EXPOSURE AND VOLUNTARY STUTTERING AS A MECHANISM OF DESENSITIZATION

By

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ABSTRACT

Background: Voluntary stuttering has long been used clinically as a form of desensitization to reduce negative emotional and cognitive reactions to stuttering. However, because previous research has primarily focused on changes in overt fluency, the potential of voluntary stuttering to reduce emotional distress remains unclear.

Methods: This research used a mixed-method design to examine voluntary stuttering via two studies. Study One was a phenomenological qualitative investigation, consisting of semi-structured interviews with adults who stutter. These interviews explored how participants used voluntary stuttering and the emotional changes they experienced. The goal was to provide a better understanding of the relationship between voluntary stuttering and desensitization. Study Two employed a mixed-method approach, combining a quantitative measure of distress and a qualitative interview. Participants were asked to rate their distress during a picture description task, both with and without voluntary stuttering. They were then asked to reflect on their experience during a debrief interview.

Results: The results of both studies provided evidence that voluntary stuttering can facilitate desensitization and thereby reduce emotional distress associated with stuttering. In Study One, participants reported decreased fear, increased comfort, and greater confidence as a result of voluntary stuttering. Study Two supported these findings, mirroring desensitization effects seen during the early stages of other exposure therapies. This supports the notion that voluntary stuttering is a form of exposure therapy. The debrief interviews provided further understanding of the exposure experience. For example, participants reported that voluntary stuttering became easier with time. And, even though some moments of voluntary stuttering turned real, voluntary stuttering made speaking easier overall.

Conclusions: These results indicate that voluntary stuttering is a useful therapeutic intervention for addressing the affective and cognitive aspects of stuttering. Findings contribute to the theoretical understanding of voluntary stuttering, suggesting that it functions similarly to other forms of exposure therapy. Both studies also indicated that the achievement of desensitization through voluntary stuttering was dependent on how the clinician presented the skill and on the individual speaker's ability to tolerate the initial discomfort that accompanied the introduction of voluntary stuttering. Clinicians must be mindful of these factors when incorporating voluntary stuttering into therapy.

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This dissertation is dedicated to the memory of my dad, Bruce Marc Herring, and the memory of my best friend and mentor, Lee Caggiano.

Dad, you made me the person I am today. You taught me to be empathetic and compassionate, to be curious and ask questions, and you made me the writer I am by editing countless papers. I can't believe you didn't get to proofread this one, but I hope I made you proud.

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1.0 INTRODUCTION

Stuttering is a multifactorial condition that includes not only observable characteristics but also affective and cognitive components (Beilby et al., 2012b; Craig et al., 2009; Klein & Hood, 2004; Klompas & Ross, 2004; Koedoot et al., 2011; Yaruss, 2010). Observable characteristics may include overt disfluencies, such as blocks, repetitions, and prolongations, as well as so-called "secondary" characteristics, such as body movements, physical tension, and circumlocution. Affective components may include adverse feelings such as shame, embarrassment, or fear. Cognitive components may include negative thoughts such as, "I am stupid," "No one will want to be my friend," or "I am worthless." While speech therapy often addresses all aspects of the stuttering disorder (Plexico et al., 2005; Yaruss et al., 2002, 2012), there is limited evidence to support the effectiveness of current techniques for reducing the adverse affective and cognitive components of stuttering.

Desensitization is a process used to minimize emotional responsiveness, ultimately reducing adverse thoughts and feelings, or distress. Numerous desensitization techniques have been extensively studied within the field of psychology (Anderson et al., 2013; Baker et al., 2010; Feske & Chambless, 1995; Foa et al., 2005; Foa & Kozak, 1986; Kaczkurkin & Foa, 2015; Lang & Lazovik, 1963; McGrath et al., 1990; Norton & Price, 2007; Opriş et al., 2012; Öst et al., 2004; Parsons & Rizzo, 2008; Paunovic & Öst, 2001; Powers & Emmelkamp, 2008; Rapee et al., 2000; Rothbaum et al., 2000, 2006; Schumacher et al., 2015; Wiederhold & Wiederhold, 2003; Wolpe, 1952, 1958). One specific desensitization technique commonly used within psychology treatment to decrease adverse thoughts and feelings is known as *exposure* therapy (Foa, 2011; Rodebaugh et al., 2004). Exposure therapy is the process of exposing clients to feared stimuli until the adverse emotional response decreases. With repeated exposure, emotional responses are

activated and ultimately become more tolerable through habituation. The new emotional response is incorporated into the association, and the experienced fear is thereby reduced (Foa & Kozak, 1986; Hayes et al., 2008).

Desensitization techniques have also been integrated within stuttering therapy (Healey & Scott, 1995; Murphy, 1999; Murphy, Yaruss, et al., 2007b, 2007a; Murphy & Quesal, 2002; Plexico & Sandage, 2011; Van Riper, 1973; Williams & Dugan, 2002; Yaruss & Reardon, 2002). One method thought to aid in the process of desensitization is *voluntary stuttering* (Brundage & Hancock, 2015; Byrd, Gkalitsiou, et al., 2016; Dayalu et al., 2001; Grossman, 2008; Healey & Scott, 1995; Meissner, 1946; Murphy, Yaruss, et al., 2007b; Sheehan & Voas, 1957; Van Riper, 1973; Yaruss et al., 2018; Yaruss & Reardon, 2002). Voluntary stuttering involves intentionally producing stutter-like disfluencies while speaking. The voluntary stuttering can be effortful, mimicking true moments of stuttering, or it can be struggle-free. Similar to traditional exposure therapy, voluntary stuttering is thought to expose individuals to feared stimuli: the moment of stuttering. The exposure process can be systematic and gradual, presented in a controlled fashion using a hierarchy from easier to more challenging speaking situations, and using different types of voluntary stuttering behavior.

Voluntary stuttering is often taught within stuttering therapy to reduce stuttering-related fears and to increase comfort during the moment of stuttering by allowing opportunities for the individual to normalize stuttering and habituate to the experience of stuttering (Byrd, Gkalitsiou, et al., 2016; Grossman, 2008; Healey & Scott, 1995; Murphy, Yaruss, et al., 2007a; Van Riper, 1973; Yaruss et al., 2018; Yaruss & Reardon, 2002). Few studies have examined the efficacy of this approach, however, prior studies on desensitization and voluntary stuttering have mainly focused on changes in observable fluency (Davidow et al., 2019; Fishman, 1937; Grossman,

2008; Meissner, 1946; Sheehan & Voas, 1957). The value of voluntary stuttering for reducing adverse thoughts and feelings related to stuttering has rarely been studied (Byrd, Gkalitsiou, et al., 2016; Grossman, 2008). Therefore, although voluntary stuttering is widely recommended and commonly used in therapy as a form of desensitization (Byrd, Gkalitsiou, et al., 2016; Healey & Scott, 1995; Meissner, 1946; Murphy, Yaruss, et al., 2007a; Van Riper, 1973; Yaruss et al., 2018; Yaruss & Reardon, 2002), the potential benefits of voluntary stuttering for reducing distress, or adverse affective and cognitive reactions, is largely unknown.

The purposes of these studies are to better understand what people who stutter experience when using voluntary stuttering and to evaluate whether emotional distress associated with stuttering decreases with the use of voluntary stuttering. To address these aims, a qualitative and quantitative mixed-method design was employed. First, in Study One, semi-structured interviews on the topic of voluntary stuttering was conducted with adults who stutter who have previously used voluntary stuttering either through therapy or on their own. Transcripts were thematically analyzed to better understand how voluntary stuttering had been used to aid in the process of desensitization. Second, in Study Two, the effects of voluntary stuttering on the subjective experience of distress were explored as participants were first introduced to voluntary stuttering and asked to voluntary stutter during a picture description task. Participants rated their emotional distress before, during, and after two picture description tasks: *without* voluntary stuttering and *with* voluntary stuttering. Lastly, Study Two participants were interviewed to better understand their experience with voluntary stuttering during the experimental conditions. Results allow for a greater understanding of the experience of voluntary stuttering and how it has been implemented, as well as its role in reducing emotional distress and fostering desensitization to stuttering behavior. Results have been translated to theoretical and clinical applications providing

information that is currently lacking, regarding desensitization methods and the effectiveness of current clinical practices.

2.0 LITERATURE REVIEW

Stuttering is a complex condition that involves disruptions in observable speech fluency as well as broader life consequences, including anxiety, fear, embarrassment, and reduced quality of life (Albach & Benson, 1994; Beilby, 2014; Beilby et al., 2012b; Corcoran & Stewart, 1998; Hood, 2006; Jezer, 2003; Murphy, 1999; Murray, 2001; Reitzes & Reitzes, 2012; St. Louis, 2001; Tichenor & Yaruss, 2019a, 2019b). These broader consequences of stuttering are often addressed in therapy, though at present, relatively little is known about whether or how commonly used approaches actually work to reduce the adverse effects of stuttering on people's lives. The overarching goal of this dissertation is to examine how the clinical technique known as *voluntary stuttering* can be used to reduce the adverse affective and cognitive reactions to stuttering and aid in the process of desensitization. To better understand the potential value of such therapy techniques, it is first necessary to understand the types of affective and cognitive reactions that are commonly experienced by people who stutter.

2.1 AFFECTIVE AND COGNITIVE COMPONENTS OF STUTTERING

Although stuttering is often described in terms of the listener's perception of blocks, repetitions, and prolongations (*ASHA - Stuttering*, n.d.; *NIDCD Fact Sheet - Stuttering*, 2016), overt speech disfluencies represent only part of the overall stuttering condition as commonly experienced by individuals who stutter. Many people who stutter report that the most detrimental aspects of stuttering are the associated feelings of embarrassment, shame, anxiety, fear, anger, helplessness, and decreased quality of life (Albach & Benson, 1994; Beilby, 2014; Beilby et al., 2012b; Corcoran & Stewart, 1998; Hood, 2006; Jezer, 2003; Murphy, 1999; Murray, 2001; Reitzes & Reitzes, 2012; St. Louis, 2001; Tichenor & Yaruss, 2019a, 2019b, 2020). Adverse thoughts and feelings can affect a person's willingness to communicate, as well as their

academic performance, employment options, social life, and overall well-being (Gerlach et al., 2018; Plexico et al., 2019; Tichenor & Yaruss, 2019a, 2020). These adverse thoughts and feelings, often referred to as the affective and cognitive components of stuttering, contribute to the adverse impact on overall quality of life that many people who stutter experience (Beilby et al., 2012b; Craig et al., 2009; Klein & Hood, 2004; Klompas & Ross, 2004; Koedoot et al., 2011; Yaruss, 2010). Because specific adverse affective and cognitive reactions may differ by individual, for this study, the term distress will be used to encompass any negative thoughts and feelings.

Research studies examining the adverse affective and cognitive aspects of stuttering and have demonstrated that adults who stutter often have negative attitudes towards stuttering and communication (McClure & Yaruss, 2003; Quesal & Shank, 1978; Silverman, 1980; Tichenor & Yaruss, 2019a, 2019b; Watson, 1988). For example, Quesal and Shank (1978) compared scores on the S-scale (Erickson, 1969) for 24 men who stutter, 24 men with articulation or voice disorders, and 24 men with no speech, language, or communication disorders. The S-scale consists of 39 true-false statements that have been shown to elicit different responses from people who stutter and people who do not stutter. The 39 items do not directly refer to stuttering but rather to communication attitudes in a general sense. Scores range from 0 to 39, and higher scores indicate more unfavorable judgments about communication. Results showed that people who stuttered had the most negative communication attitude across groups. Likewise, Silverman (1980) studied affective and cognitive reactions of women who stutter by comparing scores on the S-scale from 10 women who stutter, 10 men who stutter, and 10 women who did not stutter. Silverman found that both women and men who stuttered had significantly higher scores

compared to people who did not stutter, revealing that, regardless of sex, people who stutter have more negative attitudes towards their communication

Similar findings of adverse affective and cognitive reactions to stuttering were reported within surveys of adults who stutter. McClure and Yaruss' (2003) survey of 544 adults who stutter who participated in The National Stuttering Association. Out of the adults surveyed, 81% reported avoiding speaking situations, 80% reported that stuttering interfered with school or work, 69% reported feeling embarrassed, nearly 67% reported that stuttering interfered with their social and family life, and 40% reported being denied a job due to stuttering. Tichenor and Yaruss (2019a) surveyed 502 adults who stutter, finding that the majority of participants experienced more negative cognitive-affective reactions to stuttering than positive. Negative reactions that adults who stutter experienced include feeling embarrassed (53.1%), feeling emotionally drained (49%), and feeling ashamed (44.8%). These findings are consistent with other literature showing that people who stutter routinely experience negative thoughts and feelings associated with their stuttering.

2.2 STUTTERING AND ANXIETY: A COMPLICATED RELATIONSHIP

It has long been believed that anxiety plays a significant role in the cause or the experience of stuttering, though prior research has uncovered a range of sometimes contradictory findings (Attanasio, 2000; Craig, 1990; Davis et al., 2007; Messenger et al., 2004; Tran et al., 2011). The American Psychiatric Association's (2013) Diagnostic and Statistical Manual of Mental Disorders-Fifth Edition (DSM-V) has defined anxiety in terms of both General Anxiety Disorder (GAD) and Social Anxiety Disorder (SAD): GAD is an anxiety disorder that lasts at least six months and is characterized by consistent worry and feelings of apprehension, related to everyday events; SAD is persistent anxiety or fear related to *social* interactions. Related social

phobias can include fear of being scrutinized, fear of being negatively evaluated, fear of judgment, or fear of rejection. Different from fear that the general population experiences when confronted with threatening stimuli, a clinical diagnoses of SAD and GAD requires that "anxiety occurs in the absence of danger or when it is out of proportion relative to the actual threat" (Abramowitz et al., 2019; Barlow, 2002; Beck et al., 1985).

