braunwald, 1981). However, when specifically expressing emotions, most men are "internalizers," while women are "externalizers" (Kring & Gordon, 1998). Women are also considered to experience and express emotions (i.e. sadness, fear, sympathy, etc.) more than men; however, men are thought to experience anger and pride more than women (Plant, Hyde, Keltner, & Devine, 2000). Van Borsel, Brepoels, and De Coene (2011) reported that males were more likely to express negative attitudes in comparison to their female counterparts.

Nonverbal communication can be a key factor in identifying the emotional aspect or meaning of a sender's overall message. As receivers, males typically react with more negative emotions (i.e. anger), while females respond with more positive emotions (i.e. sympathy) (Plant, Hyde, Keltner, & Devine, 2000). A study conducted by Hall and Matsumoto (2004) found that women were more accurate than men in judging emotional meaning (anger, contempt, disgust, fear, happiness, sadness, surprise) of nonverbal cues demonstrated in facial expressions. St. Louis (2012), conducted a study with 50 males and 50 females, which found women to be more likely to tell a person who stutters to "slow down and relax" and to practice more patience. On a broader and more public scale of the differences between genders, St. Louis' (2012) study also found that the perceptions were more of a "mixed bag" between genders, and attitudes did not differ as much as previously thought. In examining communication of people with disorders, the role in gender of the receiver has yet to be fully explored.

Effective communication is based on back and forth fluidity between conversational partners, when a fluent listener encounters disfluent speech from a conversation partner, this may cause altered reactions in the listener. When viewing disfluent speech, receivers react negatively with averted gaze, impatience, giggling, embarrassment, surprise, pity, or laughter; especially if they are unfamiliar with the disfluent speaker (Bloodstein & Berstein-Ratner, 2008; Guntupalli, Everhart, Kalinowski, Nanjundeswaran, & Saltuklaroglu, 2007). Observing stuttering may also cause the listener to become less mobile and reduce speech output during conversation with a disfluent speaker (Rosenburg & Curtiss, 1954). During observation of videos with typical speech, participants observe eye regions approximately 60% of the time (Bowers, Crawcour, Saltuklaroglu, & Kalinowski, 2010; Zhang & Kalinowski, 2012), only exhibit slight increases in skin conductivity and maintain average heart rates (Guntupalli, Kalinowski, Nanjundeswaran, Saltuklaroglu, & Everhart, 2006; Guntupalli, *et al.*, 2007; Hudock, Altieri, Seikel, & Kalinowski, 2013; Zhang, Kalinowski, Saltuklaroglu, & Hudock, 2010), and self-report no state anxiety or emotional differences from baseline (Guntupalli, *et al.*, 2007). However, when exposed to videos of people who stutter (PWS) speaking, participants' eye gaze decreases (Bowers *et al.*, 2010; Zhang & Kalinowski, 2012), skin conductivity increases, average heart rate decreases (Guntupalli, *et al.*, 2006; Guntupalli, *et al.*, 2007; Zhang, *et al.*, 2010), and they report states of negative emotional valence (Guntupalli, *et al.*, 2007). Guntupalli, *et al.*, (2007) also discovered a relationship between the autonomic arousal (excited—calm) and shifts in emotional valence (pleasant—unpleasant) of fluent speakers towards the dysfluent speaker. Participants experience physiological arousal and report that they are more tense, anxious and uneasy after watching the videos of PWS speaking. Interestingly, similar responses were reported from both speakers who stutter and fluent speakers who watched the videos (Zhang, *et al.*, 2010).

Overt stuttering is characterized by phoneme prolongations, syllable/part-word repetitions, and postural fixations, which may be accompanied by concomitant behaviors such as excessive blinking, head jerks, lip biting, involuntary arm, torso, and leg movements (Bloodstein & Bernstein-Ratner, 2008). These auditory and visually disruptive characteristics can alter receivers' reactions and induce responses of being laughed at, mimicked, and being asked if the speaker is okay among many others (Bowers, *et al.*, 2009). In hopes of reducing negative impact from receivers' reactions, it is pertinent to compare the auditory and visual disruptions associated with stuttering to primarily auditory-based disruptions.

Dysarthria is an overt speech disorder primarily characterized by slurring words, speaking with a slower rate, and with increased effort (Duffy, 2005). However, people with dysarthria do not show as many visual concomitant behaviors as someone who stutters. As dysarthric speech primarily impacts acoustic speech characteristics, the comparison between participants' reactions to stuttered and dysarthric speech is important to examine. If participants exhibit less self-reported and physiological arousal to videos of speakers with dysarthria than speakers who stutter, is it because of the types of visually manifested concomitant behaviors, the type of disfluency, or the intermittency with which stuttering occurs?

One clinical approach often used to reduce potential negative reactions to stuttering is having a client disclose a communication disorder (i.e. stutter) to communication partners at the onset of their initial interaction (Hastorf, Wildfogel, & Cassman, 1979; Laurie, 2012). This procedure is reported to decrease self-reported anxiety in both the sender and receiver during the exchange. Blood and Collins (1990) reported that when disfluent speakers disclosed their communication disorder, fluent listeners responded with more positive emotions compared to when the disorder was not disclosed. One of the two main behavioral approaches to stuttering was developed by Charles Van Riper. Stuttering Modification (SM) therapies help speakers who stutter modify their stuttering to less severe forms, increase acceptance of their stuttering and reduce or eliminate fears associated with speaking and stuttering. In SM, disclosure of stuttering is a commonly used practice to reduce socially punitive penalties from stuttering, increase confidence in one's ability as a speaker and increase acceptance of stuttering (Blood & Collins, 1990). However, the effect of using disclosure statements has yet to be readily examined, especially in regards to receivers' reactions.

The current study sought to explore male and female self-reported and physiological reactions to fluent, stuttered, and dysarthric speech with and without disclosure statements of a speech disorder. By examining reactions to typical and atypical speech with and without disclosure statements, researchers hope to better understand influences to the communicative process.

