Daniel J Hudock. PRIMING ANXIETY INTO PEOPLE WHO STUTTER: AROUSAL'S INFLUENCE ON FLUENCY. (Under the Direction of Dr. Joseph Kalinowski.) Department of Communication Sciences and Disorders, November 2008.

Many experimental psychologists (Bargh, Chen, & Burrows, 1996; Berner & Maier, 2004; Bowers, 1999; Chartrand, VanBaaren, & Bargh, 2006; Chen & Haviland-Jones, 2000; Hazlett, Dawson, Schell, & Filion, 1990; Macky-Sim & Laing, 1981; Sato & Aoki, 2006; Wilkowski, & Robinson, 2007) have examined priming's influence over behavior, cognition, and language across modalities. This idea of priming or influencing a behavior with subtle cues has revealed great effect on state anxiety and cognition. The change in state anxiety is relevant to stuttering and is sought due to the hypothesized interaction between the pathology and anxiety. It has been suggested that people who stutter (PWS) are more anxious and less confident than typical speakers (Daniels & Gabel, 2004; Guitar, 2003; Peters, & Hulstijn, 1984). Yet this interaction of anxiety's influence on the degree and severity of stuttering has yet to be fully explored but is determined to have a strong correlation (Guitar, 2003; Miller & Watson, 1992; Peters, & Hulstijn,1984). However situational anxieties have shown to either increase (Craig, 1990) or have no effect (Armson, Foote, Witt, Kalinowski, & Stuart, 1997; Kalinowski, Stuart, Wamsley, & Rastatter, 1999) on dysfluencies in PWS. Though this study did not examine the effects of situations on anxiety it tried to examine a more basic unit of anxiety. This compartmentalized approach examined basic emotional priming's influence on arousal.

It examined the relationship between physiologic and self-reported arousals' effect on fluency in PWS. This relationship was examined via priming tasks of silent

readings of emotionally embedded analogous word sets then physiologic, self-reported arousal assessments and speech samples to assess priming's influence. Priming sets included positive, negative, and neutral conditions post baseline data. Conditions were randomly chosen and administered to influence altered arousal states in PWS. Experimental trials were separated into physiologic and speech sample collection phases. Initially during the physiologic phase participants remained seated and motionless while connected to skin conductance transducers and heart rate electrodes as they silently read the priming tasks. Post priming interstimulus phases of self reported arousal assessments via the Self Assessment Manikin (SAM) arousal scale (Lang, 1980) and regression to physiologic baseline were administered. The independent variable for this experiment was the priming condition, with dependent variables of physiologic arousal (skin conductance and heart rate), self-reported arousal (Self Assessment Manikin arousal scale Lang, 1980), and stuttered syllable counts.

A significant difference was noted in stuttered syllables during the positive priming condition of the speech sample phase. This positive condition differed from all other conditions (Baseline, Negative, and Neutral) by the significant reduction of stuttered syllables per passage. These results are similar to Young, (1985) which explains the true baseline of (PWS) can never be increased, but only decreased. He describes the true baseline as PWS interacting in real situations not involved with the clinic environment.

PRIMING ANXIETY INTO PEOPLE WHO STUTTER: AROUSAL'S INFLUENCE ON FLUENCY

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TABLE OF CONTENTS

LIST OF TABLES…… viii

CHAPTER I: INTRODUCTION

Review of the Literature…….. 1

Priming……. 1

Behavior/Mood……. 11

Anxiety……. 13

Stuttering…….. 18

Hypothesis…… 25

CHAPTER II: METHODOLOGY

Participants…….. 26

Materials…….. 26

Procedures…… 27

CHAPTER III: RESULTS

Speech Sample Phase…….. 28

Physiologic Assessment…….. 28

Self-Reported Arousal……. 29

CHAPTER IV: DISCUSSION

Reduction of Stuttered Syllables……. 31

Limitations……..... 34

Future Research…… 35

REFERENCES…… 36

LIST OF TABLES

1. Mean ± Standard Error by Measure Across Condition (N = 16)…… 47

CHAPTER I: INTRODUCTION

Review of the Literature

Priming

Gladwell (2005) states that priming refers to subtle triggers that influence our behavior without our awareness. Bigand, Tillmann, Poulin-Charronnat, and Manderlier (2005) describe priming as a preceding event that influences state emotion via recall of an associative memory. This causes physiological and emotional changes in the individual that can influence responses. In other words, this preceding prime accesses a specific type of emotional memory and transforms our current emotional state. Priming is like the proverbial mustard seed used metaphorically in the Bible, (Mark 4:31-32). A mustard seed though one of the smallest of all seeds, grows to be a great plant. As it is with priming subtly planting the seed of influence, which in turn has great affect on behavior, emotion or cognition. Some examples of priming range from influence on our behavior via reading passages, to music genres that alter our purchasing habits in stores (Areni & Kim, 1993; Bargh, Chen & Burrows, 1996).

As stated by (Breitmeyer, Ro, Ogmen & Todd, 2007; Hazlett, Dawson, Schell & Filion, 1990; Lau & Passingham, 2007; Stajkovic, Locke & Blair, 2006) priming consists of two categories, the conscious and nonconscious. Hazlett et al. (1990) describe attention as the differentiating factor between the categories. This is to say when attending to a stimuli, object, or communication partner the listener is thought to be conscious of the interaction, but unaware of subtle cues that influence the emotion. An example of conscious priming would be phonemic cueing, where the initial sound of a

word is produced during a word recall task for the participant. Nonconscious examples of priming are those such as: pragmatics during a conversation, smells, or gestures. These guide how humans approach our topic of conversation, or our judgments of people and objects.

Lau and Passingham, (2007) studied conscious versus nonconscious priming with phonological and semantic word judgment tasks. Participants were presented with a phonologic or semantic word description task via specific shapes (diamond of square). Once presented with the shape participants knew which task they were to complete. After task assignment presentation via the shapes participants were presented with a blank slide followed by the presentation of a prime. This prime was an outline either congruent (same shape as the assigned stimuli task) or incongruent (the other shape). When the prime was congruent with the task there was a significantly faster reaction time with increased prefrontal cerebral activation via fMRI imagery. When participants were primed with an incongruent symbol the reaction times were typically slower with difficulty completing the correct task. As participants completed the incorrect (nonconscious) priming task of the incongruent prime differing prefrontal cerebral activations were noted. With behavioral and scan data resulting in participants engaging in the wrong (nonconscious) task of the word description for the prime, not the assigned task and producing less cerebral activation for the correct (conscious) task shows that the nonconscious priming effect produces a more salient effect than the conscious (Breitmeyer, et al., 2007; Lau & Passingham, 2007; Stajkovic, et al., 2006).

Hazlett, et al., (1990) state that nonconscious priming is produced three ways: 1) inattention to the stimuli, 2) attending to the surface stimuli, or 3) attending to co-occurring events. Schacter, Wig, and Steven, (2007) state that there is a divided attention and possibly a parallel processing mechanism activated during priming. This mechanism allows for multimodal acquisition of information, such as in conversations where topic choice and inflection are influenced. Though listening to the words, acoustic gestures, and divulging the relevant points there is a sense when a topic is fasciae. Using our nonconscious perception of the pragmatics determines the avoidance of a certain topic of the ending of a conversations.

Malle and Pearce (2001) state that during cognitive processing of verbal communication speakers demonstrate increased attention to unintentional nonverbal pragmatic responses [gestures, postures, and emotional factors]. While the listener's cognitive processing lies in decoding prosody, syntax, semantics, oral, and facial representations for reception of the message. The speakers process lies in a check sum of similar areas to allow for a nonverbal agreement on comprehension of the topic. These conscious and nonconscious determinations help to make inferences about communication. This system allows for the perception of comprehension, and for the redundancy of messages.

The most media propagated form of priming utilizes subliminal advertising to influence processing and gain recognition of the stimuli from almost unrecognizable sounds or pictures. Lau and Passingham, (2007) state that the priming effect increases with less recognition of the prime itself. The initial recorded trial of subliminal

advertising occurred during 1957 in a New Jersey movie theater, by movie theater owner James Vicary. Mikkelson (2003) states that Vicary used still frames of "drink Coca-Cola", and "eat popcorn" for seven contiguous frames every 5 minutes during the movie. These seven frames created a blip on the screen for 300ms, which Vicary claimed boosted Coca-Cola sales 18.1% and jumbo popcorn sales by 57.8% during the movie. Due to this the Federal Communications Commission (FCC) banned all such subliminal advertisements on television, and radio signals (Mickelson, 2003).