Anxiety can be further differentiated as involving either trait anxiety or state anxiety (Spielberger, 1966, 1972). Trait anxiety is often considered a stable characteristic of a person, or the tendency that a person may have to be anxious across situations. Trait anxiety is thought to be stable and not situation dependent. For example, a person may experience an elevated level of anxiety when communicating. Regardless of communication partner and situation, the elevated level of anxiety is consistent. State anxiety, on the other hand, is a "temporary reaction to adverse events" (Saviola et al., 2020) that is situation dependent and often fluctuates given different contexts. For example, a person may experience anxiety when public speaking, but not during other speaking tasks.

There have been mixed findings related to the prevalence of anxiety in people who stutter (Alm & Risberg, 2007; Blumgart et al., 2010; Craig, 1990; Craig et al., 2003; Craig & Tran, 2014; Ezrati-Vinacour & Levin, 2004; Iverach et al., 2009, 2011, 2016; Kraaimaat et al., 2002; Menzies et al., 1999; Messenger et al., 2004; Mulcahy et al., 2008; Tran et al., 2011). While there is a consensus within the stuttering literature that living with stuttering can lead to adverse thoughts and feelings as well as anxiety, it remains debated whether the anxiety experienced by those who stutter is necessarily clinically significant (Blood et al., 1994; Blumgart et al., 2010; Iverach et al., 2009; Kraaimaat et al., 2002; Mahr & Torosian, 1999; Menzies, O'Brian, Onslow, Packman, et al., 2008; Miller & Watson, 1992). Some research has suggested that there is a

direct relationship between stuttering and anxiety. Such studies have supported the ideas that people who stutter have a higher social or trait anxiety compared to people who do not stutter (Blumgart et al., 2010; Craig & Tran, 2014; Ezrati-Vinacour & Levin, 2004; Kraaimaat et al., 2002). Research has also suggested that people who stutter have similar levels of anxiety to those diagnosed with generalized anxiety disorders. Some authors have suggested that anxiety has a causal relationship with stuttering: "elevated social anxiety has been found to be a risk factor for adults who have stuttered" (Tran et al., 2011). Other researchers, however, have provided conflicting evidence, highlighting no significant relationship between stuttering and anxiety: "anxiety's relationship to stuttering is weak and unremarkable" (Attanasio, 2000).

While some people who stutter may experience anxiety due to stuttering, the anxiety symptoms do not necessarily exceed the threshold for clinical significance (Iverach et al., 2009; Mahr & Torosian, 1999). Therefore, clinical anxiety disorders may *not* be more prevalent in people who stutter. It has been well documented that living with stuttering can result in adverse affective and cognitive reactions, as well as elevated levels of anxiety (McClure & Yaruss, 2003; Quesal & Shank, 1978; Silverman, 1980; Tichenor & Yaruss, 2019a; Watson, 1988).

2.2.1 Anxiety in People Who Stutter Versus People Who Do Not Stutter

There have been conflicting findings related to differences in anxiety between people who stutter and people who do not. While there is some evidence of increased trait and social anxiety within people who stutter (Blumgart et al., 2010; Ezrati-Vinacour & Levin, 2004; Kraaimaat et al., 2002), other research indicated that there are no significant anxiety differences between people who stutter and people who do not stutter (Attanasio, 2000; Blood et al., 1994; Cox et al., 1984; Craig & Hancock, 1996; Davis et al., 2007; Hancock et al., 1998; Iverach et al.,

2017; Mahr & Torosian, 1999; Messenger et al., 2015; Miller & Watson, 1992; Molt & Guilford, 1979).

Some research suggests that individuals who stutter have higher levels of anxiety compared to individuals who do not stutter. Kraaimaat, Vanryckeghem, and Dam-Baggen (2002) examined how an anxiety-provoking situation affected the behavior of 89 adults who stuttered and 131 adults who did not stutter using the Inventory of Interpersonal Situations (Van Dam-Beggen & Kraaimaat, 1999). The IIS measures the amount of emotional discomfort experienced in social situations and how often certain social responses occur. Results indicated that, compared to people who did not stutter, people who stuttered had significantly higher levels of emotional discomfort and spoke significantly less in social situations.

Similarly, Ezrati-Vinacour and Levin (2004) and Blumgart, Tran, and Craig (2010) found that adults who stutter have higher anxiety compared to adults who do not stutter. Both studies used the State-Trait Anxiety Inventory (Spielberger et al., 1983) to evaluate the relationship between stuttering and anxiety. Results from both studies indicated that trait anxiety was significantly higher in participants who stuttered compared to participants who did not stutter. Also looking at trait and social anxiety in adults who stutter, Craig and Tran (2014) conducted a meta-analysis. Trait anxiety was studied using relevant data from 19 studies, and social anxiety was examined by analyzing data from 8 studies. Results showed that adults who stuttered exhibited trait anxiety levels one-half standard deviation above those of adults who did not stutter, and social anxiety levels one standard deviation above adults who do not stutter. Based on these results, the authors concluded that adults who stutter have “substantially elevated” trait and social anxiety. While these studies suggest a difference between adults who stutter and

adults who do not stutter, the potential relationship between anxiety and stuttering, the strength, nature, and causality of the relationship remain unclear.

In contrast, Molt and Guilford (1979) found no significant differences between 15 adults who stuttered and 15 adults who did not stutter based on the STAI. Similarly, Miller and Watson (1992) also administered the STAI to 52 adults who stuttered and 52 adults who did not stutter. Results showed no significant between group differences for trait anxiety or state anxiety.

Blood et al. (1994) assessed differences in anxiety levels at baseline, low stress sessions and high stress sessions. During the baseline session, 11 adults who stuttered and 11 adults who did not stutter completed the STAI and the Personal Report of Communication Apprehension (Mccroskey, 1978), which is designed to assess anxiety, fear, and apprehension when speaking. The second session took place one week later during a scheduled "hassle-free day" (p.763). Finally, session 3 occurred during a scheduled high stress day (i.e., a day on which the participant had an exam or an interview or gave a presentation). Results showed that both groups experienced a significant increase in state anxiety from baseline to the high-stress session. However, no significant differences were found between groups for state anxiety, trait anxiety, or communication apprehension.

Results from these studies indicate that both individuals who stutter and do not stutter may experience increased anxiety in high stress situations. However, people who stuttered were *not* more prone to anxiety and did *not* consistently react to situations with higher levels of anxiety than people who did not stutter. Nevertheless, individuals who stutter tend to have more negative communication attitudes (Quesal & Shank, 1978; Silverman, 1980), suggesting that they do experience some type of distress associated with stuttering.

2.2.2 Anxiety as a Consequence of Stuttering

Due to conflicting evidence, it is not possible to assume that people who stutter are more predisposed to experience anxiety. However, anxiety may be a side effect of living with stuttering. To assess this hypothesis, Craig (1990) measured state and trait anxiety before and after therapy. Craig administered the STAI to 102 adults who did not stutter and to 102 adults who stuttered pre- and post-therapy. Pre-therapy, participants who stuttered demonstrated significantly higher state anxiety and trait anxiety compared to participants who did not stutter. Post-therapy, trait anxiety decreased for participants who stuttered, and group differences were no longer significant. State anxiety was not measured post-therapy, so conclusions related to state anxiety cannot be made. This finding can be interpreted that because participants who stutter had higher levels of trait anxiety pre-treatment compared to post-treatment, individuals who stutter are not inherently more prone to clinical anxiety disorders. Rather, the experience of stuttering may lead to feelings of anxiety.

Messenger, Onslow, Packman, and Menzies (2004) measured levels of social anxiety, based on the Endler Multidimensional Anxiety Scales-Trait (Endler et al., 1991), and fear of negative evaluation, based on the Fear of Negative Evaluation Scale (Watson & Friend, 1969), in 34 adults who stuttered and 34 adults who did not stutter. The goal of the study was to distinguish between anxiety that resulted from a social threat versus anxiety that results from a physical threat. Results showed that, compared to adults who did not stutter, adults who stutter had significantly higher scores on the FNE, as well as on two subtests of the EMAS-T related to social evaluation and new situations. Results suggest that people who stutter have a higher expectation of negative social evaluations, particularly in situations where social evaluations are likely to occur (Brundage et al., 2017; Rodgers et al., 2020). However, participants who stuttered

did *not* have increased anxiety in situations without social aspects. This finding could be interpreted as indicating that people who stutter do not inherently have increased trait anxiety but rather the experienced anxiety in social situations is a secondary effect of living with stuttering. Regardless of how these results are interpreted, it is clear that individuals who stutter experience negative emotional responses related to stuttering and communication.

Davis, Shisca, and Howell (2007) examined the hypothesized causal relationship between anxiety and stuttering by comparing state and trait anxiety levels of participants who recovered from stuttering (N=17), persisted with stuttering (N=18), and controls who never experienced a period of stuttering (N=19). Results found no significant differences in trait anxiety between the three groups. However, the persistent stuttering group showed significantly higher state anxiety compared to the recovered and control groups. It is important to note that STAI scores were collected a minimum of one year post-treatment (after recovery was determined), and STAI scores reflect a person's *current* anxiety level. Based on this information, it appears impossible to retroactively deduce the experienced anxiety level of when the recovered group was still stuttering. It is plausible that state anxiety was similar for both the persistent and recovered groups when stuttering was present, suggesting that anxiety is a consequence of stuttering.

State and trait anxiety levels have also been assessed within children and adolescents who stutter. (Blood et al., 2007; Craig & Hancock, 1996; Davis et al., 2007; Rocha et al., 2019). Craig and Hancock (1996) evaluated anxiety levels 96 school-age children who stuttered (9-14 years) and 104 age-matched children who did not stutter using the STAI. Results indicated that children who stuttered were not significantly different than children who did not stutter. This suggests that while children who stutter may experience some adverse feelings related to stuttering, they are not significantly different to children who do not stutter. Importantly, no studies have

investigated potential changes in anxiety longitudinally. One possible interpretation of this finding is that children who stutter are not predisposed to higher levels of trait or state anxiety, suggesting that living with stuttering, rather than an inherent predisposition, may contribute to experiences of anxiety. However, it is also worth considering whether the findings are influenced by the relatively large sample sizes in studies like Craig and Hancock's. Larger samples increase statistical power, which can reduce the likelihood of finding spurious differences but also make it harder to detect subtle, clinically relevant differences. Further research, particularly longitudinal studies with varying sample sizes, is needed to better understand the relationship between stuttering and anxiety.

2.2.3 Clinically Diagnosed Anxiety Within People Who Stutter

In addition to the literature comparing anxiety levels of people who stutter and people who do not stutter, there has been research looking at how people who stutter compare to clinical populations diagnosed with an anxiety disorder. As discussed above, a clinical diagnosis of anxiety requires that the anxiety response is out of proportion compared to the situation (Abramowitz et al., 2019; Barlow, 2002; Beck et al., 1985). Because stuttering related fears are often based on reality (i.e., fearing that you will get hung up on during a phone call), the anxiety response is appropriate to the actual threat and therefore does not meet the criteria of an anxiety disorder. While not necessarily clinically diagnosable, elevated anxiety can be an artifact of living with stuttering. However, there are conflicting findings on how the experienced anxiety for people who stutter compares to populations of individuals who have been diagnosed with a clinical anxiety disorder. For example, Blumgart et al. (2010) reported that the prevalence of SAD within people who stutter can be as high as 85%; however, in that study, the diagnosis of SAD was based solely on a psychiatric *screening* questionnaire, The Psychiatric Diagnostic

Screening Questionnaire (Zimmerman & Mattia, 2001). Per the authors of the PDSQ, the screening questionnaire was only intended to be a diagnostic *aid*, not to diagnose the presence of an anxiety disorder without a full diagnostic evaluation (Zimmerman & Mattia, 2001). Therefore, based on this study, the true prevalence of an anxiety disorder in the population of people who stutter is not known.

In a previously mentioned study of social anxiety, Kraaimaat et al. (2002) found that 50% of their participants who stuttered exhibited scores on the IIS that were comparable to those of "socially anxious psychiatric patients" (p. 319). Similarly, Menzies et al.'s (2008) clinical trial looking at the effects of cognitive-behavior therapy for 30 adults who stuttered found that 60% of participants met the DSM criteria of a social anxiety disorder. Both of these studies found that participants met the criteria for a clinical diagnosis of SAD; however, diagnoses were based on emotional discomfort experienced in social situations, it is unclear if these social situations were considered differently to account for the experiences of people who stutter. A social situation that would be perceived by the general population as "safe" may lead to anxiety for adults who stutter based on past experiences. The experienced anxiety would not be unwarranted or unproportionate to reality. While anxiety is present, it is appropriate based on the situation and therefore would not meet the requirements of a clinical anxiety disorder (Abramowitz et al., 2019; Barlow, 2002; Beck et al., 1985). Because a diagnosis of anxiety requires a *disproportionate* response to a given situation, and people who stutter may have heightened (yet understandable) reactions due to prior negative experiences and societal stigma, a social anxiety disorder cannot be diagnosed by simply the presence of some anxiety or by comparing scores on anxiety measures.