Chapter 2: Methodology

Participants

Per sample sizes from similar studies and predictions from power analyses, the study consisted of 40 normally fluent, native English-speaking adults (20 male, 20 female), from age 19 to 65, who did not have any training in the areas of speech, language, and hearing disorders; had no self-report of a family member, friend, or acquaintance with a diagnosis of dysarthria or stuttering; and lastly, had no self-reported history or diagnosis of any speech, language, cognitive, reading, and/or uncorrected visual or hearing deficits. All participants signed an informed consent document (approved by the Idaho State University Human Subjects Committee) prior to experimental conditions.

Instrumentation

The audiovisual stimulus was presented on an Optiplex 9010 personal computer via E-PRIME 2.0 stimulus presentation software on a 27-inch widescreen Samsung HDTV model Syncmaster P2770HD monitor. Participants had a BIOPAC MP 150 electrodes adhered to the skin of the middle two phalanges of participant’s left hand to document skin conductance (SC). The electrodes were attached to the remote transducer BIONOMADIX (MODEL BN-TX). Average heart rate, Electrocardiogram (ECG), information was collected from BIOPAC on interior wrist placements with a grounding signal on the right clavicle; and Electromyography (EMG) was placed on right mandibular protrusion or masseter muscle. Signals from the channels were synchronized from the output of the E-PRIME 2.0 program into the BIOPAC MP 150 system via an STP 100C-C interface module.

Stimuli

Stimuli speakers were recorded in the Idaho State University sound-treated television studio with a black background wearing a unidirectional microphone below the viewpoint of the camera. Speakers were recorded with a shoulder wide focus to allow for any secondary stuttering behaviors *(see Appendix C for a representation).* All stimulus speakers stated their name before reading scripts from Biographies: Skill-Based Story Cards (Remedia, 2006), and half provided a disclosure statement of a speech disorder, while the other half did not provide a disclosure statement. The stimuli consist of 30-second audiovisual segments of speakers with either typical or atypical speech (i.e. Parkinsonian dysarthria or stuttering) that did or did not disclose a speech disorder. Each participant viewed one of two sets of videos. Each set of videos consisted of six speakers representing three speaker categories (i.e., fluent, Parkinson's Disease, or PWS). In each category one speaker disclosed a speech disorder while the other did not. Two sets of videos were produced in order to alternate the speaker who disclosed a speech disorder.

Procedures

Participants were provided with brief descriptions about the instrumentation and procedures prior to starting the experiment, as well as a signed informed consent document (Approved by Idaho State University's Human Subjects Committee). Before viewing stimuli, participants were asked to wash and dry their hands thoroughly, which ensured an even amount of skin hydration among participants for skin conductance measurement. Participants completed the Multi-Dimensional Emotional Empathy Scale (Caruso & Mayer, 2000) (see appendix A) and a participant inclusionary question (see appendix B). Non-invasive electrodes were then attached to the designated areas. The researcher started E-Prime 2.0, which presented six state emotion questions. E-Prime then instructed participants to sit without excessive movement or speaking for the next thirty-seconds to collect relative physiological baseline data. E-Prime 2.0 then presented a randomized video followed by eight-item questions. The questions were the same as the six for the baseline but also included a rating of the speakers' naturalness and effort (see Appendix C for question listings).

Analysis

Physiological data were analyzed from a 30 second (s) period before the presentation of the stimulus (baseline) and a 30 s period during the presentation of the stimulus (response). E-Prime v 2.0 with a STP100C Biopac stimulus trigger sent onset and offset signals corresponding to audiovisual stimulus presentation to the BioPac MP150 system that was recorded on an independent, time synced channel on the Acqknowledge software. Researchers analyzed the average skin conductance (in microvolts). Change in heart rate was calculated from ECG by using a calculation algorithm for heart rate in the Acqknowledge software. Additionally mean and maximum right masseter EMG activity was recorded from surface electrode placement. Researchers sought to investigate a single, normalized value in order to determine if a relationship between skin conductance and heart rate could be created from the two measures. Results revealed a positive correlation of $r = 0.986$. Due to the high correlation, researchers analyzed the physiological data independently two ways, first during data (i.e. data collected during the viewing of the stimulus) was used as the response variable and the baseline data was entered as a covariate. One of the assumptions when using a covariate is that of equality of slopes. This assumption was assessed by interacting the covariate with all of the factors. None of these interactions were significant, nor did they approach significance. For the second analysis we calculated a difference value for each measure by subtracting the during value from the baseline. Due to almost identical findings between these methods of analysis for physiological and self-report data, we only report on the difference method, because this method has been used in previous publications of similar designs (Bowers, et al., 2010; Guntupalli, et al., 2006; Guntupalli, et al., 2007; Guntupalli, et al., 2012). However, it should be noted that naturalness and perceived effort were not presented during baseline, so these were analyzed as ordinal variables instead of continuous.

Chapter 3: Results

Descriptive statistics including means and standard errors were calculated for all response variables and graphical representations for physiological data are presented in figures 1 – 4.