Kirkwood (1987) states that subliminal priming methods remain controversial, nonetheless due to Vicary confessing to falsifying his data. Auditory and visual subliminal priming show an increased effect if there is a memory trace tied to the prime state (Calvo, & Nummenmaa, 2007; Molholm, Martinez, Shpaner, & Foxe, 2007). In other words, if an item is previously introduced, or if it is related to the stimuli it will decrease the temporal latency of the prime in the memory. Kelly and Chapman (2007) state that the current media uses product placement strategies of placing name brand products in plain sight for discrete amounts of time in movies, television shows, and stores, which enhances temporal memory latency in order to influence product purchases. Przekoracka-Krawczyk and Jaskowski (2007) state that the effects of subliminal priming are driven by wants of the conscious mind that drive the unconscious state. In other words if a person is thirsty when they see a Coca-Cola in conspicuous locations via product placement or as a blimp on the screen they are more inclined to yearn for one than if these occur when they already have a drink in hand or are not thirsty. This use of conspicuous name brand product placement continues to be driven into the mainstream

media due to the increased use of digital video recorders like TiVO™, though the character in the film or advertisement is a vital part of the priming effect.

Dijksterhuis and Van Knippenberg (1998) studied priming via picture description tasks. Participants were shown a drawing of either a professor, or secretary, and then were asked to take five minutes and write characteristics, attributes, lifestyle, and behavior of the professional. Following this description task a general knowledge test consisting of 40 Trivial Pursuit™ questions was administered. Results revealed participants primed for the professor group scored significantly better on the test than the secretary group.

(Abercrombie, Speck, & Monticelli, 2006; Sato, & Aoki, 2006) state that positive primes do not yield the effect that negative primes induce, in facial, auditory, or emotional priming conditions. Abercrombie, et al., (2006) examined stress's effect on memory recall. Participants were shown pictures then asked to perform a public speaking task. The participants who demonstrated negative affect were able to recall significantly more of the picture stimuli. These increased self-reported arousal states, and cortisal outputs show the robustness of the negative condition over the positive or neutral ones. Sato and Aoki (2006) revealed similar patterns during negative emotional priming when participants were primed via images of happy or angry faces, then asked to discern like or dislike for the stimuli of an ideograph (Korean written characters). During the presentation into the left or right visual fields participants were requested to fixate on crosshairs medially placed on a computer screen. Following the 500 ms fixation on the cross hair, the priming condition of the happy or angry face would appear for 25ms. This

was followed by a masking condition which was a presentation of a face similar to the prime but had emotionally pertinent sections missing. As participants then viewed the ideograph they were to press one of two buttons to discern like or dislike of the character. Results of this tachistoscope style design were increased right hemisphere activation that demonstrates a more holistic processing during the negative trials. Calvo, and Nummenmaa (2007) revealed similar right hemisphere processing during priming conditions of viewing unpleasant pictures.

Schacter. Wig, & Stevens, (2007) surveyed current and previous priming studies that incorporated the use of fMRI and PET scan data. They discussed a reduced cerebral activation in the left hemisphere posterior temporal, and occipital lobes during visual priming tasks, while demonstrating increased activation of the right occipital lobe, right inferior temporal lobe, and bilaterally in the prefrontal lobes. In other words as the prime is seen it is decoded by the right occipital lobe then progresses anteriorly to be processed holistically by the right temporal lobe, then continues to both prefrontal lobes (Lau, & Passingham, 2007; Schacter, Wig, & Steven, 2007).

Bowers (1999) studied varying upper and lower case letterings in a reading task. Participants were presented with monosyllabic words of one case, and varied upper and lower cases in each visual field. Results demonstrated that participants had similar reading rates for both trials with right visual field presentation (left hemisphere), but demonstrated a slower reading rate with the varied case words presented via the left visual field (right hemisphere).

(Bargh, et al., 1996; Berner & Maier, 2004; Chartrand, et al., 2006; Compton, Heller, Banich, Palmeri & Miller, 2000; Holmes, Mathews, Dalgleish & Macintosh, 2006; Kawakami, Dovidio & Dijksterhuis, 2003; Newman, 1987) state that priming has been proven to yield significant results in various modalities such as: visual, auditory, and olfaction. Bowers (1999) states:

> "If one adopts the present line of argument, then it is necessary to conclude that there may be as many as four (perhaps more) different perceptual systems underlying priming for different types of materials: One specific and one abstract system for a) visually displayed verbal materials, b) auditorily presented verbal materials, and perhaps c) visually displayed objects, given that abstract and specific priming effects have also been reported for these items (e.g, Biederman & Cooper, 1991,1992 for abstract results; Srinivas, 1993 for specific results) (p. 38)."

Visual priming may consist of pictures, words, or drawings. Webster (1990) states that during rapid automatized naming (RAN), people who stutter (PWS) transcribe sequences of letters, numbers, and semantic reversal tasks slower than typical speakers. Bosshardt (2006) states that PWS process semantic information at a slower rate, and maintain a more sensitive temperament while phonological coding demands are introduced. Participants were requested to create sentences using specific vocabulary words. The researchers concluded that during more taxing conditions, PWS reverted to a less demanding vocabulary, and sentence structure. These language tasks demonstrate significant alterations in sentence productions, processing, and lack of comprehension.

Dayalu, Kalinowski, and Stuart (2005) compared fluency levels of PWS while using sight word production tasks versus the phonologic decoding of nonwords. They concluded that during phonologic decoding PWS demonstrated significantly increased dysfluencies. Pellowski and Conture (2005) hypothesize that children who stutter (CWS) may exhibit lexical access problems, or speech planning issues. CWS were semantically primed for stimuli words via the presentation of semantically related words prior to the stimuli words. This study compared the reaction time of CWS and typical speakers under semantic priming conditions and concluded that presenting an auditory semantic prime decreased reaction times in children who do not stutter (CWNS) while did not affect the reaction times of the CWS. Leading researchers to hypothesize about a lexical deficit in the CWS.

Bowers (1999) states auditory priming occurs when listening without visual accompaniment, though combining visual and auditory priming tasks strengthen the priming effect. Wilkowski and Robinson (2007) primed participants by having them read an embedded word list, which altered trait anger and emotional word rating responses. Participants completed the Spielberg State Trait Anger Index (STAXI) before and after reading an embedded word list to determine if their trait (overall demeanor, and personality), or state (how the person feels at that point in time) anger would be altered. They were then asked to rate stimulus words on a nine-point negativity scale, which resulted in increased state anger and a more intense judging of the stimulus words, while not revealing a difference in state or trait anger.

The use of auditory priming via acoustic gestures is not the only way to influence ones behaviors. Hermans, De Houwer and Eelen (1996) state that depending on the genera of music, and particular song it may cause us to speed up, slow down, or alter our mood. Areni and Kim (1993) suggest that classical music played in a wine store influenced patrons to purchase more expensive wines than when top 40's music was playing. Though this did not bear significance to amount of items handled, purchased, or time spent in the store by the patrons. Turley and Milliman (2000) state:

> "Music is the most commonly studied general interior cue (Smith and Curnow, 1966;Milliman, 1982, 1986; Andrus, 1986; Yalch and Spangenberg, 1988, 1990, 1993; Baker, Levy and Grewal, 1992; Areni and Kim, 1993; Chebat, Gelinas-Chebat and Filiatrault, 1993; Gulas, and Schewe, 1994; Dube´ , Chebat, and Morin, 1995; Herrington and Capella, 1996; Hui, Dube´ , and Chebat, 1997).
>
> Based upon the results of these articles, it appears that the music played in a store can have a significant impact on a variety of behaviors including sales, arousal, perceptions of and actual time spent in the environment, in-store traffic flow, and the perception of visual stimuli in the retail store. However, the impact of music can be mediated by age of the shopper (Yalch and Spangenberg, 1990; Gulas and Schewe, 1994), music tempo (Milliman, 1982, 1986), music volume (Smith and Curnow, 1966), music preference (Herrington and Capella, 1996) and by the use of background or foreground music (Yalch and Spangenberg, 1990, 1993;

> Areni and Kim, 1993). Another interesting finding of this area of investigation is that music can influence behavior even when consumers are not consciously aware of it (Milliman, 1982; Gulas and Schewe, 1994) (p.195)."