In contrast, Mahr and Torsian (1999) found that people who stutter experience significantly less social distress, avoidance, and fear of negative evaluation compared to people who have been diagnosed with SAD. Similarly, Iverach, O'Brian, et al. (2009) found that on three separate anxiety assessments, scores from adults who stuttered were significantly less than scores from participants with a diagnosed SAD. Thus, clinically diagnosed anxiety was not more prevalent in people who stutter, even though some people who stutter experience discomfort in certain speaking situations due to stuttering.

Clinical levels of anxiety have also been examined with children and adolescents who stutter. Iverach et al. (2016) administered The Spence Children's Anxiety Scale, Child and Parent Report (Nauta et al., 2004) to 75 school-age children who stuttered (7-12 years) and 150 children who did not stutter. The children who stuttered showed significantly higher anxiety scores than the control group, but both groups fell within normal limits.

Blood, Blood, Maloney, Meyer, and Qualls (2007) administered the Revised Children's Manifest Anxiety Scale (Reynolds & Richmond, 2002), which measures physiological anxiety, worry, and social concerns, to 36 adolescents who stuttered and 36 adolescents who did not stutter. Results showed that while the adolescents who stuttered showed significantly higher scores than the control group, both groups fell within normal limits. Messenger et al. (2015) also implemented the RCMAS to study both school-age children who stuttered (6-11 years) and adolescents who stuttered (13-18 years). The RCMAS was administered to 73 children who stuttered (N=23 school-age, N=50 adolescents). Results found that for both school-age children and adolescents who stuttered, RCMAS scores fell within normal limits. Similarly, Iverach et al. (2017) used the RCMAS to study younger adolescents (11-14 years) and older adolescents (15-17 years) who stuttered. Findings were comparable to previous research, showing that both

younger and older adolescent's RCMAS scores fell within a normal range, suggesting that children and adolescents who stutter do not exhibit abnormal levels of anxiety.

There is a consensus within the stuttering literature that living with stuttering can lead to adverse thoughts and feelings as well as anxiety. However, due to the mixed findings, there is not sufficient evidence to claim that people who stutter have clinical levels of anxiety. To summarize the relationship between stuttering and anxiety, several studies have concluded that a characteristic of stuttering is higher levels of trait and social anxiety (Blumgart et al., 2010; Craig & Tran, 2014; Ezrati-Vinacour & Levin, 2004; Kraaimaat et al., 2002). However, there have also been conflicting findings suggesting that the samples were not representative of the general population of people who stutter (Craig et al., 2003) and that experienced anxiety is a consequence of living with stuttering (Craig, 1990; Messenger et al., 2004). There has also been sufficient evidence suggesting no relationship between stuttering and anxiety (Attanasio, 2000; Blood et al., 1994; Cox et al., 1984; Mahr & Torosian, 1999; Miller & Watson, 1992). Furthermore, research studying anxiety in children and adolescents who stutter shows that elevated anxiety levels are not a characteristic trait of people who stutter (Blood et al., 2007; Craig & Hancock, 1996; Davis et al., 2007; Hancock et al., 1998; Iverach et al., 2016, 2017; Messenger et al., 2015; Mulcahy et al., 2008). This provides evidence that, while stuttering *can* have psychological consequences (Beilby et al., 2012b; Craig et al., 2009; Klein & Hood, 2004; Klompas & Ross, 2004; Koedoot et al., 2011; McClure & Yaruss, 2003; Quesal & Shank, 1978; Silverman, 1980; Tichenor & Yaruss, 2019a; Watson, 1988; Yaruss, 2010), it does not originate as a psychological problem, and individuals who stutter do not consistently meet the threshold to be diagnosed with a clinical anxiety disorder.

2.3 TREATMENT OF ADVERSE AFFECTIVE AND COGNITIVE REACTIONS TO STUTTERING

It is widely agreed upon that stuttering is a multi-dimensional disorder and that the affective and cognitive aspects of stuttering can adversely impact quality of life (Beilby et al., 2012b; Craig et al., 2009; Yaruss, 2010). However, there is disagreement on how, or if, to address the adverse thoughts and feelings associated with stuttering (Harris et al., 2002; Jones et al., 2005; Marcotte, 2018; Onslow et al., 1996, 2014; Ryan, 1974). To provide guidance on how to treat and assess speech, language, and communication disorders, The American Speech-Language Hearing Association (ASHA) adapted the World Health Organization's *International Classification of Function, Disability, and Health* (World Health Organization, 2001) to describe the speech-language pathology scope of practice (ASHA, 2016). The ICF is a framework that is used worldwide to describe the human health experience. Use of the ICF can help ensure that assessment and treatment are person centered and account for the overall experiences of people living with stuttering (Tichenor et al., 2022; Tichenor & Yaruss, 2019b; Yaruss, 1998, 2007; Yaruss & Quesal, 2004). The ICF accounts for personal factors (i.e., affective, behavioral, and cognitive components of stuttering), environmental factors, and the ways that activities and participation can be impacted by stuttering. Thus, rather than focusing only on the visible aspects of a disorder (e.g., overt stuttering disfluencies), the ICF specifically highlights the importance of thoughts and feelings related to stuttering.

2.4 ADDRESSING AFFECTIVE AND COGNITIVE REACTIONS BY TREATING OVERT DISFLUENCIES

Although addressing affective and cognitive components of stuttering is specifically outlined within ASHA's scope of practice and highlighted in the ICF, some stuttering therapy approaches do not directly address or measure the affective and cognitive components of

stuttering. One possible explanation for this is older theoretical frameworks that suggest a causal relationship between anxiety and overt stuttering behaviors, or that the way someone thinks and feels about their stuttering is directly related to the number or severity of their overt disfluencies (Harris et al., 2002; Jones et al., 2005; Marcotte, 2018; Onslow et al., 1996, 2014; Ryan, 1974). In this view, “developing speech skills and abilities” is believed to result in “improvements in social, emotional, and other realms” (Marcotte, 2018). Some also believe that attitudes do not need to be directly addressed because "the production of fluent speech alone tends to bring about concurrent changes in anxiety and attitude” (Ryan, 1974). In contrast, research has provided evidence that the severity of overt stuttering disfluencies is *not* related to stuttering impact. Some people stutter more frequently and have little adverse impact on their life. Other individuals display minimal disfluencies but even though stuttering greatly impacts what they say, what they do, and how they feel (Beilby et al., 2012b; Blomgren et al., 2005; Blumgart et al., 2012; Gray & Brutten, 1964; Mulcahy et al., 2008; Sakai et al., 2017). For such individuals, the emotional impact of stuttering might be severe even if the speaker appears to a listener to be fluent and even if overt stuttering behaviors are considered (again, by a listener) to be mild. Regardless of the overt severity, stuttering can be associated with feelings of embarrassment, fear, shame, and anxiety (Blumgart et al., 2012; Douglas & Quarrington, 1952; Douglass et al., 2018; Murphy, Quesal, et al., 2007; Sakai et al., 2017). Therefore, while some research indicates that it is sufficient to address only overt speech behaviors with the hopes of altering the affective and cognitive components of stuttering, there is considerable evidence that overt fluency and the adverse impact of stuttering are *not* directly related. Given that the evidence suggests that the adverse impact of stuttering cannot be reduced by addressing the overt components of stuttering,

exploration of other treatment approaches that more directly address affective and cognitive aspects of therapy is warranted.

2.5 ADDRESSING AFFECTIVE AND COGNITIVE REACTIONS DIRECTLY

There are several ways to address the affective and cognitive aspects of stuttering directly, including Acceptance and Commitment Therapy (ACT), Cognitive Therapy, Behavioral Therapy (involving desensitization), and a hybrid approach: Cognitive-Behavioral Therapy (CBT). ACT is one method that has increasingly been used to reduce negative affective and cognitive reactions to stuttering (Beilby et al., 2012a; Yaruss, 2012; Yaruss et al., 2012). ACT does not directly modify thoughts. Rather, ACT focuses on becoming aware of thoughts, acknowledging the thoughts, and ultimately accepting them. One component of acceptance is for the person to acknowledge their thoughts without judgment. The thoughts are not good or bad; they just are. It is also important for the person to understand that their thoughts are just thoughts, and not necessarily based on reality. Once a person is able to comfortably experience whatever they think and feel, thoughts will be less disruptive in the person's life (Fletcher & Hayes, 2005; Hayes et al., 2006).

Another evidence-based treatment for decreasing adverse thoughts and feelings in people who stutter is CBT (Amster & Klein, 2008; Blomgren, 2013; Kelman & Wheeler, 2015; Menzies et al., 2009; Menzies, O'Brian, Onslow, Packman, et al., 2008; Nicholas, 2015). CBT is a hybrid of both behavioral therapy and cognitive therapy that is designed to directly address adverse thoughts as well as behaviors (Beck, 1976; Rapee et al., 2000). Strict *cognitive* therapy targets adverse beliefs and thoughts. While the ultimate goal of cognitive therapy is often to alter behavior, cognitive therapy reduces emotional responses by focusing on changing a person's beliefs and thoughts. Alternatively, *behavioral* therapy directly targets the feared stimuli and

behavior to ultimately change the adverse feelings and beliefs. CBT combines both cognitive and behavioral therapy approaches and is based on the theory that thoughts, feelings, and behaviors are all interconnected (Beck, 1967, 1976; Ellis, 1957, 1962). Because thoughts, feelings, and behavior affect one another, it is proposed that directly addressing any aspect is effective (Beck, 1967, 1976; Ellis, 1957, 1962).

CBT is one of the most researched and widely used forms of psychotherapy, often used in the treatment of anxiety disorders (David et al., 2018). Meta-analyses studying the effectiveness of CBT on GAD yielded large effect sizes. CBT was repeatedly found to be more beneficial at reducing anxiety symptoms than waitlist, no therapy, placebo, and nonspecific therapy such as support (Butler et al., 2006; Covin et al., 2008; Hofmann et al., 2012). CBT has also been found to be beneficial in reducing negative thoughts, feelings, and behaviors with people who stutter (Amster & Klein, 2008; Blomgren, 2013; Kelman & Wheeler, 2015; Menzies et al., 2009; Menzies, O'Brian, Onslow, Packman, et al., 2008; Nicholas, 2015). Menzies et al. (2008) studied thirty adults who stuttered, divided into either an experimental group that received CBT and training in a prolonged speech technique or a control group that received only training in the prolonged speech technique. The 15-hour CBT program consisted of cognitive therapy (identifying and modifying maladaptive thoughts) and exposure therapy (gradually confronting anxiety-producing stimuli). At the 12-month follow-up, participants who received CBT displayed significant improvements compared to the control group in numerous psychological measures that revealed reductions in fear, anxiety, and avoidance behaviors. Because of the nature of CBT, and that it addresses both the cognitive and behavioral aspects of stuttering, it is impossible to conclude if the reductions in emotional responses were due to the exposure therapy, the therapy focusing on maladaptive beliefs, or both.

Similar to findings within the psychology literature and treatment of other disorders (Butler et al., 2006; Gould et al., 1997; Kaczkurkin & Foa, 2015; Magill et al., 2019; Norton & Price, 2007; Rodebaugh et al., 2004; van Dis et al., 2020), CBT appears to be effective in minimizing adverse thoughts and feelings related to stuttering. CBT resulted in changes to cognition and affect, but increased speech fluency was *not* observed. This reinforces that by directly addressing negative reactions, adverse thoughts and feelings can be minimized.

2.5.1 Desensitization

One component of behavioral therapy, and therefore usually used within CBT programs is Desensitization. Desensitization is the process of minimizing emotional responsiveness through exposure, with the goal of ultimately reducing adverse thoughts and feelings. By itself, desensitization is not a tool that is used within strict cognitive therapy, for it does not specifically address thoughts and feelings. However, desensitization *alone* has been found to be equally as effective in reducing adverse thoughts, feelings, and behaviors compared to cognitive therapies that directly addresses thoughts and feelings (Öst et al., 2004). Desensitization relies on classical conditioning and the belief that fears and adverse reactions can become paired with neutral stimuli. The concept of classical conditioning was first introduced in the psychology literature (Pavlov, 1902), and then expanded upon by John Watson (1913; 1920). Pavlov and Watson explained that an innate response could become associated with a neutral stimulus, given exposure. In his widely known study, Pavlov demonstrated this concept when he classically conditioned dogs to salivate in response to a bell. Pavlov used a neutral stimulus (a bell), an unconditioned stimulus (meat powder), and an unconditioned response (salvation), to create a conditioned stimulus (the bell), and a conditioned response (salvation). The unconditioned stimulus (meat powder) reliably produced a salvation response without any conditioning. Given

the presence of the unconditioned stimulus (meat powder), an innate, reflexive, unconditioned salvation response occurred. When this unconditioned response is elicited in the presence of the neutral stimulus (the bell), it results in an association. The neutral stimulus (the bell) becomes paired with salvation response and produces a conditioned response, similar to the reaction elicited by the unconditioned response. In other words, after conditioning, the bell alone results in salvation without the presence of meat powder (Pavlov, 1902; Watson, 1913).