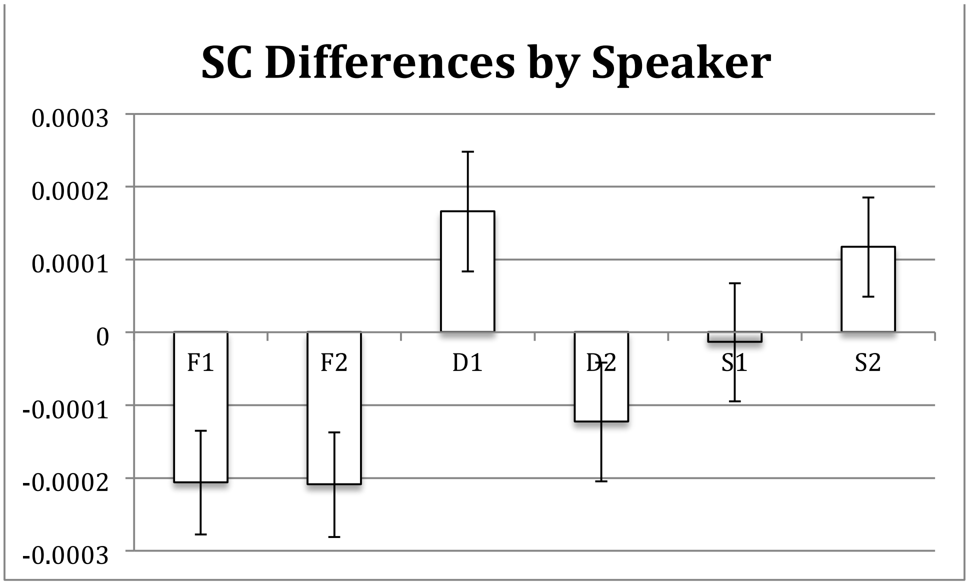

Fig. 1. This figure represents the average changes in skin conductance as a function of the stimulus condition. As shown, listeners' viewing D1 and S2 experienced an increase in skin conductance as a result of viewing Parkinsonian dysarthria and stuttered speech, whether a disclosure statement was given or not. This increase in skin conductance may be associated increased anxiety or discomfort in the listener, or anticipation of a disclosure statement. (F1 and F2 refer to the fluent speech conditions, D1 and D2 refer to the dysarthric speech conditions, and S1 and S2 refer to the stuttered speech conditions.)

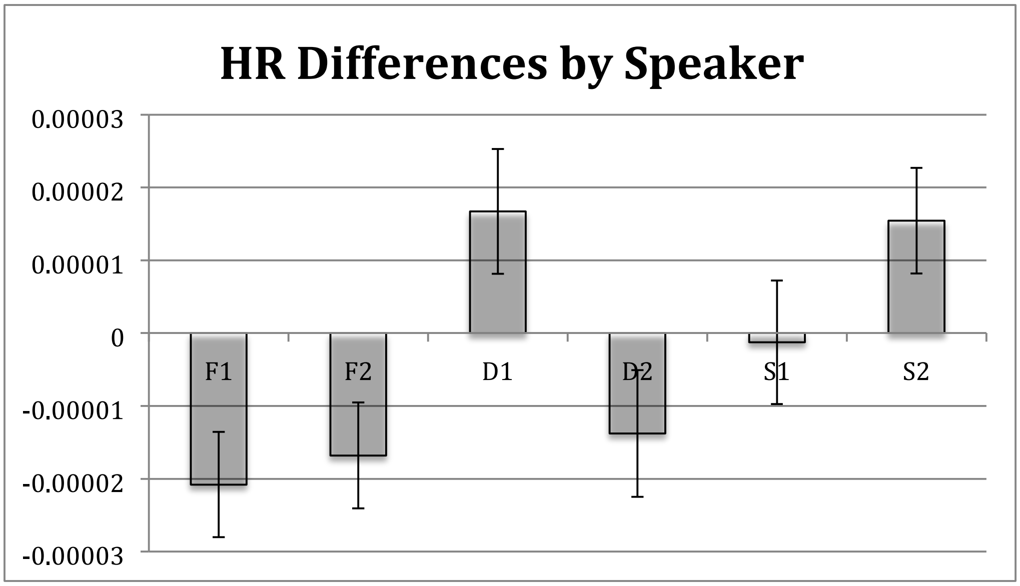

Fig. 2. The figure represents the average changes in heart rate as a function of the stimulus condition. As shown, listeners' viewing D1 and S2 experienced an increase in heart rate as a result of viewing Parkinsonian dysarthria and stuttered speech, whether a disclosure statement was given or not. Tis increase in heart rate may be associated with increased the difference in HR may be due to the listener feeling less anxious, tense, and more comfortable while viewing these speakers. (F1 and F2 refer to the fluent speech conditions, D1 and D2 refer to the dysarthric speech conditions, and S1 and S2 refer to the stuttered speech conditions.)

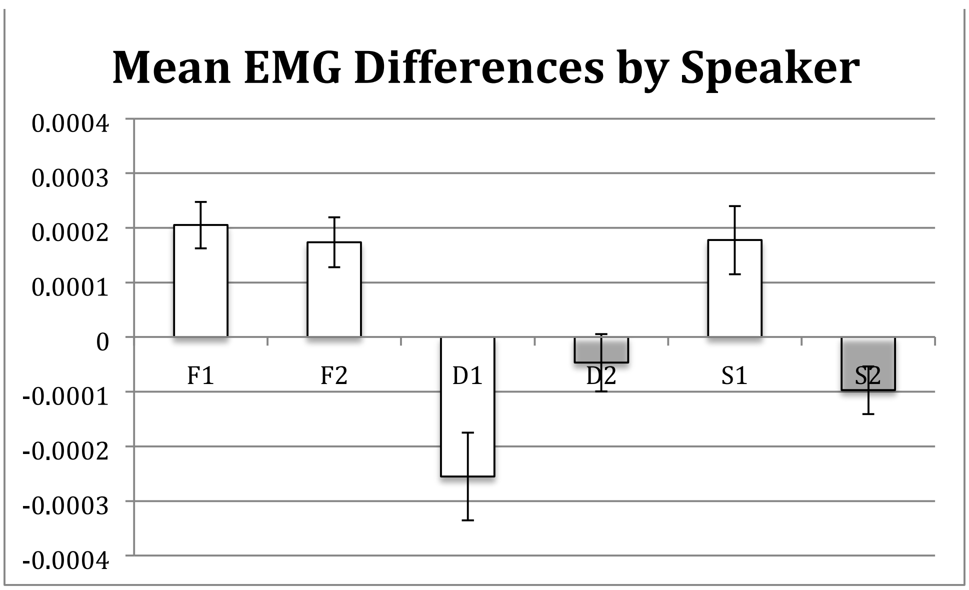

Fig. 3. This figure represents average changes in the mean electromyography (EMG) of the left temporal mandibular muscle as a function of the stimulus condition. As shown, listeners' experienced increased overall EMG activity while viewing F1, F2, and S1. This may be associated with increased anxiety or anticipation of a disclosure statement or disfluent events by the speaker. (F1 and F2 refer to the fluent speech conditions, D1 and D2 refer to the dysarthric speech conditions, and S1 and S2 refer to the stuttered speech conditions.)