(Chen & Haviland-Jones, 2000; Pause, Ohrt, Prehn & Ferstl, 2004) state that sweat samples taken from observers at various points during viewing of a frightening movie were judged to smell more intense, less pleasant and more aggressive-like than samples taken during the viewing of a comedy. Chen et al. (2000) demonstrated olfactory priming via sweat samples taken during movie conditions contain different odor qualities and can be distinguished from one another. Results revealed that participants significantly chose the correct samples when asked to choose which sample was happy or frightening. Pause et al. (2004) examined sweat samples collected from women during the viewing of a comedy, suspense/thriller, and drama movies conditions, to samples taken during aerobic activities to determine if odor could be used as a priming catalysis. It was demonstrated from this study that choice and anxiety state could be altered via olfactory priming methods. Participants were instructed to smell the samples then to judge facial pictures as happy, angry, scared, and sad. A significant difference of the participants' more intense and negative judgments were found during the thriller/scary movie sample trials than the other trials. Li, Moallem, Paller and Gottfried (2007) found similar results using positive, neutral, and negative olfactory stimuli to influence emotional impressions of faces. Stimuli consisted of varied intensities of flowers, perfumes, sulfur, etc. Results demonstrated with increased awareness of the scent the

magnitude of the priming effects were decreased. In other words the more recognizable the odor was a reduced intensity of judging was noted, but if the odor was unrecognizable a more intense judging was noted.

Behavior/Mood

Bargh et al. (1996) state that students pace can be altered via simple priming tasks. In this experiment the researchers were able to decrease the pace of students gait by having participants complete a pseudo language task consisting of scrambled sentences to prime them for the concept of slowness via incorporating words like Florida, knits, grey, careful, and many others. Results showed a significant difference in rate of pace measured via an observer using a stopwatch from the point the participant walked out of the waiting room until a specific point in the hall. Bargh, et al., also altered student's moods via similar priming methods. Participants were assigned a scrambled sentence test by one researcher who instructed the participant when finished to hand it to the professor, who happened to be in a pseudo conversation with a student in his office. The professor in the office was facing the hallway with the door partially open, but did not show recognition to the participant standing there until ten minutes had elapsed. After completion of the test the students primed for rudeness interrupted the conversation with a mean time of 326 seconds, the neutrally primed students interrupted with a mean time of 519 seconds, and the group primed for politeness interrupted with a mean time of 558 seconds though according to the institutional review board the faculty member had to break the pseudo conversation at 600 seconds and tell the participant to enter.

As reported by Chartrand, VanBaaren, Bargh (2006):

> "In addition to these short-term behavioral consequences, we propose that automatic evaluation also has long term affective consequences. Whereas the automatic activation of an object's valence is an immediate reaction to one specific entity and prepares the organism for appropriate action concerning that entity, moods are slower and more diffuse reactions to the situation as a whole and influence one's information processing style in general. It is therefore unlikely that a single exposure to one stimulus will dramatically alter the mood a person is in, but when that person is exposed to only positive or only negative stimuli for a relatively prolonged period of time, the continuous activation of these objects' valence may result in a diffuse affective reaction (p. 71)."

In other words it has been shown that mood, and behavior can be altered via changing the processing style of the individual at that time, but this one exposure to positive or negative stimuli will not have long lasting consequences. Although if the prime is consistently reactivated and the person lives with constant positive or negative affirmations it will ultimately alter the person's outlook, and emotional state, though not with the same intensity as the initial priming.

Hess, Hinson, and Statham (2004) primed participants to view elderly people as having great memories [positive], or as being senile [negative]. Methods consisted of participants forming four or five word sentences out of 30 word cards. This semantic priming task demonstrated that abstract connections form a more salient primed effect

than concrete presentations of sentences, and that if participants are a member of the representative primed group the effect is more malleable. Participants ranged from adult to elderly volunteers, and were either primed for positive, negative, or neutral perception of elderly memory functioning. The negative group demonstrated increased memory recall issues, especially with the negatively primed elderly group. Kawakami, et al., (2003) state that biases are formed in specific demographics due to the perception of certain social groups. In this study participants were shown drawings of either hooligans or elderly people then asked to judge different social situations. Results revealed that people became more conservative with their judgments during the elderly priming, and demonstrated a more intense judgment of all groups/situations when primed with the hooligan drawings.

Bargh et al. (1996) compared scores on standardized tests from African American students with and without racial information profiles gathered. They concluded that if the test did not have race as an identification marker students scored significantly better on the standardized exams. This says something about the internal cultural view of populations within the social realm whether it be PWS, hooligans, the elderly, African Americans, or other demographics. We are driven to have specific social perceptions of demographics due to the societal constraints imposed upon that population.

Anxiety

Blanchette, and Richards, (2003) state that interpretation and perception is altered via the emotional and cognitive states of the individual. Chartrand, et al., (2006) state that our nonconscious automatically primes our fight or flight response when a negative

stimuli is perceived. Participants were told to either push or pull a lever when they viewed a word and were told not to react during the presentation of a nonword. Results demonstrated a significantly increased reaction time and pushing or avoidance response during the presentation of threat words as opposed to other words. This experiment shows the avoidance response as a nonconscious reaction when facing a threatening situation. The nonconscious is primed into a threat/anxious state then cognitive processing reverts to a more holistic capacity and sensory information is given priority over comprehension tasks (Weinstein,1995; Windmann & Kruger, 1998). There are three primary anxiety components; 1) the verbal-cognitive, 2) behavioral and 3) physiological components (Ezrati-Vinacour & Levin, 2004; Lazarus, 1991; Menzies, Onslow & Packman, 1999). Using these components we can determine the specific types of nonconscious priming that effectively induce anxiety into the individual's cognitive state thus altering their processing style. Abercrombie, et al., (2006) state that negative emotional priming methods can be measured via increased saliva cortisal levels to predict state of arousal in the individual. After completion of a memory task participants viewed negative or neutral emotional pictures then completed a similar memory recall task. They then maintained a resting phase of 50 minutes before a public speaking task in front of a video camera, and 2 evaluators. Participants were asked to return after the presentation and complete another memory recall task. Results revealed an increased memory recall after the negative priming trials. These memory recall tasks were influenced via the emotional constraints of the positive or negative pictures and the public speaking tasks placed on the participants.

Skinner and Brewer (2002) primed undergraduate students prior to taking a psychology exam by talking to them about the positive outcomes, anxieties, and worries on the upcoming exam. The styles of conversation were separated into very worried and anxious, not being overly confident or overly anxious, and positive with decreased anxiety about the upcoming exam. Results revealed all conditions were significantly different with the positive projection group scoring significantly better than the rest. It was concluded that a positive prime would transcend to perceptions of achievement in performance. Therefore this idea of using a mantra of positive thought to affect performance was demonstrated to be true. These behavior and mood alterations that are demonstrated by subtle language tasks show the effectiveness of the priming mechanism.

Weinstein (1995) used Event Related Potential (ERP) to determine processing in high anxiety and low anxiety groups. Participants were presented with an emotionally embedded sentence, then an emotionally intense word followed by the probe word. Results revealed that the highly anxious group demonstrated shortened peak latency and an increased deployment of processing resources. These processing resources were wider employment of cortical structures. In other words if presented with a negative word it will decrease reaction time on upcoming words. This holistic processing style is evident when in an unfamiliar situation and become more cognizant of the environment thus heightening reaction time and environmental awareness. This environmental awareness can be envisioned by imagining a walk down a dark path or street when alone and much more aware of surroundings and of possible dangers. Maheu and Lupien (2003) state that this processing style change is an evolutionary trait thought to assist in recall and

avoidance of dangerous situations that are encountered. These indirect measures of anxiety are thought to be valid means for predicting differences in performance, moods, and behaviors.