Brutten & Shoemaker (1967) and other authors applied the model of classical conditioning to stuttering, to explain how stuttering-related fears can be viewed as conditioned responses to conditioned stimuli. Specifically, they hypothesized that it is possible for a person to stutter with no negative emotional reactions. In such a situation, stuttering may feel easy, with no apparent frustration or excess struggle. When the idea of stuttering does not elicit fear, anxiety, or any adverse emotional response, then stuttering would be considered a neutral stimulus. In contrast, if a person who stutters gets stuck in a particularly difficult moment of stuttering (unconditioned stimulus), this may provoke the involuntary reaction of embarrassment, fear, or shame. This reliable emotional response would be considered an unconditioned response. As the unconditioned stimulus of feeling "stuck" or the inability to produce speech occurred while stuttering, any moments of stuttering could become associated with the adverse emotional response. At that point, the once-neutral stimulus (stuttering) becomes a conditioned stimulus that evokes the conditioned response of embarrassment, fear, or shame. Following this example, many situations, environments, sounds, words, or even communication in general, can become classically conditioned to elicit negative responses, and through repeated experiences, the conditioned emotional responses would spread to and affect many aspects of a person's life (Brutten & Shoemaker, 1967).

Desensitization is one method for reducing these conditioned emotional responses. The mechanism involves repeated exposure to a feared stimulus or experience such as confronting one's fear of insects or heights by purposely encountering them numerous times until one can habituate and the fear response is no longer present (Foa & Kozak, 1986; Rapee et al., 2000; Wolpe, 1952, 1958). For people who stutter, desensitization can be accomplished by talking openly about stuttering, exploring moments of stuttering, "deawfulizing" stuttering by having fun (Murphy, Yaruss, et al., 2007a), and by meeting other people who stutter (Byrd, Chmela, et al., 2016; Gerlach et al., 2019; Herring et al., 2022). For example, speakers may be encouraged to learn more about stuttering in general and about what stuttering feels like for them (both physically and emotionally). The act of learning about stuttering encourages the individual to confront stuttering while becoming more comfortable. Speakers may also explore moments of stuttering by purposely prolonging a moment of stuttering to increase awareness and gain a better understanding what they are doing with their speech mechanism during a moment of stuttering. Having fun with stuttering, such as being rewarded during stuttering contests rather than viewing stuttering as taboo or a wrong way of talking, allows the individual to alter their relationship with stuttering. Additionally, people who stutter may find it desensitizing to learn about or meet other people who stutter. Gaining support in this manner and seeing that they are not alone can make stuttering feel less uncomfortable and isolating. The fundamental principle involved in all of these various desensitization activities is to change one's experience and reaction to stuttering. Rather than stuttering eliciting discomfort or distress, an individual can learn to tolerate and make stuttering a more neutral stimulus.

2.5.1.1 Reciprocal Inhibition

One method that was historically used to achieve desensitization is reciprocal inhibition (Borkovec, 1972; Davison, 1968; Rachman, 1967; Wolpe, 1952, 1958, 1961). Made popular by Joseph Wolpe in the 1960s, reciprocal inhibition is the process of eliciting an anxiety-inhibiting response in the presence of anxiety-producing stimuli (Wolpe, 1961). Reciprocal inhibition relies on the assumption that a person cannot be simultaneously relaxed and anxious. To ensure a relaxed state while the conditioned stimulus is presented, relaxation exercises, hypnosis, or drugs were used to counteract the elicited anxiety (Borkovec, 1972; Davison, 1968; Lader & Mathews, 1968; Wolpe, 1958, 1961, 1968). Intentionally eliciting an anxiety inhibitory response (i.e., relaxation) during a conditioned fearful situation was hypothesized to weaken the association between the conditioned stimuli and the unconditioned response. This would then result in a decrease in the experienced anxiety (Wolpe, 1968). Similar to reciprocal inhibition, in which the participant is directly exposed to anxiety-provoking stimuli, imaginal reciprocal inhibition has the person *imagine* the feared stimuli (e.g., *visualizing* coming in contact with a snake) while eliciting an anxiety inhibitory response (e.g., a relaxation exercise). Reciprocal inhibition was typically implemented systematically, slowly exposing the participant to feared conditioned stimuli until he or she could tolerate the stimuli without an anxiety response. This procedure was then repeated with each level on a hierarchy from easier situations that were less likely to evoke anxiety to harder situations that were more likely to evoke anxiety until no fear-evoking conditioned stimuli remained (Borkovec, 1972; Wolpe, 1958, 1961, 1968).

Reduction of a wide range of fears has been observed after the completion of systematic reciprocal inhibition treatment programs (Borkovec, 1972; Davison, 1968; Jones, 1924; Lazarus, 1961). For example, Borkovec (1972) examined the effectiveness of imaginal systematic

reciprocal inhibition in reducing anxiety related to contact with a snake. To measure changes in anxiety, researchers collected data on pulse rate and skin conductance, as well as subjective reports. The imaginal reciprocal inhibition protocol consisted of imagery practice, relaxation training, and working through an 18-item hierarchy related to approaching a snake. Analyses revealed that imaginal reciprocal inhibition produced a statistically larger reduction in pulse rate compared to no therapy. Decreased pulse rate is associated with decreased sympathetic nervous system arousal, which indicates visceral states such as fear and stress. Significant changes were also observed in skin conductance following repeated exposure to items on the fear hierarchy. Greater skin conductance was observed during the first presentation of an item compared to after multiple presentations of the same item. In addition, significant differences were seen with skin conductance as the fear hierarchy progressed, suggesting decreased arousal of the sympathetic nervous system. These findings suggest that a reduction in anxiety can be seen after repeated exposure to the same stimuli and after repeated practice with reciprocal inhibition. Significant changes were not observed in the self-reported, subjective measure. However, it was reported that the use of imaginal systematic desensitization "tended to produce decreases in self-reported fear" (Borkovec, 1972).

2.5.1.2 Reciprocal Inhibition With People Who Stutter

Systematic reciprocal inhibition has been attempted with people who stutter (Boudreau & Jeffrey, 1973; Brady, 1968; Brutten & Shoemaker, 1967; Lanyon, 1969; Tyre et al., 1973). In the vast majority of the studies conducted thus far, the specific purpose of the reciprocal inhibition exercise was to reduce the frequency of stuttering behaviors. Researchers repeatedly presented conditioned stimuli (e.g., visualizing an anxiety-producing speaking situation) *without* the presence of the conditioned response (e.g., anxiety), until the association was extinguished. To

ensure the absence of the conditioned response, relaxation, drugs, and hypnosis were used, similar to the procedures implemented in the psychology literature. For example, Brady (1968) proposed that adverse thoughts and feelings are causally related to a person's degree of fluency, causing a "vicious circle of anxiety and disfluency" (Brady, 1968). Brady hypothesized that if anxiety were reduced, then observable stuttering behaviors would also reduce. This could be interpreted that anxiety elicited by speaking situations must be treated alongside overt disfluencies. To reduce the overt stuttering disfluencies, Brady employed a behavioral modification program consisting of speaking in a slow, relaxed manner, combined with the use of an electronic metronome in a study involving six adults who stuttered. To reduce stuttering-related anxiety, an imaginal reciprocal inhibition protocol was used. Participants created personalized hierarchies of speaking situations that elicited anxiety ranging from "minimal anxiety" to "intense anxiety" (Brady, 1968). The subjects were then put into a tranquil state through the use of relaxation strategies and/or an injection of methohexital sodium, and visualization was used to replicate feelings of anxiety. After the completion of the study, three of the six subjects exhibited increased fluency within the laboratory setting. With the aid of the relaxed state, anticipated anxiety was reportedly deconditioned, but because of the hypothesized relationship between anxiety and fluency, direct anxiety levels were not measured or reported. Furthermore, due to natural variability seen in stuttering, it is possible that changes in fluency were random and had no relation to anxiety.

Both Lanyon et al. (1969) and Tyre et al. (1973) conducted case studies looking at changes in fluency following imaginal reciprocal inhibition. Both studies used similar methodology, studying adults who stutter who reported having high levels of stuttering-related anxiety. Standardized measurements of stuttering severity and emotional impact, number of

disfluencies, and rate of speech were completed both pre- and post-treatment. While degree of fluency was measured in both studies, no stuttering management techniques were taught. Instead, participants created fear hierarchies and were trained in deep muscle relaxation (Gregory, 1968; Jacobson, 1938). The participants were asked to visualize increasingly feared situations as they implemented deep muscle relaxation and maintained a relaxed state. In Tyre et al.'s (1973) study, post-treatment results showed a decrease in speaking rate and stuttering frequency, as well as a slight improvement in speech-related attitudes, though the data for this part of the study were based on clinician judgments not speaker self-reports. In Lanyon's (1969) study, post-treatment results revealed a statistically significant decrease in overt stuttering disfluencies. Similar to previous research, both studies failed to assess speaker attitudes or changes in experienced anxiety, making it impossible to evaluate if reciprocal inhibition had any effect on anxiety.

Imaginal reciprocal inhibition was also implemented by Boudreau and Jeffrey (1973), who studied 12 adolescents/young adults who stutter ranging from 16 to 22 years of age. Eight subjects were randomly selected to receive 12 therapy sessions in which they created personalized hierarchies of anxiety-provoking situations. The subjects were then taught relaxation strategies and practiced maintaining their relaxed state while imagining a feared situation. Five of the eight subjects in the experimental group showed increased fluency when comparing percentage of words stuttered pre- and post-treatment. Significant differences were seen across time and between groups. Consistent with the previous studies, only overt fluency was measured, so it remains unclear if systematic reciprocal inhibition affected experienced anxiety, adverse thoughts, or adverse feelings. Furthermore, these studies all implemented *imaginal* reciprocal inhibition. Because all situations were imagined within the laboratory, and

the individuals did not actually speak in feared situations, it is possible that observed fluency changes were a result of increased comfort in the assessment situation.

Gray and England (1972) conducted a study that measured both changes in anxiety and fluency. It was reported that "reciprocal inhibition procedures" (Gray & England, 1972) were administered, but the specific procedures were not specified. Fifteen adults who stutter were treated using reciprocal inhibition over the course of six months. Levels of fluency and anxiety were measured at four time points over the course of treatment. Stuttering frequency was measured during an oral reading task, while anxiety was measured using two standardized assessments, the Willoughby Neurotic Tendency Inventory (Willoughby, 1934) and Eysenck Personality Inventory (Eysenck & Eysenck, 1964) as well as skin conductance levels. Results showed a significant reduction in stuttering disfluencies between time point 1 and time point 4. However, the majority of fluency gains were seen between time point 1 and time point 2, and no statistically significant fluency difference was observed between time point 2 and time point 4. Related to anxiety, results on the EPI showed a significant reduction in anxiety between time point 1 and time point 4, as well as between time point 3 and time point 4. No significant changes were observed on the Willoughby. Measurements of skin conductance revealed significant reductions between time point 1 and time point 4, suggesting decreased arousal of the sympathetic nervous system, which is related to emotional arousal such as fear (Dawson et al., 2017; Nesse et al., 1985). Given these results, Gray and England (1972) interpreted the potential relationship between fluency and anxiety. From time point 1 to time point 4, there was no significant change in frequency, but there *was* a significant change in anxiety. Based on this comparison, it was concluded that fluency and anxiety were not directly related. This finding provides evidence of why only measuring fluency is not sufficient, and anxiety measurements

are critical for assessing the effectiveness of systematic desensitization. Similar to previously discussed studies implementing reciprocal inhibition, the entire study was conducted within the laboratory and there was no control group. Because of these limitations, it is possible that the observed changes in anxiety were a result of adjusting to the research setting.

Few studies have strictly measured changes in the affective and cognitive components of the stuttering disorder. Because there is no clear relationship between severity of overt stuttering behaviors and a person's thoughts and feeling (Beilby et al., 2012b; Blumgart et al., 2012; Gray & Brutten, 1964; Mulcahy et al., 2008; Sakai et al., 2017), or anxiety and stuttering (Alm, 2014; Attanasio, 2000; Blood et al., 1994; Cox et al., 1984; Craig & Hancock, 1996; Davis et al., 2007; Hancock et al., 1998; Iverach et al., 2009, 2017; Mahr & Torosian, 1999; Messenger et al., 2015; Miller & Watson, 1992; Molt & Guilford, 1979), definitive conclusions cannot be drawn about affective and cognitive changes based on overt fluency levels. Beyond the fact that the reciprocal inhibition studies with people who stutter mainly looked at changes in fluency, the integral theory within reciprocal inhibition is that there must be an anxiety inhibitory response in the presence of anxiety-producing stimuli. A relaxed state must be maintained while the person imagines or experiences the feared stimuli in order to disassociate the conditioned response.

Later work revealed that exposure to conditioned stimuli alone could reduce the conditioned response *without* relaxation or the introduction of an anxiety inhibitory response (Cooke, 1968; Dawson & McMurray, 1978; Gillan & Rachman, 1974; Marshall et al., 1972; McGlynn et al., 1981; Waters et al., 1972). When comparing desensitization with relaxation and desensitization without relaxation, there were no significant differences in anxiety reduction (Cooke, 1968). This finding disproved Wolpe's hypothesis that reciprocal inhibition was the mechanism behind minimizing anxiety and that feelings related to anxiety must be counter-

conditioned by relaxation (Wolpe, 1958, 1981). Rather, it appeared that exposure to conditioned stimuli was the active ingredient in reducing anxiety. After these conflicting findings emerged, reciprocal inhibition fell out of favor in therapy, and other methods of reducing negative reactions were emphasized. Exposure to conditioned stimuli *without* an anxiety-inhibitory response is known as *exposure* therapy.