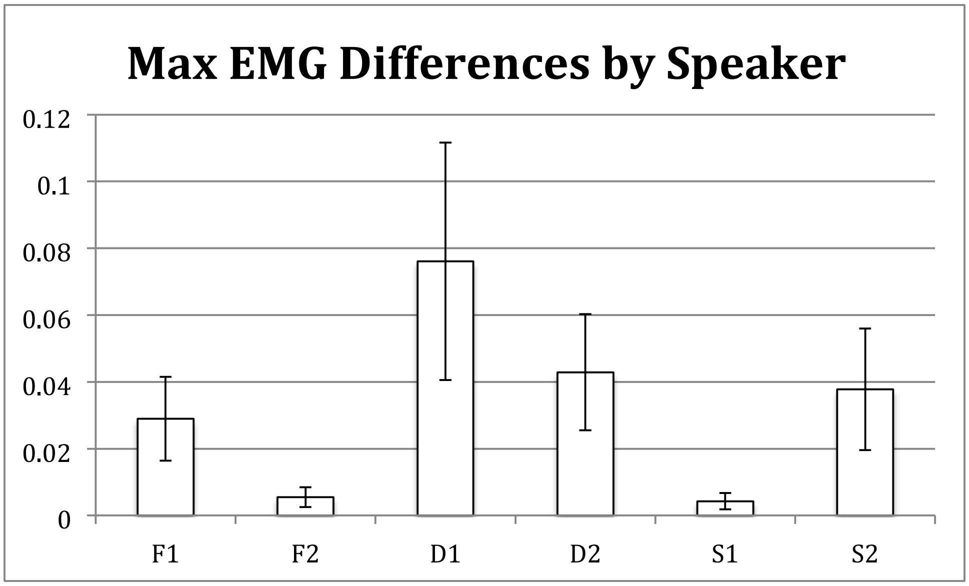

Fig. 4. This figure represents average changes in the maximum electromyography (EMG) of the left temporal mandibular muscle as a function of the stimulus condition. As shown, listeners' exhibited more forceful EMG activity when viewing D1. This may be due to more anxiety or discomfort while viewing D1, or anticipation of a statement or disfluent events. (F1 and F2 refer to the fluent speech conditions, D1 and D2 refer to the dysarthric speech conditions, and S1 and S2 refer to the stuttered speech conditions.)

In addition, table 1 presents means and standard errors for self-report state emotional data. Correlations among the Multi-Dimensional Emotional Empathy Scale (Caruso & Mayer, 2000) to physiological and self-report state emotion data are presented in tables 2.

Table 1. Mean and standard error of ratings (*n* = 40) to speech samples as a function of 8 rating scales.

	Self-report state emotion questions							
	Baseline		Fluent speech		Dysarthric speech		Stuttered speech	
Rating scale			F1	F2	P1	P2	S1	S2
Anxiety	4.800	-0.230	4.875 (0.209)	5.125 (0.190)	4.825 (0.196)	5.050 (0.179)	4.300 (0.224)	4.750 (0.211)
Comfort	4.300	-0.270	2.825 (0.291)	2.825 (0.286)	2.975 (0.271)	2.950 (0.302)	3.700 (0.266)	3.200 (0.287)
Tension	4.700	-0.220	4.875 (0.200)	4.950 (0.199)	4.800 (0.183)	4.975 (0.184)	4.350 (0.234)	4.875 (0.190)
Mood	1.700	-0.170	1.675 (0.115)	1.750 (0.123)	1.800 (0.157)	1.600 (0.112)	1.900 (0.171)	1.925 (0.154)
Interaction	4.600	-0.200	4.750 (0.199)	4.825 (0.192)	4.650 (0.204)	4.750 (0.202)	4.525 (0.218)	4.800 (0.190)
Patience	1.900	-0.210	1.650 (0.150)	1.825 (0.143)	1.825 (0.138)	1.750 (0.155)	2.200 (0.197)	1.925 (0.154)
Naturalness	NA		2.225 (0.188)	2.025 (0.210)	3.125 (0.197)	3.462 (0.205)	5.200 (0.187)	4.125 (0.197)
Effort	NA		2.308 (0.208)	2.200 (0.249)	3.325 (0.177)	3.925 (0.219)	5.525 (0.129)	4.564 (0.157)

F1 and F2 denote fluent stimuli speaker one and two respectively
P1 and P2 denote dysarthria samples from speaker with Parkinson's Disease one and two respectively
S1 and S2 denote stuttered samples from speaker who stutter's one and two respectively

Table 2. Significant correlations between physiological data to the Multi-Dimensional Emotional Empathy Subscales.