Guntupalli, Kalinowski, Nanjundeswaran, Saltuklaroglu, and Everhart (2006) state:

> "Researchers have frequently used measures such as electrodermal response (EDR), heart rate (HR), blood pressure, blood volume and flow as a general indicator of physiological anxiety both in PWS and those who do not stutter. Among these physiological measures, EDR has been used extensively as a sensitive and reliable measure of physiological arousal to various emotional or affective stimuli, such as fear, anxiety, excitement etc. (Ashcroft et al., 1991; Dietrich and Roaman, 2001; Lang et al., 1993). EDR measurement is simple, repeatable, and fast. It can be a useful method for acquiring data that describes autonomic nerve activity, specifically the responses of sympathetic nervous system to various kinds of arousal evoking emotional stimuli (Tarvainen et al., 2001). EDR has been found to increase monotonically with intensifying stimulation and the apparent trend in the data is that skin conductance increases proportionately with autonomic arousal (Bradley et al., 2001; Lang et al., 1993). Heart rate is another physiological measure that is commonly used as a tool for measuring physiological anxiety (Caruso et al., 1994; Peters and Hulstijn, 1984; Weber and Smith, 1990). Unlike skin conductance, which is under the control of the sympathetic nervous system, heart rate is

under the influence of both sympathetic and parasympathetic systems. In contrast to EDR responses to stressors, differential effects on HR have depended on the strength of the related stimuli. In cases that have examined the impact of fearful stimuli or strong stressors, an increase in HR has been observed, due to the systemwide activation of sympathetic nervous system. However, in cases of mild to moderate stressors, greater variety in HR patterns have been observed (e.g., either an acceleration or deceleration, depending on the situation) (Stern et al., 2001). In other words, no unidimensional pattern has been found to exist among (arousal-related responses), such as increased EDR responses that are accompanied by an increase in HR or breathing rate. Lacey (1967) noted that on some occasions deceleration in heart rate was accompanied by increases in skin conductance. A recent model of autonomic function suggests that sympathetic and parasympathetic branches of the autonomic nervous system can act independently, reciprocally, or even coactively (i.e., increase or decrease together) to an external stimulus (Bernston et al., 1991, 1993). In people who stutter, a deceleration in heart rate prior to stuttering has been attributed to the coactivation pattern of both sympathetic and parasympathetic activations (Alm, 2004). Therefore, due to the variability in physiological responses, generalizing the physiological data from a single channel (e.g., EDR) to the entire autonomic system in a unidimensional continuum of arousal may lack accuracy and may be

misleading (Weber and Smith, 1990; Stern et al., 2001; Alm, 2004). Hence, in the present study, to provide more consistency in data interpretation, we recorded the changes in both EDR and HR through independent channels to indicate the autonomic activity to fluent and stuttered speech (p. 2)."

Stuttering

Electrodermal responses are consistent physiologic measures of arousal states in participants (Dietrich & Roaman, 2001; Hazlett, et al., 1990). Dietrich and Roaman (2001) state there is a significant difference between self-reported anxiety scales and skin conductance measurements. They hypothesize that the results may be due to PWS being in denial of the severity of their stuttering or that PWS do not want to admit that stuttering hinders their lives to the extent predicted by the physiological arousal. Kraaimaat, Janseen, and Brutten (1988) state that Galvanic Skin Response (GSR) prior to treatment is a predictor to therapeutic results in PWS. Results demonstrated increased arousal prior to completion of a reading task, and the inability of PWS to decrease dysfluencies during treatment.

G.W. Blood, I.M. Blood, Bennett, Simpson, & Susman, (1994) states there are no significant difference between subjective anxiety of PWS and people who do not stutter (PWNS) in any situation. This study compared PWS and PWNS with the Spielberg State Trait Anxiety Index (STAI), Galvanic Skin Response (GSR), heart rate, and saliva cortisol levels without finding a significant difference between PWS and PWNS. Miller

and Watson (1992) state that PWS generally do not demonstrate increased state or trait anxiety unless it directly deals with communication. Baumgartner and Brutten (1983) studied the relationship between anxiety and stuttering via heart rate measures, which results showed that two of the three participants did not demonstrate an adverse reaction during speaking situations, but the third participant showed an increased heart rate just before their dysfluent moments although not yielding significance.

Valyo (1971) used skin conductance to measure arousal during speaking situations of PWS and PWNS, then reported that both PWS and PWNS showed an increased skin conductance for speech versus silent tasks. It was demonstrated that stuttering participants showed a significantly higher level of arousal than the non stuttering participants during speech, although Valyo did not remove the speech artifact that occurs during skin conductance testing. The results for the study may have been due to the speech artifact noted. Grey and England (1972) used skin conductance to examine correlations between autonomic arousal and stuttering frequency finding that both decreased but not in a correlated manner.

Peters and Hulstijn (1984) viewed heart rate and skin conductance in three participants who stuttered during speech tasks where they described the freezing response during dysfluent periods of speech. This freezing response noted is similar to the freezing response in mice during traumatic situations and that physiologic characteristics include decreased heart rate and blood pressure during the dysfluency (or extreme anxiety condition in the mice) (Alm, 2004; Caruso, Chodzko-Zajko, Bidnger, & Sommers 1994; Guitar, 2003; Miller & Watson 1992; Peters & Hulstijn, 1984). Alm (2004) concluded

that the freezing response is an emotional response of anticipatory anxiety. Pesak (1990) contradicts the freezing response mentioned in previous studies due to a lacking account for the laryngeal reflex during the dysfluent episode. The laryngeal reflex occurs when the larynx closes during a dysfluency and the autonomic system reacts to this as an inability to inhale. Thus the system shows similar patterns to a chocking response where the heart slows, blood pressure drops, and anxiety increases via increased adrenaline, which enables the body to maintain a longer period of survival during asphyxiation.

Newman (1987) primed typical speaking participants to have increased anxiety level about their speech and to speak with stuttering like behaviors. Researchers collected three speech samples from participants 1)where they did not interrupt, 2)interrupted and called attention to word repetitions, pauses, and other stuttering like behaviors (true of falsified disfluencies), and 3) researchers did not interrupt the participants. Following this sequence participants demonstrated slower speech, increased pauses, and many word avoidance behaviors emerged by the third sample. Darley and Spriestersbach (1952) state that similar to the (monster study) by Johnson, these tactics created socially anxious people, but did not create a PWS according to the overt characteristics of stuttering including part/whole word repetitions, prolongations, and postural fixations (Kalinowski & Saltuklaroglu, 2005).

There has been much discussion about whether PWS demonstrate higher trait anxiety than their fluent counter parts. It has been hypothesized that PWS not only have a higher trait anxiety, but an increased state anxiety during speaking situations (Alm, 2004; Brutten, 1975; Craig, 1990; Craig, Hancock, Tran & Craig, 2003; Ezrati-Vinacour &

Levin, 2004; Guitar, 2003; Kraaimaat, Vanryckeghem & Van Dam-Baggen, 2002; Messenger, Onslow, Packman & Menzies, 2004; Trotter 1982, 1983; Vanryckeghem, Hylebos, Brutten & Peleman, 2001). Vanryckeghem, et al., (2001) used Brutten's Communication Attitude Test (CAT) on 143 children who stutter to determine negative perceptions of speaking situations as a factor of age. Results revealed that by age 13 maladaptive emotions were linked with social speaking situations in PWS.

Craig (1990) primed PWS for increased state anxiety via speech samples taken during telephone conversations. Results revealed that PWS demonstrated higher state anxiety during the preintensive treatment phone speech samples. The post intensive therapy results demonstrated that PWS showed decreased trait anxiety levels to within normal limits during similar anxiety priming conditions. This overall reduction in anxiety however did not prove significant for the state anxiety's during similar situations. Craig, et al., (2003) polled a general population about stuttering via phone interviews with random numbers selected out of a phonebook. The examiner asked participants if anyone in the household was a PWS after a definition was given. Based on whether a PWS resided in the house, questions were asked. It was concluded that PWS who received therapy were 12% more anxious about social situations than typical speakers, and PWS who did not receive therapy were 4.2% more anxious. Though this did not account for the severity of the PWS of which the more severe seek treatment.