2.5.1.3 Exposure Therapy

Exposure therapy is a form of behavioral therapy that requires a person to repeatedly confront a feared stimulus *without* the anxiety-reducing strategies used in reciprocal inhibition, until the adverse response is reduced or eliminated (Abramowitz et al., 2019; Barlow, 2002; Carl et al., 2019; Foa, 2011; Foa & Kozak, 1986; Norton & Price, 2007; Öst et al., 2004; Rodebaugh et al., 2004). Like reciprocal inhibition, exposure therapy is typically conducted systematically, following a methodical process that involves a hierarchy of ranked, feared situations or conditioned stimuli. Unlike reciprocal inhibition, systematic exposure therapy does *not* involve eliciting an anxiety-inhibitory response through medication or relaxation. Rather, exposure therapy reduces the emotional response by demonstrating that increasingly difficult moments can be tolerated. The anxiety-evoking stimuli are introduced methodically, ensuring that the client can experience the feared stimuli, confront the anticipated response, and observe how the anxiety decreases with time (Foa & Kozak, 1986).

Contrasting the gradual nature of systematic exposure therapy, exposure therapy can also be implemented with intense prolonged exposure to the feared stimulus; this is known as *flooding*. Rather than using a hierarchy and working up to the most feared stimuli or situations, the person confronts their most feared stimuli and tolerates the discomfort until the distress diminishes or they can no longer withstand the discomfort (Marks, 1973; Marks et al., 1971).

Systematic desensitization is often preferred over flooding because it allows the person to slowly approach conditioned stimuli. With flooding, there is the risk that the person will begin the exposure but then not be able to continue due to extreme discomfort, ultimately reinforcing the conditioned response (Ewert, 1986; Pitman et al., 1991; Rachman, 1966).

Exposure therapy can be accomplished using imaginal techniques, *in vivo* (Bakker et al., 1998; Koerner & Fracalanza, 2012; van Balkom et al., 1997), or in virtual reality environments (Opriş et al., 2012). Imaginal exposure uses visualization, thoughts, and memories to expose the person to feared stimuli. *In vivo* exposure uses real-life exposure, in which participants interact with actual people, objects, and stimuli, in the environment. Virtual reality allows the participant to feel they are interacting with actual people, objects, and stimuli, without actually being in the environment. Each method of exposure therapy can be beneficial depending on the individual, their current level of fear, and accessibility to physical stimuli or virtual reality hardware.

2.5.1.3.1 Theoretical Explanations of Exposure Therapy

The inhibitory learning model is a theoretical framework to describe the mechanics of exposure therapy. According to the inhibitory learning model, exposure therapy relies on corrective learning and memory to achieve extinction of adverse emotional responses and to decondition stimuli (Craske et al., 2008, 2014). For feared stimuli to be deconditioned, one must repeatedly experience a mismatch between the feared stimulus (e.g., snakes) and the occurrence of the feared outcome (e.g., being bitten by the snake). Assuming that most snakes do not typically bite people, the person can collect conflicting evidence for their fear and begin to consider a more realistic outcome. This helps to create an inhibitory relationship between the feared stimulus (snakes) and the unconditioned stimulus (e.g., fear) so that the unconditioned stimulus no longer triggers an adverse emotional response.

Unlike the inhibitory learning model, the Emotional Processing Theory (EPT) is a theoretical framework that does not assume that feared conditioned stimuli are due to unlikely anticipated negative outcomes. The goal of EPT is *not* to solely find conflicting evidence and extinguish the fear. Rather, EPT proposes that habituation or decreased reactivity to feared stimuli is the mechanism of exposure therapy (Foa & Kozak, 1986; Foa & McNally, 1996; Rachman, 1980). With repeated and prolonged exposure, conditioned and innate reactions become tolerable and ultimately lessen. EPT suggests that exposure therapy first activates the perception of a feared stimulus, referred to as a fear structure. Once the fear structure is activated, new conflicting reactions can be integrated (Foa & Kozak, 1986). For example, a fear structure for snakes might be that snakes bite people. This is reinforced when seeing a snake (feared stimulus) is followed by fear (adverse emotional response). However, with repeated exposure, habituation occurs, and seeing a snake is experienced with a reduction of fear. EPT suggests that in order to experience a reduction in fear, the fear structure must be activated and experienced (e.g., seeing a snake), and new information, gained from habituation (e.g., increased comfort), must be incorporated into the structure. A new structure then forms resulting in a reduction of fear.

2.5.1.3.2 Theoretical Explanations of Exposure Therapy Related to Stuttering

One main difference between the inhibitory learning model and EPT is the likelihood of the anticipated outcome. The inhibitory learning model assumes that there will be a mismatch between the feared stimulus (e.g., stuttering) and the occurrence of the feared outcome (e.g., feeling embarrassed). Conflicting evidence can then be collected to disprove the feared outcome and reduce distress. However, the anticipated outcome (e.g., embarrassment) is plausible for

people who stutter. Therefore, there may *not* be a discrepancy between the anticipated outcome and reality, making it impossible to collect conflicting evidence.

EPT, however, does not require collecting conflicting evidence. Rather than convincing themselves that stuttering is not embarrassing, the goal is to normalize stuttering and habituate to the experience of stuttering. With repeated and prolonged exposure to stuttering, conditioned and innate reactions (e.g., embarrassment) become tolerable and ultimately lessen. As stuttering becomes normalized, and the person habituates to the feeling associated with stuttering, it does not trigger an adverse emotional response. The integration of these novel reactions results in a new structure that does not include the adverse emotional response to the stimulus.

2.5.1.4 Exposure Therapy With People Who Do Not Stutter

Within the psychology field, exposure therapy has been successfully implemented to reduce conditioned anxiety responses related to phobias and anxiety disorders (Anderson et al., 2013; Baker et al., 2010; Feske & Chambless, 1995; Kaczkurkin & Foa, 2015; Lang & Lazovik, 1963; McGrath et al., 1990; Meyerbröker & Emmelkamp, 2010; Norton & Price, 2007; Opriş et al., 2012; Öst et al., 2004; Parsons & Rizzo, 2008; Powers & Emmelkamp, 2008; Rothbaum et al., 2000, 2006; Schumacher et al., 2015; Triscari et al., 2015; Wiederhold & Wiederhold, 2003). In a large meta-analysis of 33 studies (Wolitzky-Taylor et al., 2008), therapy programs that included exposure therapy were found to be more effective than non-exposure treatments, placebos, and no treatment. Exposure therapy has also been compared to CBT with an exposure component and is equally as effective in reducing adverse thoughts and feelings such as social anxiety and fear (Feske & Chambless, 1995; Foa et al., 2005; McLean et al., 2001; Norton & Price, 2007; Paunovic & Öst, 2001). Given that similar results were found using exposure therapy *with and without* cognitive therapy components, it appears that exposure therapy is the

active ingredient responsible for the reduction in anxiety. Exposure *alone* is equally as effective in reducing adverse thoughts, feelings, without directly addressing thoughts and feelings (Öst et al., 2004; Wolitzky-Taylor et al., 2008).

Exposure therapy to reduce anxiety has also been conducted using virtual reality (VR; (Anderson et al., 2003, 2013; Parsons & Rizzo, 2008; Powers & Emmelkamp, 2008). Research comparing the effectiveness of VR exposure and *in vivo* exposure suggests that both exposure methods are equally effective and that either type of exposure therapy is more effective at reducing anxiety than no exposure at all (e.g., waitlist groups) (Emmelkamp et al., 2001, 2002; Krijn et al., 2004; Rothbaum et al., 1995, 2000). Unfortunately, most strictly *in vivo* studies have not specifically studied the effectiveness of exposure therapy by itself. Rather, research has focused on treatment packages and CBT programs that include exposure therapy as just one component of a broader approach (Gould et al., 1997). Öst et al. (2004) compared the effectiveness of CBT and isolated exposure therapy in 73 participants diagnosed with agoraphobia. Agoraphobia is an anxiety disorder where situations are feared due to the potential of feeling embarrassed, trapped, or helpless. Weekly, individual, sessions were conducted consisting of either in vivo exposure therapy or CBT compared to a waitlist control group. Within the exposure therapy group, participants created a fear hierarchy and systematically confronted feared situations with the company of a therapist. Weekly homework assignments consisted of repeating exposures that were completed in therapy. Because this group involved only exposure, cognitions were not directly addressed. If maladaptive thoughts were mentioned by the participant, the therapist only listened passively and directed the conversation back to the exposure experience. Within the CBT group, an identical in vivo exposure procedure was administered, but cognitive therapy was simultaneously administered. In this study, the cognitive

therapy consisted of identifying maladaptive thoughts and then disputing the irrational cognitions through open-ended probing questions (Neenan, 2009; Padesky, 1993). Maladaptive thoughts and evidence supporting the current beliefs were challenged after the completion of exposure therapy experiences. Results on numerous anxiety, depression, fear, quality of life, and social adjustment assessments showed significant improvements after *either* exposure only or exposure-plus-CBT programs, as compared to the control group. These improvements were maintained at a 1-year follow-up. These results suggest that CBT plus exposure and exposure-only treatments are equally effective in reducing anxiety, reducing fear, and improving quality of life. While the exposure-only treatment was strictly behavioral therapy and did not directly address maladaptive thoughts or dispute cognitions, similar outcomes were observed. This provides evidence that exposure-only treatment is sufficient for reducing anxiety and fears. Similar results have been found with phobias in various populations including PTSD, fear of needles, flying, and spiders (Arroll et al., 2017; Cardoş et al., 2017; Kothgassner et al., 2019; McDonnell-Boudra et al., 2014; Powers & Emmelkamp, 2008).

2.5.1.5 Exposure Therapy With People Who Stutter

The potential value of exposure-based desensitization therapy has been widely discussed in the stuttering literature (Healey & Scott, 1995; Murphy, 1999; Murphy, Yaruss, et al., 2007a, 2007b; Murphy & Quesal, 2002; Plexico & Sandage, 2011; Van Riper, 1973; Williams & Dugan, 2002; Yaruss & Reardon, 2002). Despite the literature encouraging the use of exposure therapy with people who stutter, there has been extremely limited research evidence supporting traditional exposure therapy (i.e., without anxiety-reducing relaxation, hypnosis, or drugs) with people who stutter (Menzies, O'Brian, Onslow, Packman, et al., 2008). There have been a handful of published empirical studies examining traditional exposure therapy for people who

stutter without the addition of cognitive therapy (CBT) (Brundage et al., 2006, 2016; Brundage & Hancock, 2015; Scheurich et al., 2019). Scheurich et al. (2019) created a therapy protocol to isolate the component of exposure therapy and evaluate its effectiveness for people who stutter. Six adults who stutter received 10 exposure therapy sessions. To maintain consistency across participants, individualized hierarchies were not created. Rather, all participants were asked to read a script to an audience of 3-6 adults. It was assumed that speaking in front of an audience would be fear-evoking for the participants. Anxiety was measured using a Daily Behavioral Rating (DBR) scale created by the authors of the study (ranging from 0 to 10, reflecting no anxiety to very high anxiety). Scheurich et al. also administered the Social Phobia and Anxiety Inventory (Turner et al., 1989) to participants (before and after therapy). The affective, behavioral, and cognitive components of stuttering were measured using the Behavior Assessment Battery for Adults (Vanryckeghem & Brutten, 2018). After exposure therapy, average DBR scores decreased below baseline levels for 5 of the 6 participants. These results remained consistent when measured 6 months after the conclusion of treatment. On average, SPAI scores also decreased with exposure therapy and remained lower than baseline levels 6 months post therapy. BAB scores remained fairly consistent over the course of the exposure therapy. The only noticeable change was observed in the behavior checklist that identifies behaviors associated with avoiding stuttering. While statistical tests were not run and significance was not calculated, results suggest that there was an overall reduction in anxiety and an improvement in the affective and cognitive components of stuttering after exposure therapy. These promising preliminary findings suggest that traditional exposure therapy is effective in minimizing emotional responses for people who stutter.

There were three additional studies that incorporated exposure within the methods (Brundage et al., 2006, 2016; Brundage & Hancock, 2015). While the sole focus of each study was not to examine exposure therapy, participants were ultimately (virtually) exposed to speaking situations, consistent with methods used within exposure therapy research. For example, in both Brundage et al. (2016) and Brundage and Hancock (2015) ten adults who stutter were asked to give four-five minute speeches in front of either a virtual audience or a live audience. Because both study objectives were not directly related to exposure therapy, results related to changes in distress before, during, and after the virtual speeches were not reported. However, reported results did suggest that speaking apprehension ratings were similar for virtual and live audiences, and participants had significantly higher subjective and objective distress levels when presenting in front of a virtual audience compared to an empty virtual room. These studies provided a foundation for exposure-type methods for people who stutter.

Despite the limited empirical data studying the effectiveness of exposure therapy for people who stutter, exposure-based desensitization is widely used clinically within stuttering therapy (Healey & Scott, 1995; Murphy, 1999; Murphy, Yaruss, et al., 2007a, 2007b; Murphy & Quesal, 2002; Plexico & Sandage, 2011; Van Riper, 1973; Williams & Dugan, 2002; Yaruss & Reardon, 2002). Nevertheless, additional research is necessary to ensure that stuttering therapy is consistent with the tenets of evidence-based practice (EBP), and to verify that speech-language pathologists are proving the best possible care in line with EBP. More research is needed to see if exposure therapy can impact the affective, behavioral, and cognitive aspects of stuttering.