Response variable	Suffering	Positive sharing	Responsive crying	Emotional attention	Feeling for others	Emotional contagion
SC	0.079*	0.044**	0.063*	0.043**	NS	0.038**
HR	0.059*	0.043**	0.077*	0.044**	NS	0.043**
EMG mean	0.027**	0.016**	-0.018**	-0.003**	-0.028**	0.017**
EMG max	NS	NS	-0.003**	-0.006**	0.073*	NS
Anxiety	0.065*	0.073*	0.085*	NS	NS	0.016**
Comfort	0.077*	NS	NS	0.095*	0.080*	0.080*
Tension	-0.085*	-0.043**	NS	NS	NS	0.083*
Mood	NS	0.054*	NS	NS	-0.054*	0.083*
Interaction	-0.086*	NS	-0.065*	-0.053*	NS	-0.026**
Patience	NS	0.014**	-0.084*	-0.037**	-0.071*	0.017**
Naturalness	-0.079*	-0.094*	0.008**	0.007**	-0.018**	0.009**
Effort	-0.024**	-0.004**	0.070*	NS	0.022**	0.045**

**Significant at $p < 0.05$; *Trends at p 0.05-0.1; listed values represent *r*, *NS* are nonsignificant differences.

Inferential statistics consisted of mixed model analysis in SAS (v. 9.3, 2010). In addition, the participants consisted of 20 males and 20 females with 10 per gender viewing each set of videos. Thus the mixed model was designed to have one between subjects factor (gender with two levels) and two within subjects factors (category of speaker with three levels and disclosure with two levels). Residuals were analyzed for normality, skewness, and kurtosis. Physiological data were normally distributed, whereas self-report data were non-normal. Mixed model analysis estimates standard errors using restricted maximum likelihood estimation (REML) rather than least squares estimation, and adjusts the denominator degrees of freedom accordingly. For a summary of inferential statistical results, please see Table 3 for physiological data and table 4 for self-report data. If significant effects were found, post-hoc comparisons were calculated using a

Tukey-Kramer adjustment. To examine the effect of disclosure on category we used contrast comparisons. Results are displayed in Table 5.

Table 3. Summary table of the main and interaction effects for the inferential statistical analysis of the physiological variables.

Comparisons	SC	HR	EMG Mean	EMG Max
Disclosure x Gender x Category	*NS*	*NS*	*NS*	*NS*
Gender x Category	*NS*	*NS*	*NS*	*NS*
Disclosure x Category	*NS*	*NS*	*0.0065**	*NS*
Disclosure x Gender	*NS*	*NS*	*NS*	*NS*
Category	*NS*	*NS*	*0.0124**	*NS*
Gender	*NS*	*NS*	*NS*	*0.0175**
Disclosure	*0.1000*	*NS*	*0.0666*	*NS*

*Significant at $p < 0.05$; listed nonsignificant values represent trends toward significance and *NS* represents nonsignificant differences.

Table 4. Summary table of the main and interaction effects for the inferential statistical analysis of the self-report state emotion questions.

	Self-Report State Emotional Questions							
Comparisons	**Anxiety**	**Comfort**	**Tension**	**Mood**	**Interaction**	**Patience**	**Naturalness**	**Effort**
Disclosure x Gender x Category	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*
Gender x Category	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*
Disclosure x Category	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*	*0.0001**	*0.0001**
Disclosure x Gender	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*
Category	*0.0528*	*NS*	*NS*	*NS*	*NS*	*NS*	*< 0.0001**	*0.0001**
Gender	*NS*	*NS*	*0.0622*	*0.0002**	*NS*	*0.0032**	*0.049**	*NS*
Disclosure	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*	*0.0067**	*0.0378**

*Significant at $p < 0.05$; listed nonsignificant values represent trends toward significance and *NS* represents nonsignificant differences.

Table 5. Summary from the effect of disclosure statements by category using contrast comparisons.

Response variable	Overall use of disclosure	Fluent to combined disfluent	Fluent to dysarthric	Fluent to stuttered	Stuttered to dysarthic
SC	*0.109*	*0.0697*	*NS*	*0.0978*	*NS*
HR	*NS*	*NS*	*NS*	*NS*	*NS*
EMG mean	*NS*	*0.0004**	*0.0001**	*0.0248**	*0.0988*
EMG max	*NS*	*NS*	*NS*	*NS*	*NS*
Anxiety	*NS*	*NS*	*NS*	*0.0235**	*0.0503*
Comfort	*NS*	*NS*	*NS*	*0.0698*	*NS*
Tension	*NS*	*NS*	*NS*	*NS*	*NS*
Mood	*NS*	*NS*	*NS*	*NS*	*NS*
Interaction	*NS*	*NS*	*NS*	*NS*	*NS*
Patience	*NS*	*NS*	*NS*	*NS*	*NS*
Naturalness	*0.0026**	*0.0001**	*0.0001**	*0.0001**	*0.0001**
Effort	*0.0343**	*0.0001**	*0.0001**	*0.0001**	*0.0001**

*Significant at $p < 0.05$; listed nonsignificant values represent trends toward significance and *NS* represents nonsignificant differences.

The possibility of a speaker-by-disclosure interaction existed. That is, participants could respond to disclosure from one speaker in a different manner from disclosure by another speaker. In order to assess potential speaker-by-disclosure interactions each speaker was analyzed individually. This created a between subjects effect of disclosure. To assess if any individual speaker elicited differential responses based on disclosure we performed an analysis of speaker using the mixed model design. Speaker by disclosure effects are listed in Table 6.

Table 6. Summary of speaker effects as a function of disclosure and gender.

	Category	Fluent				Dysarthic				Stuttered			
	Speaker	F1		F2		D1		D2		S1		S2	
Response variable	Disclosure	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
SC	Male					0.0697**							
	Female												
HR	Male												
	Female					0.0761**							
EMG mean	Male									0.0423*			
	Female							0.0234*		0.0220*			
EMG max	Male												
	Female												
Anxiety	Male												
	Female												
Comfort	Male												
	Female												
Tension	Male												
	Female												
Mood	Male												
	Female												
Interaction	Male												
	Female	0.0533**											
Patience	Male	0.0299*				0.0965**							
	Female												
Naturalness	Male												

	Female												
Effort	Male								0.0771**				
	Female												

*Significant at $p < 0.05$ using a Tukey-Kramer adjustment; listed nonsignificant values represent trends (**) toward significance.