Many studies have been conducted with a variety of measurements to determine if PWS demonstrate increased anxiety over the typical population (Blood et al., 1994; Ezrati-Vinacour & Levin, 2004; Guitar 2003; Leanderson & Levi 1967). Ezrati-Vinacour

and Levin (2004) concluded that PWS demonstrate an increased trait anxiety, and increased state anxiety about social situations via the Trait Anxiety Inventory, and Speech Situation Checklist questionnaires completed by PWS, and PWNS. The PWS demonstrated increased anxiety with increased severity of their stuttering classification. Blood, et al., compared cortisal levels in saliva samples from PWS and PWNS found a significant difference only in the severe PWS population. They further state that perceptual studies are not the best judge of arousal in PWS. Leanderson and Levi (1967) studied chemosensory output of urine in PWS to conclude that higher levels of catecholamine (epinephrine /adrenaline, norepinephrine/noradrenaline) were discovered in the severe PWS, which are thought to be an indirect measure of increased trait anxiety. Guitar (2003) measured the acoustic startle response of PWS revealing a significant difference between PWS and PWNS's blink response. It was hypothesized that PWS demonstrate a more sensitive and reactive temperament.

Miller and Watson (1992) state:

> "Classical conditioning theories propose that a person who stutters learns to associate speech with negative emotional states such as anxiety, fear, and stress (Brutten & Shoemaker,1967; Mysak, 1960; Van Riper, 1937). Anticipation of specific situations or speech difficulties evokes or intensifies anxiety, resulting in speech disintegration (Brutten & Shoemaker, 1967; Sheehan, 1970). Negative emotions become classically conditioned so that anxiety and/or fear become eliciting stimuli for fluency failure (Brutten & Shoemaker, 1967; Sheehan, 1970). In other words,

> learned anxiety or fear has a causal effect on dysfluency (p. 790)."
>
> Daniels and Gabel (2004) stated "These emotions ultimately may become part of the person's way of communicating, potentially more disruptive to their communication than the presence of dysfluent speech. For persons who stutter, negative emotions influence both the ability to communicate and the style of communicating, leading them to communicate in a different way or to choose not to communicate. These emotions are a second, personalized cost of stuttering that can impact social identity (p.203)."

Kraaimaat, Vanryckeghem, and Van Dam-Baggen (2002) stated: "It seems plausible that social anxiety among adults who stutter may stem from a generalization of speech-associated negative emotion. It seems obvious, therefore, that attention should be given in speech therapy to anxiety related speech situations and stuttering among the high socially anxious person's who stutter (p. 326)." Blomgren, Roy, Callister, and Merrill (2005) studied the long term effects of the Successful Stuttering Modification Program (SSMP) which did not have the goal of enhancing fluency into individuals, but had the goal of a reduction in their feelings of being handicapped by the disorder via the Perception of Stuttering Inventory measure. The SSMP is an intensive three week intervention program consisting of stuttering modification techniques with a strong emphasis on desensitization. Results post therapy were increased fluency, less avoidances, lower state and trait anxieties, less handicapping feelings, less psychic somatoanxiety, and expectancy of stuttering directly following the program. Six months

post therapy evaluations concluded that participants reported less word avoidances, expectancies of stuttering, and psychic somatoanxiety of stuttering events.

Craig, Tran, and Craig (2003) studied perceptions of PWS among people who have not had direct contact with PWS. Participants were gathered via a randomized telephone poll and were asked if they have had an interaction with a PWS. If they had not, they were asked to participate and answer questions about perceived characteristics of PWS. Results revealed that participants viewed PWS as shy, anxious, self conscious, and lacked confidence, however did view PWS as having average or above average intelligence. The majority of participants stated that they did not think they would be embarrassed while talking to a PWS. Klassen (2001) states that participant's negative stereotypes of PWS were decreased for those who maintain contact with at least one PWS. Participants who were in contact with at least one PWS filled out a questionnaire dealing with characteristic of PWS and results demonstrated a less intense judging of PWS severity, anxiety, and overall negative attributes than previously recorded studies.

Guntupalli, Kalinowski, Nanjundeswaran, Saltuklaroglu, and Everhart (2006) examined the physiologic arousal of PWNS viewing stuttered speech samples. Results concluded that PWNS demonstrated increased skin conductance, decreased heart rate, and physiologic arousal during the viewing of stuttered speech samples. However decreased arousal was noted upon extended exposure to the stuttered samples. Simply put when PWNS are exposed to PWS, or stuttered speech sample there is a psychophysiological arousal, but upon extended exposure the negative perceptions and physiological arousal is decreased.

Hypothesis

Priming has been shown to yield significant results in altering anxiety, behavior, and cognition in typical populations. Since there is controversial evidence about the effect that anxiety has on the fluency in PWS this study is being conducted to determine that relationship. It is hypothesized that during positive priming conditions the arousal state and stuttered syllable counts will decrease.

CHAPTER II: METHODOLOGY

Participants

Participants were fourteen male and two female adult PWS exhibiting at least 5% stuttered syllables during pre-experimental inclusion criteria. They ranged from 18-52 years old with a mean age of 25. Participants did not report any other speech, language, hearing, or uncorrected vision deficits.

Materials

Psychophysiological arousal assessments of Echocardiogram (ECG), and Galvanic Skin Response (GSR) modules using the Biopac MP150 System (Goleta, CA) were used. Data acquisition will consist of the Acq*Knowledge 3.9.1* Lab Assistant software for Mac (Biopac Systems, Goleta, CA). Sampling rates were 500Hz with low pass filters set at 35Hz and 1Hz for the ECG and GSR respectively. The high pass filter for the ECG module was set at 0.5Hz. All settings were in accordance with Biopac's standards. In addition to physiologic measures participants completed the Self-Assessment Manikin (SAM) arousal scale (Lang, 1980) to examine self reported arousal at baseline and post priming conditions. Emotional priming word sets were retrieved via Berner and Maier (2004) then matched by complexity and category to create congruent analogous word sets. Examples of word sets being neutral (water – wet), negative (uneasy – sad), positive (happy – joyess). All priming conditions were presented via timed Powerpoint slides on a Macbook thirteen-inch widescreen monitor. Each of the 18 slides per condition were shown for a period of three seconds during the priming. Speech

samples were retrieved via Kalinowski, Armson, Roland-Mieszowski, Stuart and Gracco (1993) and presented as a Microsoft Word document at page width zoom on the thirteen-inch Macbook screen. A Samsung SC-MX10 digital camcorder was used to record randomized speech samples to retrieve stuttered syllable counts. Coded DVD's of speech samples were made using Quicktime Pro 7.5 on a Macbook using OSX 10.5.4, then examined by a graduate student in communication sciences & disorders.

Procedures

Participants were instructed to wash, and dry their hands thoroughly to maintain a consistent hydration and oil ratio across participants. Alcohol swabs were then used on placement sites to assist with consistency. Transducers were applied to the index and middle flanges of the left hand. A baseline period of five minutes was maintained where participants were instructed to remain as motionless as possible. The examiner then presented the SAM to determine self reported affect, arousal level and dominance. Participants were instructed to use their right hand to point to their state affect, arousal level and dominance on the SAM nine point likert scale. Following the interstimulus phase of two minutes participants were presented one of three randomly selected priming analogy word sets [positive, negative, neutral] via a timed Powerpoint presentation. The presentation consisted of each of the 18 slides being shown for three seconds before automatically proceeding on to the later one. Post priming condition a ten second artifact reduction phase was administered where participants continued to remain motionless. This was to reduce the cognitive artifact of the silent reading. Post reduction phase a fifteen second physiologic sample was marked followed by a two minute interstimulus

phase before the administration of the next priming condition following the previously set procedures. Post physiologic testing the speech sample phase of the study was administered. Participants followed similar priming procedures as listed above during the speech sample phase. During this phase participants orally read a randomized baseline passage while under video and audio recording. Following the baseline speech sample a two minute interstimulus phase was administered. The experimenter then presented a similar priming condition via previously explained methods. Ten seconds post priming participants orally read one of the three remaining randomized passages for stuttered syllable counts. This procedure was replicated until satisfying all priming conditions. Presentation order was developed using http://www.randomizer.org/.