2.5.1.6 Voluntary Stuttering

One clinical technique used to achieve exposure-based desensitization is voluntary stuttering. Voluntary stuttering, also referred to as pseudostuttering, intentional stuttering,

bouncing, or negative practice (Dunlap, 1932; Gregory, 2003; Guitar, 2019; Ham, 1990; Ingham, 1984; Manning & Dilollo, 2018; Nicholas, 2015; Sheehan, 1970; Sheehan & Voas, 1957; Van Riper, 1973), allows the client to deliberately exhibit observable stuttering or stuttering-like behavior. This exposes themselves to at least some part of the feared stimulus, similar to exposure therapy, "diminishing the fear he has learned to have of stuttering" (Gregory, 1972).

The intent of any type of voluntary stuttering is to purposely produce stuttering-like behaviors. When doing so, speakers are attempting to remain in control of their speech, and they also are able to select how and when voluntary stuttering will be used. Voluntary stuttering may *sound* like stuttering to the listener, but the speaker is aware that the behavior is not true stuttering. Voluntary stuttering creates the surface behaviors that typically accompany stuttering in an intentional manner. Because stuttering is more than observable disfluencies (Tichenor & Yaruss, 2019b), voluntarily producing stuttering-like disfluencies is not a true moment of stuttering and it will likely not be associated with the sensation of loss of control[1] (Martin & Haroldson, 1986; Perkins, 1983, 1984, 1990) or result in the reaction of frustration. This form of "stuttering," when the person is voluntarily doing it, often makes it easier for the person to stay present in the moment of "stuttering."

2.5.1.6.1 Types of Voluntary Stuttering

Since the 1940s, three types of voluntary stuttering have been discussed. Clinicians at The University of Iowa introduced the "bounce", "an easy, obvious repetition of the first sound of the word until the word is said without tension" (Meissner, 1946). Later, Sheehan introduced

[1] In this paper, "voluntary stutter/ing" will be used as a verb to describe the act of voluntary stuttering. For example, "the participant will voluntary stutter." Because stuttering is associated with the sensation of loss of control, the term "voluntary stuttering" is different than "voluntarily stuttering. "Voluntary stutter" will be used when describing the act of purposely producing stuttering-like disfluencies. "Voluntarily stutter" would be purposely trying to experience the sensation of a loss of control.

the “slide” (1975), a tension-free prolongation of the first sound. Because both the bounce and slide are low-tension versions of stuttering that do not feel or sound like a true moment of stuttering, they will be discussed in this paper as forms of “struggle-free voluntary stuttering.” Struggle-free voluntary stuttering is a tension-free, easy sound repetition or sound prolongation and does not coincide with secondary struggle behaviors (Brundage & Hancock, 2015; Davidow et al., 2019; Dayalu et al., 2001; Grossman, 2008; Meissner, 1946; Sheehan & Voas, 1957; Van Riper, 1973). The third type of voluntary stuttering is imitating a true moment of stuttering. This will be referred to as “effortful voluntary stuttering.” Effortful voluntary stuttering is produced by mimicking true moments of stuttering behavior, with struggle and tension, in a purposeful manner. Similar to struggle-free voluntary stuttering, effortful voluntary stuttering allows the client to be exposed to a replication of the surface stuttering behavior in a more controlled manner (Fishman, 1937; Sheehan & Voas, 1957; Van Riper, 1973).

While voluntary stuttering is not real stuttering, it is possible for voluntary stuttering to transform into actual moments of stuttering. Voluntary stuttering may trigger the autonomic response of fear, leading to the speaker’s automatic reaction of tensing his body potentially leading to a true moment of stuttering. To minimize the risk of voluntary stuttering turning into a true moment of stuttering, clinicians often suggest using a hierarchy starting with struggle-free voluntary stuttering (Gregory, 2003; Guitar, 2019; Van Riper, 1973). It is thought that because this form of voluntary stuttering is less realistic, it is less likely to turn into a real moment of stuttering. As stuttering is tolerated and the person habituates, voluntary stuttering turns real less often, making it easier to use effortful voluntary stuttering for the purposes of exposure and desensitization.

Voluntary stuttering is often implemented clinically to help people expose themselves to stuttering or stuttering-like behaviors and is thought to assist with the desensitization process (Byrd, Gkalitsiou, et al., 2016; Healey & Scott, 1995; Meissner, 1946; Murphy, Yaruss, et al., 2007a; Van Riper, 1973; Yaruss et al., 2018; Yaruss & Reardon, 2002). Furthermore, voluntary stuttering follows the same theoretical framework involved in exposure therapy (Foa, 2011; Foa & Kozak, 1986). In this view, voluntary stuttering can be said to activate the fear structure of stuttering and incorporate new information that conflicts with the current feared experience, thereby leading to a change in the fear structure. For example, when a person voluntarily stutters and exposes themselves to the feared stimulus, it is hypothesized that the fear structure for stuttering will be activated. Habituation occurs and the once conditioned responses of embarrassment and fear are reduced. This conflicts with the current fear structure, causing a new structure to form and fear to reduce.

2.5.1.6.2 Efficacy of Voluntary Stuttering on Fluency

Historically, the goal of voluntary stuttering was to induce fluency. It was hypothesized that stuttering "errors" could be "more effectively eliminated by repeating the error [rather] than repeating the correct response" (Meissner, 1946). Thus, voluntary stuttering has been generally studied as a fluency-enhancing strategy. Previous research has not directly measured the effects of voluntary stuttering on adverse affective and cognitive reactions to stuttering, even though voluntary stuttering is often implemented clinically as a form of desensitization. Nevertheless, the research has shown that voluntary stuttering appears to reduce observable disfluencies.

Fishman (1937) was one of the first researchers to test the effects of voluntary stuttering. Five adults who stuttered were asked to insert effortful voluntary stuttering that simulated the participant's true stuttering during a reading task. Stuttering frequency was measured before and

after the speakers were trained to stutter voluntarily. For two of the participants, whose stuttering primarily consisted of blocks, voluntary stuttering tended to increase their stuttering frequency. For the remaining three participants, whose stuttering primarily consisted of sound, syllable, and word repetitions, voluntary stuttering tended to decrease their stuttering frequency. Unfortunately, because of the small sample size, conclusions cannot be made on the impact of different types of voluntary stuttering on fluency. Furthermore, because of the natural variability of stuttering, and the fact that a reduction in stuttering does not infer a reduction of adverse thoughts and feelings, it remains unclear if any form of voluntary stuttering affected the desensitization process and altered the adverse or cognitive reactions to stuttering.

In contrast to Fishman's (1937) use of effortful voluntary stuttering, Meissner (1946) studied struggle-free voluntary stuttering and its effect on stuttering frequency. Twenty-four adults who stuttered were asked to read four different passages: in a control passage, participants were instructed not to use voluntary stuttering; in the other three passages, the participants were instructed to use struggle-free voluntary stuttering on 5%, 25%, and 50% of the text. The participants were instructed to insert an "easy, obvious repetition of the first sound of the word until the word is said without tension" (Meissner, 1946). Results showed that there were significantly more true moments of stuttering when 5% of words were voluntary stuttered, compared to 25% and 50%. Alternatively, when 25% and 50% of words were voluntary stuttered there were significantly fewer moments of *true* stuttering, compared to the control reading. There was no explanation in the paper of how "true" versus voluntary moments of stuttering were judged, though it appears that judgments were made based on the listener's perception of observable physical tension. There was no mention of the speaker's perspective on moments of true stuttering or how voluntary stuttering made them feel.

Sheehan and Voas (1957) compared the effectiveness of struggle-free voluntary stuttering and effortful voluntary stuttering on overt fluency. Twenty-four adults who stuttered were divided into three groups: struggle-free voluntary repetitions, struggle-free voluntary prolongations, and effortful voluntary stuttering (replicating the participant's true stuttering). Each participant was asked to read four passages, six times each, implementing their assigned type of voluntary stuttering. The participants that inserted either struggle-free voluntary repetitions or struggle-free voluntary prolongations both exhibited a significant increase in fluency. Participants who used struggle-free voluntary repetitions showed the greatest increase in fluency. Conversely, the participants who inserted effortful voluntary stuttering did not demonstrate a significant increase in fluency. While struggle-free voluntary stuttering resulted in increased fluency, it is worth noting that no form of voluntary stuttering was significantly more effective than the adaptation effect observed in the control readings. Furthermore, affective and cognitive reactions to stuttering were not measured, so no conclusions can be made about the role of voluntary stuttering and the process of desensitization.

In an unpublished dissertation project, Grossman (2008) examined the impact of voluntary stuttering on fluency. Ten adults who stuttered who had no prior experience with voluntary stuttering were tested across three conditions: spontaneous speech without implementing any fluency enhancing or stuttering modification techniques, struggle-free voluntary stuttering with the prompt of a light, and light only. Analyses revealed a statistically significant decrease in both overt stuttering frequency and secondary physical characteristics in the voluntary stuttering condition compared to the control and light conditions. Consist with previous findings, voluntary stuttering appeared to enhance fluency. However, conclusions cannot be drawn about changes in affective or cognitive reactions due to voluntary stuttering.

Most recently, Meissner's study (1946) was replicated by Davidow, Grossman, and Edge (2019) with 12 adults who stuttered. Each participant read 300-syllable passages in four conditions: control with no voluntary stuttering and struggle-free "bouncing" on 5%, 10%, and 15% of the syllables read. Researchers measured the occurrence of "true" moments of stuttering across conditions, as well as the participants' speaking rate, speech naturalness, and perceived effort. Similar to Meisner's study, there was no explanation of how true moments of stuttering were defined. Results were consistent with Meisner finding that the condition with the most moments of voluntary stuttering (15%) resulted in statistically fewer moments of "true" stuttering when compared to the 5% reading condition. All three conditions using voluntary stuttering also resulted in increased fluency compared to the control condition. Analyses also indicated that the 5% and 10% voluntary stuttering conditions required significantly less speech effort than the control reading. Using a 7-point scale, the passages with 5% voluntary stuttered syllables were rated by listeners as more natural sounding compared to the 10% and 15% conditions. Lastly, when measuring the articulation rate (stutter-free syllables per second), it was found that the 5% voluntary stuttered condition resulted in significantly faster articulation than the 15% condition. Davidow et al.'s (2019) and Meissner's (1946) findings regarding speech fluency are consistent with those of Fishman (1937), suggesting that voluntarily inserting repetitions into speech may enhance fluency. However, because these studies only measured listener-rated overt fluency, they do not shed light on the question of whether voluntary stuttering affects the process of desensitization.

2.5.1.6.3 Effects of Voluntary Stuttering on Affective and Cognitive Reactions

Grossman (2008) was the first to study the emotional impact of voluntary stuttering. The study collected both qualitative data about the experience of voluntary stuttering and the impact

of voluntary stuttering on fluency. Six adults who stuttered who had previous experience with voluntary stuttering were interviewed to better understand the phenomenon of voluntary stuttering. All of the participants reported that the use of voluntary stuttering reduced stuttering-related fear, anxiety, and frustration. Two of the participants specifically reported that voluntary stuttering helped achieve desensitization. This was the first documented evidence that voluntary stuttering can be used to reduce stuttering-related fears and is a successful form of desensitization. Still, the process of desensitization has yet to be studied in real time.

Byrd, Gkalitsiou, Donaher, and Stergiou (2016) also studied client's perception and perceived benefits of voluntary stuttering. A 45-item questionnaire focusing on affective, behavioral, and cognitive aspects of the stuttering disorder was administered to 206 adults who stuttered. Forty-seven percent of participants reported a reduction or elimination of their fear after using voluntary stuttering. Participants reported a larger reduction in fear with the use of effortful voluntary stuttering compared to struggle-free voluntary stuttering. Participants who used effortful voluntary stuttering were "more likely to report decreased physical tension," decreased stuttering frequency, and a "long-term reduction in their stuttering frequency" (Byrd, Gkalitsiou, et al., 2016). This finding that effortful voluntary stuttering was more likely than struggle-free voluntary stuttering to reduce fear, physical tension, and stuttering frequency provides preliminary evidence that effortful, realistic voluntary stuttering is more likely to activate a person's fear structure. Because fear structure activation is believed to be required for exposure therapy to be successful (Foa & Kozak, 1986), it appears that effortful voluntary stuttering is more effective than struggle-free voluntary stuttering as a form of exposure therapy.

Previous qualitative and survey research formed a strong foundation supporting that voluntary stuttering can be used to aid desensitization (Byrd, Gkalitsiou, et al., 2016; Grossman,

2008). Additional research is necessary to explore how affective and cognitive reactions change *as* voluntary stuttering is introduced. Furthermore, the degree to which voluntary stuttering impacts thoughts and feelings remains largely unknown.

2.6 STATEMENT OF THE PROBLEM

Voluntary stuttering meets the requirements to be considered a form of exposure therapy (Foa & Kozak, 1986); however, there has been very little research examining if any form of exposure therapy is effective in reducing negative thoughts and feelings within people who stutter (Scheurich et al., 2019). Despite the lack of research, voluntary stuttering is commonly recommended as a form of desensitization in stuttering therapy (Byrd, Gkalitsiou, et al., 2016; Healey & Scott, 1995; Meissner, 1946; Murphy, Yaruss, et al., 2007a; Van Riper, 1973; Yaruss et al., 2018; Yaruss & Reardon, 2002). Qualitative data suggest that voluntary stuttering can aid in the process of desensitization (Byrd, Gkalitsiou, et al., 2016; Grossman, 2008), though additional research is necessary to ensure that stuttering therapy is consistent with the tenets of EBP. While exposure therapy has been shown to reduce fear and adverse emotional reactions in the psychology literature for a range of conditions (Baker et al., 2010; Feske & Chambless, 1995; Kaczkurkin & Foa, 2015; Meyerbröker & Emmelkamp, 2010; Norton & Price, 2007; Öst et al., 2004; Schumacher et al., 2015; Triscari et al., 2015; Wiederhold & Wiederhold, 2003), little research supports the use of exposure therapy in the reduction of stuttering-related fears and adverse emotional reactions. To adhere to the principles of evidence-based practice, the gap in the empirical evidence must be addressed.