Discussion

Results from the current study demonstrated a trend in supporting similar studies that report increased physiological and self-reported arousal when viewing speakers with communication disorders (Guntupalli et al., 2006; Guntupalli et al., 2007; Hudock, et al., 2013; Zhang, et al., 2010). Trends were present for changes in SC and HR during contrast comparisons, as well as a main effect for increases in the mean EMG. Similar to previous research, selfreported state emotional scales revealed participants to express more negative emotions towards the disfluent speakers, which is consistent with disfluent events triggering autonomic and emotional responses (Franck et al., 2002; Guntupalli et al., 2007; Guntupalli et al., 2012; Zhang et al., 2010). Specifically, this means that when the listener was viewing speech, either fluent or disfluent, it still evoked a negative autonomic response. When the speakers offered a disclosure statement a significant effect were revealed for self-reported state emotions such as patience and interaction. These findings also support the notion that men and women experience empathy differently, indicating women to be slightly more sensitive than men (Blood & Collins, 1990; Plant et al., 2000). It is important to note that the number of comparisons and variables may have affected the results.

Other research has compared fluent observers' perceptions of disfluent speakers in speaking and non-speaking situation, which found observers to perceive disfluent speakers as more shy, anxious, tense, etc. when compared to fluent speakers (Kalinowski, Stuart, & Armson, 1996). More recently, research has focused on comparing the observer's emotional state responses in coordination with autonomic arousal, which concluded that there is a correlation between changes in arousal and the emotional state responses of the fluent listeners towards the disfluent speakers (Guntupalli et al., 2007; Guntupalli et al., 2012). Along with monitoring changes in autonomic arousal and emotional state responses, this is the first study to compare empathy scores to physiological arousal and state emotion responses. Empathy scores were determined by using a multi-dimensional scale from Caruso and Mayer (2000), which consisted of the following categories: suffering, positive sharing, crying, emotional attention, feel for others, and emotional contagion. These scores were able to determine the type of empathy displayed by each participant in the specified categories. Using the comparison of empathy scores in coordination with arousal and emotional states, we were able to examine a possible relationship between these measures. Researchers found a positive high correlation between arousal and emotion. This high correlation between arousal and emotion means that when listeners viewed the stimuli, it initiated a change in arousal (i.e. increase in HR and SC), which simultaneously created an affect on the listener's emotional state as well (i.e. being more patient or higher level of interaction). Due to the shifts in autonomic arousal and self-reported state emotions, we know that disfluent speech creates an emotional response in the fluent observer.

Physiological Effects

Although no significant main effect differences were revealed for SC or HR, trends were present during contrast comparisons. Research conducted by Guntupalli et al. (2006; 2007; 2012) and Zhang et al. (2010) revealed an increase in SC and a decrease in HR when listeners observed disfluent (i.e. stuttered) speech, which indicated that the disfluent speech and aberrant secondary behaviors were the cause for the autonomic arousal changes. This study was different in the aspect that dysarthric speech was included alongside stuttered speech, and there were no visually aberrant behaviors exhibited by the disfluent speakers. Guntupalli et al. (2007) also recorded emotional responses from fluent listeners; however, instead of focusing on perceptions of PWS (i.e. anxious, nervous, tense, etc.), this study focused on the listeners' self-reported emotional state while viewing the disfluent speakers (i.e. patience, interaction, mood, etc.) and if offering a disclosure statement affected autonomic arousal and/or emotional states. Trends revealed that when a speaker offered a disclosure statement it did have a physiological effect, such as a slight increase in SC, as well as an increase in the mean EMG. Trends were also present during selfreported state emotional scales in the areas such as patience and interaction. Self-reported measures revealed listeners to convey more negative associated emotions compared to baseline when a disclosure statement was not offered, in comparison to listener's reacting more positively when it was offered (Blood & Collins, 1990; Laurie, 2012).

Speaker Categories and Disclosure

In the current study, there were three speaker effects or categories: fluent (F1 and F2), Parkinson's dysarthria (D1 and D2), and stuttering (S1 and S2). Even though D2 offered a disclosure statement, participants exhibited a higher mean EMG (i.e. more frequent jaw clenching) and considered the speech to be more effortful than D1. When offered a disclosure statement from D1, participants experienced an increase in autonomic arousal and reported to be more patient versus observing the other speakers. Increase in autonomic arousal could be due to anxiousness and anticipation of potential disfluent events; however, the statement had a positive effect, and the observer was more patient towards receiving the message being delivered (Blood & Collins, 1990; Laurie, 2012). In post-hoc analysis, it was determined that D2 presented more disfluent events, and this may have increased the discomfort in the listener. In contrast, D1 did not produce as many disfluent events, perhaps likely in listeners being more patient and understanding. S1 presented more severe stuttering than S2, and exhibited more postural fixations, phoneme repetition, and blocks. A disclosure statement was offered by S1 and yielded more jaw clenching, which may indicate the anxiety felt by the listener due to anticipation or discomfort of observing the disfluent events presented; however, it did not have a significant effect on the participants' emotional state (Laurie, 2012; Manfredini & Lobbezoo, 2009). The severity of disfluent events, or lack thereof, can affect the degree of physiological and emotional reactions, which may influence the results presented in this study.