CHAPTER III: RESULTS

Speech Sample Phase

The mean stuttered words and standard errors per condition were: baseline 18.9 ± 4.1, positive 15.6 ± 3.0, neutral 18.0 ± 3.5, and negative 21.2 ± 2.6. Refer to table 1 for a complete chart of means and standard errors across assessments per condition. A one way repeated measures ANOVA revealed a significant main effect in the stuttered syllables between the positive condition when compared to all conditions [$F(3,45)$= 2.809, Sphericity Assumed p =.0218, $\eta 2$= .158, ϕ = .637 at α = .05]. The F Test based on Sphericity was used because sphericity holds [w(5) =0.51, Mauchly Test of Sphericity p = *.099,* at α = .05]. To protect against Type I error a Type III Sum of Squares was used to examine the variation after correcting for other effects [F= (3,45)= 2.8, p= .050]. No other significant differences were noted between any conditions.

Physiological Arousal

Skin conductance means and standard errors per conditions were baseline 2.602 ± 0.408, positive 2.410 ± 0.351, neutral 2.412 ± 0.358, and negative 2.544 ± 0.395. No significant differences were noted between any conditions within subjects. Heart rate means and standard errors per condition were baseline 71.5 ± 2.4, positive 72.6 ± 2.5, neutral 73.8 ± 2.6, and negative 75.4 ± 2.1. No significant differences were noted across any conditions within subjects for heart rate changes.

Self-Arousal Assessments

SAM Anxiety means and standard errors were baseline 7.7 ± 0.3, positive 7.2 ± 0.4, neutral 7.1 ± 0.4, and negative 7.7 ± 0.3 revealing no significant differences across conditions between subjects.

CHAPTER IV: DISCUSSION

Reduction of Stuttered Syllables

The purpose of this study was to examine the relationship between anxiety and fluency in PWS. The most pertinent finding for this study was the difference in stuttered words during the positive priming condition. It is hypothesized that emotional priming can alter our state anxiety via subtle language tasks. This emotional influx has been shown to either increase (Craig, 1990) or have no effect (Armson, Foote, Witt, Kalinowski, & Stuart, 1997; Kalinowski, Stuart, Wamsley, & Rastatter, 1999) on dysfluencies in PWS. Though this study did not prime for any of the situational speech anxieties listed above which have dramatic effect on the emotional state. It examined the subtle emotional influence that language tasks have over communication in PWS. These subtle influences were noted behaviorally via the reduction of stuttered words after the positive priming condition. Having only a slight reduction in stuttered words during the positive condition when compared to all other conditions is thought to be due to the overtness of the stuttering phenomenon. Stuttering has been characterized as having external symptomatology of repetitions, prolongations, and postural fixations (Kalinowski & Saltuklaroglu, 2005). These intermittent and involuntary dysfluencies manifest themselves during all situations. Kalinowski, Stuart, Wamsley, and Rastatter (1999) state that there are no significant differences between stuttering frequency in an isolated or observed condition. Participant's speech samples were recorded during observed and nonobserved settings. In the nonobserved condition experimenters turned

off the visible tape recorder and asked the participant to orally read a passage in a closed environment. The results showed similar dysfluencies during the observed and non conditions. Armson, et al., (1997) state that there are no significant differences between audience size and stuttering frequency. Participants orally read to audiences of two, four, and fifteen people; which did not reveal a significant difference in stuttering frequency. This stuttering phenomenon is such an overt pathology that it demonstrates similar frequency of dysfluencies in a variety of settings and situations. Though the stuttering frequency itself is not altered by these social parameters the emotional state may be.

Along with being an overtly characterized disorder stuttering involves many internal emotional attributes. (Brutten & Shoemaker, 1967; Sheehan, 1970; Yaruss & Quesal, 2006) have noted some emotional factors related to the pathology, but see it as an effect caused from the overt characteristics. These may consist of social speaking phobias, negative emotions toward communication, and other personality traits. Simply put the stuttering overtly characterizes itself with the outward behaviors that cause emotional distress to the individual. With this distress comes the sound, word, and situation avoidances that are familiar in PWS. These emotional stressors lend themselves to increased overt symptomotologies which are represented by the vicious cycle theory in the stuttering field (Kalinowski & Saltuklaroglu, 2005). This theory simply states that the avoidance of speech tasks creates increased anxiety, which leads to increased dysfluencies.

In the current study a significant reduction of stuttered syllables was noted during the positive priming condition, however no other significant interactions were noted

between any other conditions of assessments. This is hypothesized to be due to the emotional priming tasks used interacting with the speech. In other words the priming conditions may have had the subtle effect intended, but it was only shown behaviorally with the stuttered syllable counts decreasing for the positive condition because of the priming acting as a catalysis for the speech. This effect allows for the initial reaction during the positive condition to be a more relaxed state, thus decreasing the dysfluencies. This nonconscious awareness of decreased dysfluencies increases the emotional affect of the PWS, which in turn continues to decrease the dysfluencies. The positive priming acts as a catalyst for reduced dysfluencies, then the reduced dysfluencies takes over the priming effect. Whereas the negative or neutral priming conditions intended to increase the anxiety cannot overpower the negative priming of the stuttering itself. It is then hypothesized that the stuttering itself creates the main priming effect. Thus during dysfluency it is hypothesized that any positive priming effect was reduced and any negative or neutral effect could not be exceeded. As Young, (1985) stated the true baseline fluency of PWS is in real life speaking situations, and that this baseline can not be increased. As shown it is possible to reduce the perceptual stuttering events but not to increase the stuttering frequency from the baseline.

Limitations

Reasons for lack of significance could be due to robustness of the stimuli, interpersonal interactions, setting, or small sample size. This simple priming task was chosen to reduce the cognitive artifact placed on the individual during the physiologic measures, in hindsight a more robust priming task should have been chosen. Robustness of the priming effect is the amount of influence that the task has over the individual or the response. It is suggested that a simple priming task of silently reading analogous words may demonstrate enough robust influence for categorical priming tasks but holds little influence over speech and arousal tasks. However behavioral or lexical priming studies have used semantic or syntactic priming conditions disguised as language tasks or sentence completion tasks to influence the individuals (Bargh, et al., 1996; Becker, 2007; Dijksterhuis, & Van Knippenberg, 1998). These robust priming strategies allow the person to consciously decrypt the embedded message or word while completing the language task. This decryption is thought to strengthen the primed effect that occurs. By altering the presentation of the priming stimuli to be a cognitive language task of word reversal, sentence completion, or sentence organization the priming effects may have proven to be more robust. Though these perceptual language tasks sought to influence state emotion it has yet to be proven if language tasks show influence over the speech act itself; especially in PWS.

Problems in arousal within this study consisted of the within subjects design, lack of difference in arousal measures, and no check on participants for attentiveness. Due to

the specific population used and the variability of skin response among genders, participants, and other factors a within subjects design was used. This did not allow for a physiologic comparison between participants. Since there was not a difference noted in arousal it is impossible to ascertain that the priming tasks influenced the arousal. The basic assumption of this project was that the emotionally embedded words would alter the arousal levels of the participants. Without definitive arousal measures this basic premises may not hold. It is unknown to researchers if participants were attending to the stimuli. No comprehension check was used to ensure proper attention.

Another limitation of this study may have been caused by interpersonal interactions such as the experimenter's role as a clinician, participating in group therapy, or being a PWS may have altered the arousal and comfort level in participants. Although the experimenter performed little speaking other than the delineation of procedures prior to the experiment it could have influenced the arousal of the participants during experimental procedures (Guntupalli, et al., 2006). The last limitation to be covered is the small sample size of 16 adults who stutter being combined with the lack of arousal results discovered.

Future Research

Specific areas of interest would be increasing the robustness of the priming stimuli, examining other priming means, and probing to a fuller degree the effect that self reported arousal interacts with physiologic arousal.

REFERENCES

Abercrombie, H. C., Speck, N. S., & Monticelli, R. M. (2006). Endogenous cortisol elevations are related to memory facilitation only in individuals who are emotionally aroused. *Psychoneurodocrinology, 31,* 187-196.

Alm, P. A. (2004). Stuttering, emotions, and heart rate during anticipatory anxiety: a critical review. *Journal of Fluency Disorders, 29*, 123-133.