2.7 RESEARCH QUESTIONS

Based on the exposure therapy literature reviewed above and the research examining the potential benefits of voluntary stuttering (Byrd, Gkalitsiou, et al., 2016; Davidow et al., 2019;

Grossman, 2008), this current dissertation project is comprised of two studies, each addressing a research question:

1) What are the reported experiences of using voluntary stuttering related to the adverse affective and cognitive components of stuttering, from the perspective of adults who stutter?

Prior studies (Byrd, Gkalitsiou, et al., 2016; Grossman, 2008) have indicated that people who stutter find voluntary stuttering to be helpful in reducing stuttering-related emotional distress and increasing desensitization; however, the results have been limited by methodological and theoretical considerations. For example, Byrd et al.'s (2016) study used a survey to collect broad information related to stuttering and voluntary stuttering. This contributed valuable information about the use of voluntary stuttering, but personal experiences and specific information related to desensitization were not obtained. Grossman's (2008) qualitative study did allow for individual experiences and further exploration of the experience of voluntary stuttering. However, prompts were related to the overall experience of voluntary stuttering such as "What type or types of voluntary stuttering did you use?" (Grossman, 2008), and there was no emphasis on how voluntary stuttering may have aided in fear reduction. Thus, Study One will include a qualitative investigation focused on the *personal experiences* of individuals who have both benefited and not benefited from voluntary stuttering as a tool for desensitization. It is hypothesized that adults who stutter will initially report increased discomfort when first introduced to voluntary stuttering as a therapeutic technique (Finn et al., 2009; Foa & Kozak, 1986). Additionally, it is expected that with continued use, participants will experience a reduction in adverse reactions to stuttering, gradually habituating to moments of stuttering, and learning to tolerate the sensation, ultimately resulting in increased comfort and decreased distress. For individuals who did not

experience desensitization from voluntary stuttering, it is hypothesized that the technique may have been introduced too early in the therapy process or used with adults primarily seeking increased speech fluency, rather than those open to accepting stuttering as a potential outcome of their intervention (Floyd et al., 2007; Prochaska, 1999; Prochaska & DiClemente, 1984).

2) What are the reported experiences when adults who stutter are first exposed to a voluntary stuttering task?

There have been no studies looking at reports of discomfort *while* using voluntary stuttering or when first introduced to voluntary stuttering. Byrd, Gkalitsiou, et al. (2016) found that 72% of participants felt "uncomfortable" or "somewhat uncomfortable" when first introduced to voluntary stuttering; importantly, 47% of participants also reported that voluntary stuttering either "reduced" or "eliminated their fear" (p. 293-294). Still, no prior research has examined whether subjective levels of distress change as an individual is first introduced to voluntary stuttering or the specific personal experiences during that initial exposure. Thus, Study Two will investigate these perceived experiences through self-reported distress ratings and a qualitative debrief interview. Based on prior research, it is hypothesized that participants will report increased distress when first exposed to voluntary stuttering, but will feel more comfortable with time.

3.0 METHODS

This two-part study employed a mixed-method design to address the research questions sequentially. Research question one (*What are the reported experiences of using voluntary stuttering related to the adverse affective and cognitive components of stuttering, from the perspective of adults who stutter?*) was explored through a qualitative analysis of semi-structured interviews with adults who stutter to better understand how voluntary stuttering had been used in therapy as part of the desensitization process. After Study One was completed, Study Two was conducted as a critical first step to lay the groundwork for future research. Research question two (*What are the reported experiences when adults who stutter are first exposed to a voluntary stuttering task?*) was addressed using a single case research design, observing quantitative changes in self-reported distress during the introduction to voluntary stuttering, followed by a semi-structured debrief interview to gain deeper insights into the experience.

3.1 STUDY ONE: PHENOMENOLOGICAL QUALITATIVE INVESTIGATION

A qualitative investigation was conducted to collect information on personal experiences with voluntary stuttering and its reported impact on desensitization. Previous research has supported the use of voluntary stuttering to increase desensitization (Byrd, Gkalitsiou, et al., 2016; Grossman, 2008), though more information is needed to understand personal experiences of *how* voluntary stuttering has been used and its role in desensitization. The present study will yield a better understanding of what people who stutter experience when using voluntary stuttering to facilitate desensitization. To gain a broader understanding, the qualitative investigation also included data from individuals who reported that voluntary stuttering did *not* lead to desensitization. Together, this data provides valuable insights into how individuals experience voluntary stuttering in both their therapy and daily life.

3.1.1 Method

Interpretative phenomenological analysis (IPA; (Creswell & Poth, 2018) was used to explore participants' experiences with voluntary stuttering and its potential effect on desensitization. Phenomenological qualitative research is used to study specific phenomena, such as lived experiences or concepts, from the perspective of individuals with direct experience (Aldridge et al., 2019; Bricker-Katz et al., 2013; Creswell & Poth, 2018; Howard et al., 2019; Marks et al., 2019). IPA has been used in stuttering research to better understand the overall experience of stuttering (Tichenor & Yaruss, 2018), the role of support organizations (Trichon & Tetnowski, 2011), and how individuals manage stuttering (Plexico et al., 2005).

This study used phenomenological methods to better understand how voluntary stuttering affects desensitization by exploring (a) how individuals have used voluntary stuttering both in and out of therapy and (b) how individuals perceive the impact of voluntary stuttering on their lives. This approach aided in the collection of information related to different types of voluntary stuttering (e.g., effortful vs. struggle-free), explored the effects of voluntary stuttering, examined how often people use voluntary stuttering both in and out of therapy, and investigated how participants perceived its impact in different situations. Study One also collected data on the length of time participants used voluntary stuttering before observing any fear reduction, if it occurred. Specifics about the IPA process are described below.

As the study involved the collection of information through verbal responses, it was deemed "exempt" by the Michigan State University Human Research Protection Program (HRPP) / Institutional Review Board (IRB) under 45 CFR 46.104(d) 2ii. The exempt category 2ii states that audiovisual recordings, as well as verbal and written responses, may be gathered using interview procedures, as long as a potential data breach would not result in criminal or civil

liability for the participant, or damage to financial standing, employment, reputation, or educational advancement. To minimize the likelihood of a data breach, all confidential information was removed during the transcription process, with names replaced by generic codes such as [name] or [speech therapist], and specific locations replaced by codes such as [speech therapy]. Additionally, all data collected were kept secure and confidential on a password-protected external hard drive in a locked room, ensuring the protection of human subjects.

3.1.2 Participants

Participants included nine adults who stutter (ages 20-39), recruited from personal contacts of the authors, research registries from previous studies, online postings, and word of mouth. Inclusion criteria for the first five participants required that they: (a) self-identify as a person who stutters, (b) report that stuttering started during childhood (before age 8, in keeping with other studies of childhood-onset stuttering; (Yairi & Ambrose, 2013), and (c) report having previous experience with voluntary stuttering under the guidance of an SLP, that led to desensitization. For the remaining four participants, inclusion criteria was similar, with a slight modification to criteria (c) stating that they had previous experience with voluntary stuttering under the guidance of an SLP, but that it did *not* lead to desensitization. To allow for diversity in therapy experiences, support experiences, and overt stuttering behaviors, no other inclusion criteria were used.

Given that individuals who stutter often describe stuttering as a speaker-experienced loss of control, rather than overt disfluencies (Tichenor & Yaruss, 2019b), stuttering was classified using self-report rather than listener-based judgments. To obtain the necessary information, potential participants completed a screening questionnaire (Appendix A) prior to any other data collection.

Based on previous qualitative research in the stuttering literature (Grossman, 2008; Plexico et al., 2005; Tichenor & Yaruss, 2018; Trichon & Tetnowski, 2011), it was anticipated that nine total participants would be sufficient. However, the final number of participants was determined by an analysis of data saturation (Fusch & Ness, 2015). Interviews continued, with participants added until saturation was reached, meaning no novel information emerged with the addition of further participants. It was predicted that saturation for participants who found voluntary stuttering to be desensitizing would be reached after interviewing four participants. After saturation appeared to be reached, one additional participant was interviewed (five participants total) to confirm that no novel themes emerged.

Recruiting participants who did *not* find voluntary stuttering to be desensitizing (n=4) was more challenging. Therefore, for this exploratory stage of the investigation, data saturation was the goal but may not have been fully achieved.

3.1.3 Data Collection Procedures

Data was collected through both questionnaires or published assessments and a semi-structured interview.

3.1.3.1 Questionnaires and Published Assessments

To gain general information about stuttering, support activities, and therapy experiences, participants completed a questionnaire specifically created for this study. This questionnaire (see Appendix B) consists of 20 questions related to participant demographics, concomitant disorders, stuttering therapy history, and stuttering self-help history. Table 1 displays a subset of relevant information, and the complete demographic data can be found in Appendix C for a complete listing of demographic data.

Table 1: Study One – Demographics

	Group	Age	Gender	Race	Other Diagnoses	History of Stuttering Therapy	History of Stuttering Support
P01	D	34	Female	White	-	Yes	Yes
P02	D	36	Male	White	Depression	Yes	Yes
P03	D	39	Male	White	Anxiety	Yes	Yes
P04	D	41	Female	White	Anxiety	Yes	Yes
P05	D	28	Male	White	Anxiety, ADHD, Depression	Yes	Yes
P06	N	25	Male	Black or African American	Anxiety, Depression, Learning Disorder	Yes	No
P07	N	30	Male	Black or African American	-	Yes	No
P08	N	30	Male	Black or African American	-	Yes	No
P09	N	20	Male	Black or African American	Anxiety, Learning Disorder	Yes	No

Note: D = Voluntary stuttering was desensitizing, N = Voluntary stuttering was *not* desensitizing

Data were also collected on the adverse impact of stuttering, state and trait anxiety, and the type of therapy participants had previously received. Informed consent and three questionnaires (described below) were administered via Qualtrics, an online platform for data collection. During the analysis stage, responses were reviewed to gain a deeper understanding of how voluntary stuttering may have affected individuals differently.

To assess the adverse impact of stuttering on participants' lives, they completed the *Overall Assessment of the Speaker's Experience of Stuttering* (Yaruss & Quesal, 2016). The OASES-A (for adults) consists of 100 items divided into four sections, each addressing a specific aspect of the ICF model: General Information, Speaker's Reactions, Daily Communication, and Quality of Life. Items are scored on 5-point Likert-type scales, with higher scores indicating a greater adverse impact. Scores on each section are averaged to provide an overall impact score and impact rating, providing insight into the extent of stuttering's adverse impact on participants' lives. The OASES was chosen due to its strong reliability and validity in measuring the overall

impact of stuttering while assessing all aspects of the ICF model. All sections of the OASES, as well as the overall score, have high internal consistency ranging from .94 to .99. Test-retest reliability is also strong, ranging from .89 to .95. Prior studies have demonstrated the OASES' validity: its content validity stems from being based on the WHO's ICF (WHO, 2001), and studies have shown that the OASES accurately reflects the experiences of people who stutter (Tichenor et al., 2022; Tichenor & Yaruss, 2019b; Yaruss, 1998, 2007; Yaruss & Quesal, 2004). Construct validity, which indicates how OASES scores relate to one another, is supported by analyses showing Cronbach's alpha levels ranging from .66 to .96, depending on the test sections being compared. This range in construct validity underscores that each section measures unique aspects of the stuttering experience. Table 2 provides OASES scores for participants in Study One.