Different categories of speakers revealed an effect on the participants' autonomic arousal, as well as self-reported state emotions. Participants exhibited more EMG activity (i.e. jaw clenching) when offered a disclosure statement, in coordination with slight increases in SC and HR. Two disfluent speakers, the first speaker with Parkinson's (D1) and the second stuttered speaker (S2), yielded an increase in SC and HR by the listener. As for HR, past research identified a deceleration when viewing unpleasant stimuli, but this study found a trend for an increase in HR (Guntupalli et al., 2007; Zhang et al., 2010). Since the trend was found for speakers D1 and S2, the difference in HR may be due to the listener feeling less anxious, tense, and more comfortable while viewing those particular speakers (Blood & Collins, 1990; Laurie, 2012; Plant et al., 2000). Participants were also found to be more patient and had higher levels of interaction, more specifically towards the fluent and dysarthric speaker categories. The increase in autonomic arousal was unexpected when the speaker gave a disclosure statement, because increase in autonomic arousal is associated with experiencing stress and anxiety (Bowers, Saltuklaroglu, &Kalinowski, 2007; Guntupall et al., 2006; Guntupalli et al., 2007; Guntupalli et al., 2012; Manfredini & Lobbezoo, 2009). However, the increase during these conditions could possibly mean that participants were anxious upon anticipating spontaneous disfluent events from the speakers. In relation to the self-reported state emotions, participants may have been more patient and willing to interact with a speaker who disclose their disorder due to the unexpected behaviors being put out in the open (Blood & Collins, 1990; Laurie, 2012). When people with communication disorders disclose it, it allows the receiver to understand what's going on and what to expect while interacting with them. In a way, this evens out the communicative interaction between partners, because there are not surprises for the unfamiliar listener, and the disfluent speaker does not have to worry about the possible reactions from the listener. In turn, the disclosure statement may decreases anxiety because possible concurrent behaviors are known, and the listener may demonstrate more patience when and if they do occur.

Self-reported State Emotions

Fluent listeners observing disfluent speech have been found to experience an increase in autonomic arousal, such as SC, in response to emotion-provoking stimuli. This increase in SC also occurred in conjunction with a decrease in HR, which is associated with emotional valence (pleasantness—unpleasantness) of the viewed stimuli (Guntupalli et al., 2007; Guntupalli et al., 2012; Zhang et al., 2010). Self-reported measures revealed how the different speakers affected the emotions of the listener. In the present study, all participants reported low anxiety and tension for all speakers, whether fluent or disfluent; however, listeners did become slightly more uncomfortable and less patient when observing the stuttered samples versus the fluent or dysarthric samples, which is consistent with previous research. Due to the aberrant behaviors exhibited by PWS, it is further supported that struggle behaviors such as excessive eye blinks, postural fixations, etc. create a negative emotional response in an unfamiliar listener (Guntupalli et al. 2006; Guntupalli et al., 2007; Guntupalli et al., 2012; Zhang et al., 2010), especially when compared to dysarthric speech. More negative reactions to stuttering as compared to dysarthic speech may have also been influenced by the stimulus speaker's age and perceived frailty. For example the speakers who stutter were 30 years old (S1) and 25 years old (S2) and the speakers with dysarthria were 60 years old (D1) and 72 years old (D2). Furthermore, the speakers who stutter were healthy looking, while the speakers with dysarthria exhibited some slight physical tremors and difficulty with memory issues during the recordings. It is important to note that the participants' level of interaction and mood stayed close to the baseline, which may indicate that the samples provided were not diverse enough; however, when asked to rate the speaker's naturalness and effort, there were obvious differences in that the dysarthric were rated moderate effort and unnaturalness, and the stuttered speakers were rated to have very unnatural and highly effortful speech. Thus, indicating even though moderate and highly disfluent speech was observed, participants would not interact any differently or have any less patientce with a disfluent speaker compared to a fluent speaker.

Gender

Being empathic is an important human emotion and it has been hypothesized that men and women experience this emotion differently. More specifically, women have been thought to be more empathic and understanding, while men are more likely to react negatively and be less understanding (Plant et al., 2000). From the averages gathered in this study, men and women reported to experience empathy with very slight differences in numbers. The biggest difference in empathy experience between gender was found in the "responsive crying" section of the empathy scale, which means that women were more likely to cry if someone else was crying, while men were not as likely. In the current study, this information reveals that neither gender reacts more positively or negatively when observing disfluent speech in comparison to fluent speech in the emotional self-reported measures. Along with differences in empathy experience, men were also found to have a higher max EMG measure, or exert more force than women, when clenching their jaws while observing the stimulus videos. On average, the mean EMG measures were greater and showed a difference when participants were observing both fluent speakers (F1 and F2) and the first stuttered speaker (S1). Jaw clenching has been associated with anxiety and stress, so these results could be related to the level of anxiety in anticipation of observing the speaker (Manfredini & Lobbezoo, 2009). Whether the speaker offered a disclosure statement or not could also affect the anxiety in the listener, which may help the unfamiliar listener, to be more comfortable around a disfluent speaker. If the speaker disclosed a disorder, the listener may be anticipating a disfluent event or their jaw may be hanging open in shock when the disfluent events occur; however, if the speaker did not disclose and experienced frequent disfluent events, it could be the explanation for the increased jaw clenching and anxiety in the participant. In relation to empathetic differences (i.e. the association between jaw clenching and anxiety) the results support that men experienced more negative emotions (i.e. stress or anxiety) compared to women, who were found to be express more positive emotions, empathy towards the speakers, in support of the literature (Manfredini & Lobbezoo, 2009; Plant et al., 2000).

Chapter 4: Conclusions

With communication disorders such as stuttering and dysarthria, intermittent disfluent events occur during speaking situation. For stuttering, these events typically occur during the initial onset of a word and on consonants, which are sometimes accompanied with concomitant behaviors such as postural fixations, limb or head jerking, excessively eye blinking, etc. (Bloodstein & Bernstein-Ratner, 2008). Parkinsonian dysarthria is similar to stuttering in that there is no control over movements made while speaking; however, dysarthria is attributed to muscle weakness and further lack of control as the disease progresses (Bloodstein & Ratner, 2008; Duffy, 2005). The differences between the two is that Parkinsonian dysarthria may not manifest in a person's speech until the oral muscles become more fatigued, but stuttering can occur at anytime during conversation and is not related to muscle fatigue. Furthermore, this study helps support the concept that providing a disclosure statement by a disfluent speaker can be helpful in communicative interactions with unfamiliar listeners. Most importantly, we can apply this in therapy with PWS, because the particular population presents more aberrant behaviors, which can be disturbing to those who have no experience with it. A disclosure statement can also be beneficial for speakers with dysarthria, because it helps the listener to know that it takes more effort and patience to understand the message being delivered. Any discomfort that may be experienced can ultimately be greatly decreased for both parties.