Armson, J., Foote, S., Witt, C., Kalinowski, J., & Stuart, A. (1997). Effect of frequency altered feedback and audience size on stuttering. *European Journal of Disorders of Communication : The Journal of the College of Speech and Language Therapists, London, 32*(3), 359-366.

Areni, C. S., & Kim, D. (1993). The influence of background music on shopping behavior: Classical versus top-forty music in a wine store. *Advances in Consumer Research, 20*(1), 336-340.

Bargh, J. A., Chen, M., & Burrows, L. (1996). Automaticity of Social Behavior: Direct Effects of Trait Construct and Stereotype Activation on Action. *Journal of Personality and Social Psychology, 71* (2), 230-244.

Baumgartner, J. M., & Brutten, E. J. (1983). Expectancy and heart rate as predictors of the speech performance of stutterers. *Journal of Speech and Hearing Research, 26,* 383-385.

Becker, S. I. (2007). The mechanism of priming: Episodic retrieval or priming of pop-out? *Acta Psychologica, 127* (2)*,* 324-339.

Berner, M. P., & Maier, M. A. (2004). The Direction of Affective Priming as a Function of Trait Anxiety When Naming Target Words With Regular and Irregular Pronunciation. *Experimental Psychology, 51* (2), 1-11.

Bigand, E., Tillmann, B., Poulin-Charronnat, B., & Manderlier, D. (2005). Repetition priming: Is music special? *The Quarterly journal of experimental psychology.A, Human experimental psychology, 58*(8), 1347-1375.

Blanchette, I., & Richards, A. (2003). Anxiety and the Interpretation of Ambiguous information: Beyond the Emotion-Congruent Effect. *Journal of Experimental Psychology: General, 132* (2), 294-309.

Blomgren, M., Roy, N., Callister, T., & Merrill, R. M. (2005). Intensive Stuttering Modification Therapy: A Multidimensional Assessment of Treatment Outcomes. *Journal of Speech, Language, and Hearing Research, 48*, 509-523.

Blood, G. W., Blood, I. M., Bennett, S., Simpson, k. C., Susman, E. J. (1994). Subjective Anxiety Measurements and Cortisol Responses in Adults Who Stutter. *Journal of Speech and Hearing Research, 37*, 760-768.

Bosshardt, H. G. (2006). Cognitive processing load as a determinant of stuttering: Summary of a research programme. *Clinical Linguistics & Phonetics, 20* (5), 371-385.

Bowers, J. S. (1999). Priming Is Not All Bias: Commentary on Ratcliff and McKoon (1997). *Psychological Review, 106* (3), 1-60.

Breitmeyer, B. G., Ro, T., Ogmen, H., & Todd, S. (2007). Unconscious, stimulus-dependent priming and conscious, percept-dependent priming with chromatic stimuli, *Perception & Psychophysics, 69* (4), 550-557.

Brutten, G. J. (1975). Stuttering: Topography, assessment and behavior change strategies. In J. Eisenson (Ed.), *Stuttering:A second symposium*. New York: Harper & Row.

Brutten, E.J., & Shoemaker, D.J. (1967). *The modification of stuttering.* Englewood Cliffs: Prentice Hall.

Calvo, M. G., & Nummenmaa, L. (2007). Processing of unattended emotional visual scenes. *Journal of experimental psychology.General, 136*(3), 347-369.

Caruso, A. J., Chodzko-Zajko, W. J., Bidnger, D. A., & Sommers, R. K. (1994). Adults Who Stutter: Response to Cognitive Stress. *Journal of Speech and Hearing Research, 37*, 746-754.

Chartrand, T. L., Van Baaren, R. B., & Bargh J.A. (2006). Linking Automatic Evaluation to Mood and Information Processing Style: Consequences for Experienced Affect, Impression Formation and Stereotyping. *Journal of Experimental Psychology, 135* (1), 70-77.

Chen, D. & Haviland-Jones, J. (2000). Human olfactory communication of emotion. *Perceptual and Motor Skills, 91*, 771-781.

Compton, R. J., Heller, W., Banich, M. T., Palmieri, A., & Miller, G. A. (2000). Responding to Threat: Hemispheric Asymmetries and Interhemispheric Division of Input. *Neuropsychology. 14* (2), 254-264.

Craig, A. (1990). An Investigation into the Relationship Between Anxiety and Stuttering. *Journal of Speech and Hearing Disorders, 55*, 290-294.

Craig, A., Hancock, K., Tran, Y., & Craig, M. (2003). Anxiety Levels in People Who Stutter: A Randomized Population Study. *Journal of Speech, Language, and Hearing Research, 46,*1197-1206.

Craig, A., Tran, Y., & Craig, M. (2003). Stereotypes towards stuttering for those who have never had direct contact with people who stutter: A randomized and stratified study. *Perceptual and motor skills, 97*(1), 235-245.

Daniels, D. E., & Gabel, R. M. (2004). The Impact of Stuttering on Identity Construction. *Topics in Language Disorders, 24* (3), 200-215.

Dayalu, V. N., Kalinowski, J., & Stuart, A. (2005). Stuttering Frequency on Meaningful and Nonmeaningful Words in Adults Who Stutter. *Folia Phoniatrica et Logopaedica, 57,* 193-201.

Dietrich, S., Roaman, M. H. (2001). Physiologic arousal and predictions of anxiety by people who stutter. *Journal of Fluency Disorders, 26,* 207-225.

Dijksterhuis, A., & Van Knippenberg, A. (1998). The Relation Between Perception and Behavior, or How to Win a Game of Trivial Pursuit. *Journal of Personality and Social Psychology, 74* (4), 865-877.

Ezrati-Vinacour, R., & Levin, I. (2004). The relationship between anxiety and stuttering: a multidimensional approach. *Journal of Fluency Disorders, 29,* 135-148.

Gladwell, M. (2005). Blink: The Power of Thinking Without Thinking. New York City, NY. Little, Brown & Company.

Gray, B. B., & England, G. (1972). Some effects of anxiety deconditioning upon stuttering frequency. *Journal of Speech and Hearing Research, 15,* 114-122.

Guitar, B. (2003). Acoustic Startle Responses and Temperament in Individuals Who Stutter. *Journal of Speech, Language, and Hearing Research, 46,* 233-240.

Guntupalli, V.K., Kalinowski, J., Nanjundeswaran, C., Saltuklaroglu, T., & Everhart, D. E. (2006). Psychophysiological responses of adults who do not stutter while listening to stuttering. *International Journal of Psychophysiology, 62* (1), 1-8.

Hazlett, H., Dawson, M., Schell, A., & Filion, K. (1990). Electrodermal activity as a prodromal sign in schizophrenia. *Biological Psychiatry*, *41*(1), 111-113.

Hermans, D., De Houwer, J., & Eelen, P. (1996). Evaluative decision latencies mediated by induced affective states. *Behaviour research and therapy, 34*(5-6), 483-488.

Hess, T. M., Hinson, J. T., & Statham, J. A. (2004). Explicit and Implicit Stereotype Activation Effects on Memory: Do Age and Awareness Moderate the Impact of Priming? *Psychology and Aging, 19* (3), 621-625.

Holmes, E. A., Mathews, A., Dalgleish, T., & Macintosh, B. (2006). Positive Interpretation Training: Effects of Mental Imagery Versus Verbal Training on Positive Mood. *Behavioral Therapy, 37* (3), 237-247.

Johnson, W., Darley, F., & Spriestersbach, D. (1952). Form 14: Stutterers' self-ratings of reactions to speech situations. *Diagnostic manual in speech correction*, New York: Harper and Brothers.

Kalinowski, J., Armson, J., Roland-Mieszowski, M., Stuart, A., & Gracco, V. L. (1993). Effects of Alterations in Auditory Feedback and Speech Rate on Stuttering Frequency. *Language and Speech, 36* (1), 1-16.

Kalinowski, J., & Saltuklaroglu, T. (2005). *Stuttering* (1st ed.) Plural Publishing

Kalinowski, J., Stuart, A., Wamsley, L., & Rastatter, M. P. (1999). Effects of Monitoring Condition and Frequency-Altered Feedback on Stuttering Frequency. *Journal of Speech, Language, and Hearing Research*, *42*, 1347-1354.

Kawakami, K., Dovidio, J. F., & Dijksterhuis, A. (2003). Effect of Social Category Priming on Personal Attitudes. *Psychological Science,* 14 (4), 315-319.

Kelly, B., & Chapman, K. (2007). Food references and marketing to children in australian magazines: A content analysis. *Health promotion international, 22* (4), 284-291.

Kirkwood, B. J. (1987). Subliminal control of behaviour: myth or miracle? *The New Zealand Medical Journal, 100* (817), 69-70.

Klassen, T. R. (2001). Perceptions of people who stutter: Re-assessing the negative stereotype. *Perceptual and motor skills, 92*(2), 551-559.

Kraaimaat, F. W., Janssen, P., & Brutten, G. J., (1988). The Relationship between Stutterers' Cognitive and Autonomic Anxiety and Therapy Outcome. *Journal of Fluency Disorders*, *13*, 107-113.

Kraaimaat, F. W., Vanryckeghem, M., & Van Dam-Baggen, R. (2002). Stuttering and social anxiety. *Journal of Fluency Disorders, 27,* 319-331.

Lang, P. J. (1980). Behavioral treatment and bio-behavioral assessment: computer applications. In J. B. Sidowski, J. H. Johnson, & T. A. Williams (Eds.), Technology in mental health care delivery systems (119-l37). Norwood, NJ: Ablex.

Lau, H. C., & Passingham, R. E. (2007). Unconscious activation of the cognitive control system in the human prefrontal cortex. *Journal of Neuroscience*, *27* (21), 5805-5811.

Lazarus, R. S. (1991). Progress on a cognitive-motivational-relational theory of emotion. *American Psychology, 46* (8), 819-834.

Leanderson, R., & Levi, L. (1967). A new approach to the experimental study of stress and stuttering. *Acta Otolaryngologica*, *224*, 311–316.

Li, W., Moallem, I., Paller, K. A., & Gottfried, J. A. (2007). Subliminal smells can guide social preferences. *Psychological science : a journal of the American Psychological Society / APS, 18*(12), 1044-1049.

Mackay-Sim, A. & Laing, D.G. (1981) The sources of odors from stressed rats. *Physiologic Behavior*, *27*, 511–513.

Maheu, F. S., & Lupien, S. J. (2003). Memory in the grip of emotions and stress: A necessarily harmful impact? [La memoire aux prises avec les emotions et le stress: un impact necessairement dommageable?] *Medecine sciences : M/S, 19*(1), 118-124.

Malle, B. F., & Pearce, G. E. (2001). Attention to Behavioral Events During Interaction: Two Actor-Observer Gaps and Three Attempts to Close Them. *Journal of Personaliy and Social Psychology, 81* (2), 278-294.

Menzies, R. G., Onslow, M., & Packman, A. (1999). Anxiety and Stuttering: Exploraing a Complex Relationship. *American Journal of Speech Pathology, 8,* 3-10.

Messenger, M., Onslow, M., Packman, A., & Menzies, R. (2004). Social anxiety in stuttering: measuring negative social expectancies. *Journal of Fluency Disorders, 29,* 201-212.

Mikkelson, D. P. August 18, 2002. 'Subliminal Advertising.' retrieved from: www.snopes.com/business/hidden/popcorn.htm on: November 30, 2007.

Miller, S., & Watson, B. C. (1992). The Relationship Between Communication Attitude, Anxiety, and Depression in Stutterers and Nonstutterers. *Journal of Speech and Hearing Research, 35,* 789-798.

Molholm, S., Martinez, A., Shpaner, M., & Foxe, J. J. (2007). Object-based attention is multisensory: Co-activation of an object's representations in ignored sensory modalities. *The European journal of neuroscience, 26*(2), 499-509.

Newman, L. L. (1987). The effects of punishment of repetitions and acquisition of "stutter-like" behaviors in normal speakers. *Journal of Fluency Disorders, 12* (1), 51-62.

Pause, B. M., Ohrt, A., Prehn, A., & Ferstl, R. (2004). Positive emotional priming of facial affect perception in females is diminished by chemosensory anxiety signals. *Chemical senses, 29*(9), 797-805.

Pellowski, M. W., & Conture, E. G. (2005). Lexical Priming in Picture Naming of Young Children Who Do and Do Not Stutter. *Journal of Speech, Language, and Hearing Research, 48,* 278-294.

Pesak, J. (1990). Voice production is the result of a reflex process. [Die Stimmbildung ist durch einen Reflexvorgang bedingt] *Folia phoniatrica, 42*(2), 60-63.

Peters**,** H. F. M., & Hulstijn**,** W. (1984). Stuttering and anxiety: The difference between stutterers and nonstutterers in verbal apprehension and physiologic arousal during

the anticipation of speech and non-speech tasks. *Journal of Fluency Disorders, 9,* 67-84.

Przekoracka-Krawczyk, A., & Jaskowski, P. (2007). Perceptual learning can reverse subliminal priming effects. *Perception & Psychophysics, 69* (4), 558-566.

Sato, W., & Aoki, S. (2006). Right hemispheric dominance in processing of unconscious negative emotion. *Brain and Cognition, 62* (3), 261-266.

Schacter, D.L., Wig, G.S., & Steven, W.D. (2007). Reductions in cortical activity during priming. *Current Opinions in Neurobiology, 17* (2), 171-176.

Sheehan, J. G. (1970). *Stuttering: Research and therapy.* New York: Harper & Row.

Skinner, N., & Brewer, N. (2002). The Dynamics of Threat and Challenge Appraisals Prior to Stressful Achievement Events. *Journal of Personality and Social Psychology, 83* (3), 678-692.

Stajkovic, A. D., Locke, A.E., & Blair, E.S. (2006). A first examination of the relationships between primed subconscious goals, assigned conscious goals, and task performance. *Journal of Applied Psychology, 91* (5), 1172-1180.

Trotter, A. (1982). *A normative study of the speech situation checklist for children*. Paper presented at the American Speech-Language and Hearing Association Convention, Washington, DC.

Trotter, A. (1983). *A normative study of the speech situation checklist for children,* Masters Thesis, San Diego State University.

Turley, L. W., & Milliman, R. E. (2000). Atmospheric effects on shopping behavior: A review of the experimental evidence. *Journal of Business Research, 49*(2), 193-211.

Valyo, R. A. Jr. (1971). Skin Potential responses of stutterers and nonstutterers during speech and silence. *Dissertation Abstracts, 32,* 1904B.

Vanryckeghem, M., Hylebos, C., Brutten, G. J., Peleman, M. (2001). The relationship between communication attitude and emotion of children who stutter. *Journal of Fluency Disorders, 26*, 1-15.

Webster, W. G. (1990). Concurrent cognitive processing and letter sequence transcription deficits in stutterers. *Canadian Journal of Psychology, 44* (1), 1-13.

Weinstein, A. M. (1995). Visual ERPs Evidence for Enhanced Procession of Threatening Information in Anxious University Students. *Society of Biological Psychiatry, 37,* 847-858.

Wilkowski, B. M., & Robinson, M. D. (2007). Keeping one's cool: Trait anger, hostile thoughts, and the recruitment of limited capacity control. *Personality and Social Psychology Bulletin, 33*(9), 1201-1213.

Windmann, S., Kruger, T. (1998). Subconscious Dection of Threat as Reflected by an Enhanced Response Bias. *Consciousness and Cognition,* 7 (4), 603-633.

Young, M. A. (1985). Increasing the frequency of stuttering. *Journal of Speech and Hearing Research*, *28,* 282-293.

Table 1.

Mean ± Standard Error by Measure Across Condition (N = 16).

	Baseline	Positive	Negative	Neutral
Heart rate	71.5 ± 2.4	72.6 ± 2.5	73.8 ± 2.6	75.4 ± 2.1
Skin conductance	2.602 ± .408	2.410 ± .351	2.412 ± .358	2.544 ± .395
SAM (E)	3.88 ± .256	3.75 ± .371	4.19 ± .277	3.81 ± .277
SAM (A)	7.69 ± .313	7.19 ± .400	7.13 ± .427	7.69 ± .326
SAM (D)	6.50 ± .354	6.19 ± .379	6.50 ± .387	6.44 ± .365
Stuttered Words	18.9 ± 4.1	15.6 ± 3.0	21.2 ± 2.6	18.0 ± 3.5