Clinical Application

In a controlled setting, people do exhibit physiological and self-reported arousal, although not to the severity it's been reported before. Gender differences were revealed for the participants' levels of anxiety, patience, and empathy expressed towards the speakers, as well as the amount of force exhibited when clenching their jaws. Interestingly though, we did find that the discomfort someone feels when exposed can be reduced with a disclosure statement. This information for the use of a disclosure can be helpful for clinician to use in their day-to-day therapy sessions. In the future, researchers may want to change the investigation parameters, such as creating a more natural experiment using a more realistic interaction setting.

Limitations

As with most research, there are limitations to this study. Since the results of SC and HR were not significant or as consistent as previous research, it may be due to equipment error or that the electrodes were not sensitive enough to provide accurate measurements. A larger sample size would also be beneficial to gain even more precise results of physiological and emotional responses. Most importantly, the number of comparisons and measures may have had an effect on the results and may not be as representative as anticipated.

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Appendix A

Multi-Dimensional Emotional Empathy Scale (Caruso & Mayer,1998).		
1.	I feel like crying when watching a sad movie.	Strongly Disagree 1 2 3 4 5 Strongly Agree
2.	Certain pieces of music can really move me.	1 2 3 4 5
3.	Seeing a hurt animal by the side of the road is very upsetting.	1 2 3 4 5
4.	I don't give others' feelings much thought.	1 2 3 4 5
5.	It makes me happy when I see people being nice to each other.	1 2 3 4 5
6.	The suffering of others deeply disturbs me.	1 2 3 4 5
7.	I always try to tune in to the feelings of those around me.	1 2 3 4 5
8.	I get very upset when I see a young child who is being treated meanly.	1 2 3 4 5
9.	Too much is made of the suffering of pets or animals.	1 2 3 4 5
10.	If someone is upset I get upset, too.	1 2 3 4 5
11.	When I'm with other people who are laughing I join in.	1 2 3 4 5
12.	It makes me mad to see someone treated unjustly.	1 2 3 4 5
13.	I rarely take notice when people treat each other warmly.	1 2 3 4 5
14.	I feel happy when I see people laughing and enjoying themselves.	1 2 3 4 5
15.	It's easy for me to get carried away by other people's emotions.	1 2 3 4 5
16.	My feelings are my own and don't reflect how others feel.	1 2 3 4 5
17.	If a crowd gets excited about something so do I.	1 2 3 4 5
18.	I feel good when I help someone out or do something nice for someone.	1 2 3 4 5
19.	I feel deeply for others.	1 2 3 4 5
20.	I don't cry easily.	1 2 3 4 5
21.	I feel other people's pain.	1 2 3 4 5
22.	Seeing other people smile makes me smile.	1 2 3 4 5
23.	Being around happy people makes me feel happy, too.	1 2 3 4 5
24.	TV or news stories about injured or sick children greatly upset me.	1 2 3 4 5
25.	I cry at sad parts of the books I read.	1 2 3 4 5
26.	Being around people who are depressed brings my mood down.	1 2 3 4 5
27.	I find it annoying when people cry in public.	1 2 3 4 5

28.	It hurts to see another person in pain.	1 2 3 4 5
29.	I get a warm feeling for someone if I see them helping another person.	1 2 3 4 5
30.	I feel other people's joy.	1 2 3 4 5

Appendix B

Participant information form

Participant No. ____________ ~~Today's Date and Time:~~

/ /

AM PM

____

Speech Sequence:____ (Researcher only)

Participant's Name (Initials): ______

Age:___ Gender: M / F Ethnicity:__________________

Medical History Questionnaire

Have you ever experienced or been diagnosed with any of the following, or are you experiencing any of the following at present? Please circle the appropriate response and explain any "Yes" answers below.

1. Visual difficulties, blurred vision, or eye disorders	Yes	No
2. Blindness in either eye	Yes	No
3. If Yes to either of the above, have problems been corrected	Yes	No
4. Hearing problems	Yes	No
5. Learning disabilities (problems of reading, writing, or comprehension)	Yes	No
6. Communication disorders	Yes	No
7. Cognitive problems	Yes	No
8. Severe head trauma/injury	Yes	No
5. Stroke	Yes	No

6. Epilepsy or seizures Yes No

7. Neurological surgery Yes No

8. Paralysis Yes No

9. Anxiety disorders Yes No

10. Depression Yes No

11. Claustrophobia Yes No

12. Other Neurological, Psychological, or Emotional problems Yes No

Please explain any “Yes” responses:

____

____

Do you have any family members who have speech/language/hearing/ or neurological deficits?
Yes No

If yes please list the condition: ___________________________

How familiar are you with people who have speech/language/hearing/ or neurological deficits?

Very familiar Not familiar at all
1 2 3 4 5 6 7

Appendix C

Figure 5: Screen shot of a stimuli speaker to indicate level of focus.

Interaction and main effects

EMG mean interaction and main effects	d.f.	*F*	*p*
Disclosure x category	5,194	3.34	0.0065
Category	2,76	4.65	0.0175
Mood main effect	**d.f.**	***F***	***p***
Gender	1,38	17.23	0.0002

EMG max main effect	d.f.	*F*	*p*
Gender	1,38	6.17	0.0175

Patience main effect	d.f.	*F*	*p*
Gender	1,38	9.88	0.0032
Naturalness main effect	**d.f.**	***F***	***p***
Category	2,76	81.17	0.0001
Disclosure	1, 38	8.21	0.0067
Gender	1,38	3.99	0.05
Disclosure x category	5,193	34.24	0.0001
Naturalness main effect	**d.f.**	***F***	***p***
Category	2,76	96.65	0.0001
Disclosure	1, 38	4.63	0.0378
Disclosure x category	5,192	40.01	0.0001