To assess and describe participants' trait and state anxiety and gain a better understanding of how they experience anxiety, participants completed the State-Trait Anxiety Inventory (Spielberger et al., 1983). The STAI-T (Trait Anxiety) form consists of 20 statements related to trait anxiety (non-situational, stable anxiety) describing different emotions such as, "I worry too much over something that really doesn't matter," and the STAI-S (State Anxiety) form is made up of 20 statements related to state anxiety (fluctuating, situation dependent anxiety), such as "I am presently worrying about possible misfortunes." Participants were asked to respond to each statement based on how often they "generally feel" (for the STAI-T) or "feel right now, in this moment," (for the STAI-S) using a 4-point Likert scale ranging from "Almost never" to "Almost always." Scores on each form range from 20-80, with higher scores indicating greater levels of trait or state anxiety. Both the STAI-T and STAI-S forms have high internal consistency, measured by a modified version of Cronbach's Alpha. The internal consistency for STAI-T

Table 2: Study One – Impact and Rating Scores on the Overall Assessment of the Speaker's Experience of Stuttering (OASES)

	Group	General Information	Reactions to Stuttering	Communication Daily Situations	Quality of Life	Total Score
P01	D	1.90 Mild-Moderate	1.80 Mild-Moderate	2.00 Mild-Moderate	1.32 Mild	1.75 Mild-Moderate
P02	D	2.55 Mild-Moderate	2.03 Mild-Moderate	1.96 Mild-Moderate	1.80 Mild-Moderate	2.06 Mild-Moderate
P03	D	1.90 Mild-Moderate	1.83 Mild-Moderate	1.72 Mild-Moderate	1.24 Mild	1.67 Mild-Moderate
P04	D	1.25 Mild	1.77 Mild-Moderate	1.88 Mild-Moderate	1.12 Mild	1.53 Mild-Moderate
P05	D	2.45 Moderate	2.80 Moderate	2.38 Moderate	2.20 Mild-Moderate	2.47 Moderate
P06	N	3.05 Moderate-Severe	3.53 Moderate-Severe	3.64 Moderate-Severe	3.68 Moderate-Severe	3.50 Moderate-Severe
P07	N	1.95 Mild-Moderate	3.43 Moderate-Severe	2.20 Mild-Moderate	2.96 Moderate	2.71 Moderate
P08	N	1.70 Mild-Moderate	3.90 Severe	1.88 Mild-Moderate	3.44 Moderate-Severe	2.84 Moderate
P09	N	2.60 Moderate	3.73 Moderate-Severe	2.86 Moderate	3.29 Moderate-Severe	3.18 Moderate-Severe

Note: D = Voluntary stuttering was desensitizing, N = Voluntary stuttering was *not* desensitizing

ranges from .86 to .94, while STAI-S ranges from .83 to .92. The STAI-T form also has high test-retest reliability ranging from .73 to .86. Not surprisingly, the test-retest reliability for the STAI-S form is lower, ranging from .16 to .54, due to the nature of state anxiety, which is variable and dependent on the situation. The validity of STAI-T was measured by assessing correlations between the STAI-T and two other standardized anxiety tests. Correlations were high, indicating high validity, ranging from .75 to .83. The validity of STAI-S was assessed by comparing scores in stressful versus relaxed situations. The STAI-S consistently reflected higher mean scores in stressful situations and lower mean scores in relaxed environments, demonstrating the STAI-S' ability to differentiate anxiety levels based on situational factors (Spielberger et al., 1983). Table 3 provides STAI scores as well as percentile rankings for Study One participants.

Table 3: Study One – Standard Scores and Percentile Ranks on the State-Trait Anxiety Inventory (STAI)

	Group	STAI-Trait Score	STAI-Trait Percentile	STAI-State Score	STAI-State Percentile
P01	D	35	57%	38	61%
P02	D	52	94%	49	88%
P03	D	41	72%	43	77%
P04	D	56	95%	55	93%
P05	D	44	81%	37	58%
P06	N	49	90%	48	86%
P07	N	48	88%	50	90%
P08	N	45	83%	37	58%
P09	N	59	98%	60	98%

Note: D = Voluntary stuttering was desensitizing, N = Voluntary stuttering was *not* desensitizing

3.1.3.2 Interviews

Semi-structured interviews were conducted remotely, using Zoom. Participants were asked to be in a private, quiet setting, such as their bedroom or office. Each interview was video and audio recorded for later transcription. Due to the often-silent nature of stuttering (Tichenor & Yaruss, 2019a), video recording helped ensure accurate transcriptions of the participants' responses. Collecting video recordings did make ensuring confidentiality more challenging. However as mentioned above, all videos were saved on a password-protected external hard drive stored in a locked room, and confidential information was removed from all transcripts. Interviews began with the participants being prompted to tell the researcher about their experiences with voluntary stuttering. This prompt allowed the participants to share broadly about what is most relevant for them related to voluntary stuttering. Follow-up questions were then based on each participant's response, using specific words and terms that the participants themselves used. For example, if a participant stated, "At first when I used voluntary stuttering it didn't work," a follow-up question might be, "You shared that at first voluntary stuttering didn't

work, what do you mean by 'work'?" Or if a participant states, "I started using voluntary stuttering all the time," the follow-up question might be, "Can you give some examples of situations or times you started to use voluntary stuttering?" When specific topics of interest were not organically introduced by the participant, standard questions were asked to ensure that information was obtained. The standard questions used to prompt participants who found voluntary stuttering to be desensitizing were: 1) "What kind of thoughts and feelings do you currently have when you stutter?" 2) "How were you first introduced to voluntary stuttering?" 3) "Do you remember why voluntary stuttering was introduced?" 4) "When you used voluntary stuttering, what did the fake moments of stuttering sound and physically feel like?" 5) "When did you typically use voluntary stuttering?" 6) "How often did you typically use voluntary stuttering?" 7) "Did your experience with voluntary stuttering change over time?" 8) "How long did you use voluntary stuttering for?" 9) "What about voluntary stuttering did you like?" 10) "What about voluntary stuttering did you not like?" 11) "Do you still use voluntary stuttering? If yes, how often?" 12) "Did voluntary stuttering have an impact on your fluency? If yes, how so?" 13) "Did voluntary stuttering ever turn into real moments of stuttering? If yes, did that changed over time?" 14) "Did voluntary stuttering help reduce fears, negative thoughts or feelings? If yes, why do you think it helped?" 15) "Have you found anything else that's helped reduce fears, negative thoughts or feelings related to stuttering? If yes, what has helped?"

For participants who did not find voluntary stuttering desensitizing, the questions used to prompt participants were: 1) "What kind of thoughts and feelings do you currently have when you stutter?" 2) "How were you first introduced to voluntary stuttering?" 3) "Do you remember why voluntary stuttering was introduced?" 4) "When you used voluntary stuttering, what did the fake moments of stuttering sound and physically feel like?" 5) "When did you typically use

voluntary stuttering?" 6) "How often did you typically use voluntary stuttering?" 7) "Did your experience with voluntary stuttering change over time?" 8) "How long did you use voluntary stuttering for?" 9) "What about voluntary stuttering did you like?" 10) "What about voluntary stuttering did you not like?" 11) "What made you decide to stop using voluntary stuttering?" 12) "How did voluntary stuttering make you feel?" 13) "Did voluntary stuttering have an impact on your fluency? If yes, how so?" 14) "Did voluntary stuttering ever turn into real moments of stuttering? If yes, did that change over time?" and 15) "Have you found anything that's helped reduce fears, negative thoughts or feelings related to stuttering? If yes, what has helped?" These questions within the semi-structured interview allowed the researcher to gain a cohesive understanding of each participant's experience using voluntary stuttering and how it related to desensitization.

3.1.4 Data Analysis and Interpretation

Audio-recorded interviews were transcribed verbatim and analyzed following procedures outlined by Creswell and Poth (2018). Similar methods have been used in previous phenomenological studies of stuttering (Bricker-Katz et al., 2013; Britton et al., 2019; Grossman, 2008; Howard et al., 2019; Jackson et al., 2015; Lisiecka et al., 2021; Plexico et al., 2005; Schaffer et al., 2021; Tichenor & Yaruss, 2018). To gather overall impressions, each transcript was initially read to gain a broad, holistic understanding of what was most significant for each participant. Transcriptions were then re-read to take notes or "memos" (Creswell & Poth, 2018) and highlight statements that specifically related to voluntary stuttering and desensitization. These highlighted statements were then coded to consolidate the data into "meaning units" (Moustakas, 1994) that captured the essence of the participants' responses. Codes were used to organize the data, label meaningful topics, and identify consistencies across participants.

During the coding process, information provided by the participants was slightly transformed to allow for generalization. For example, a statement such as, “voluntary stuttering was difficult to use during a job interview,” may elicit the codes for both “thoughts and emotions” and “situations” as the participant described voluntary stuttering as “difficult” (reflecting their thoughts on voluntary stuttering) and referenced that voluntary stuttering was used during a job interview (a specific situation). This transformation of data ensured that underlying themes could be identified despite variations in participants’ specific explanations, experiences, or situations. This also increased the likelihood of uncovering themes, even if participants were unaware of how voluntary stuttering related to their experience of desensitization.

Once codes were created for all participants, they were organized into categories to identify relationships or similarities, which were then used to create themes and subthemes. For example, the hypothetical code “thoughts and emotions” might be combined with “fear” and “stigma,” to form the theme “reactions to stuttering.” Subthemes under “reactions to stuttering” could include “avoidance,” “physical tension,” or “anxiety.” Individual transcripts and the previously coded statements were then reviewed again to confirm that the themes adequately captured the participants’ reported experiences.

Finally, the identified themes identified from individual participants were compared across all participants to uncover commonalities and differences. This process of interpreting the data, identifying recurring themes across participants, and making judgments on what information is most relevant, provided a deeper understanding of the shared experience of using voluntary stuttering and its impact on desensitization.

3.1.4.1 Reliability and Credibility

Researcher reliability and credibility were established by adapting protocols from previous qualitative studies on stuttering (Jackson et al., 2015; Plexico et al., 2010; Tichenor & Yaruss, 2018). This process involved identifying potential biases that could be introduced by the investigator and advisor during the data review. The investigator (Herring), a doctoral student studying stuttering, is a person who stutters and a licensed /certified speech-language pathologist with extensive experience working with individuals who stutter. The advisor (Yaruss) is a Professor of Communicative Sciences and Disorders who does not stutter. He is a board-certified specialist in fluency disorders, holds a master's degree and PhD in speech-language pathology, and is an ASHA Fellow. Both the investigator and the advisor began by documenting their personal experiences with voluntary stuttering and desensitization – whether as a client or clinician (Herring) or as a clinician (Yaruss). Although it was impossible to fully eliminate all personal biases, this process helped to distance their personal experiences from those of the participants (Moustakas, 1994). Further reducing bias, the investigator and advisor came from distinct backgrounds, each offering individual perspectives.

To ensure agreement, after the interviews were transcribed and initial themes were created, the advisor (Yaruss) reviewed the data. Based on discussion and feedback, codes and themes were revised. There were numerous iterations of this review process as codes and themes were finalized. As a final reliability check, Yaruss reviewed the transcripts once more as well as the investigator's written description and interpretations of themes. At this stage, no discrepancies were found, and a consensus was reached.

3.1.4.2 Summary

Study One used interpretative phenomenological analysis to explore the experience of voluntary stuttering and its relation to desensitization. The results offer a deeper understanding of how individuals have used voluntary stuttering, how frequently it was used, the type of voluntary stuttering used, and its overall impact on desensitization. The findings provide foundational data on whether and how individuals benefit from voluntary stuttering.

3.2 STUDY TWO: MIXED METHOD INVESTIGATION

A mixed method investigation using an experimental paradigm followed by a qualitative investigation was conducted to examine how adults who stutter experience first being exposed to a voluntary stuttering task. The objective of the experimental portion of this study was to observe the potential additive effect of voluntary stuttering, while creating a foundation for future, more in-depth experimental research.

3.2.1 Participants

Participants for Study Two were separate and independent from those in Study One. This group consisted of three adults who stutter (ages 28-41), recruited through personal contacts of the authors, research registries from previous studies, online postings, and word of mouth. The inclusion of these three participants was based on previous single-case research studies (Pelletier, 2002; Rickards-Schlichting et al., 2004; Turner et al., 2011) and the recommendation that single-case studies include “a minimum of three participants” (Gast & Ledford, 2018).

Similar to Study One, inclusion criteria required participants: (a) self-identify as a person who stutters, and (b) report that their stuttering started during childhood (before age 8, in keeping with other studies of childhood onset stuttering; (Yairi & Ambrose, 2013). Unlike Study One, to minimize the probability of a floor effect, Study Two did not exclude participants with prior

experience using voluntary stuttering. Furthermore, participants who had previously refused to try voluntary stuttering (whether in therapy or elsewhere), based on self-report, were excluded to minimize the likelihood of recruiting individuals with above-average resistance to voluntary stuttering. To obtain this information, an inclusion screening questionnaire (Appendix D) was administered to all potential participants before any other data were collected.

3.2.2 Data Collection Measurements

After inclusion criteria was confirmed, data were also collected through three methods: subjective units of distress (SUDS), questionnaires, and a qualitative debrief interview.

3.2.2.1 Subjective Units of Distress (SUDS)

SUDS, originally referred to as the "subjective anxiety scale" (Wolpe & Lazarus, 1966) is a 101-point self-rating scale, ranging from 0 to 100, "used to assess the level of state anxiety that one feels in response to a specific stimulus, with higher scores indicating higher levels of anxiety" (Shaw et al., 2021). SUDS was first introduced as a method to quantify the process of desensitization and rate anxiety (Wolpe, 1958; Wolpe & Lazarus, 1966). Although the "D" in SUDS often stands for distress (Benjamin et al., 2010a; Kim et al., 2008; Shaw et al., 2021), it has also historically represented disturbance (Harris et al., 2002; Wolpe & Lazarus, 1966) or discomfort (Kaplan et al., 1995). Regardless of how the "D" is defined, SUDS is consistently used in desensitization research to measure self-reported *anxiety* (Benjamin et al., 2010; Brundage et al., 2016; Brundage & Hancock, 2015; Diemer et al., 2014; Donahue et al., 2009; Hayes et al., 2008; Kiyimba & O'Reilly, 2020; Menzies et al., 1999; Menzies, O'Brian, Onslow, Packman, et al., 2008; Norrholm et al., 2016; Ressler et al., 2004; Shaw et al., 2021; Tanner, 2012; Wolpe, 1958, 1969). For this study, the term distress will be used within the context of SUDS.

In previous research, the frequency of SUDS rating has ranged from every 30 seconds to once every 5 minutes (Benjamin et al., 2010; Donahue et al., 2009; Hayes et al., 2008; Norrholm et al., 2016). To maximize the number of data points and increase the likelihood of identifying subtle changes in distress, while also being cognizant of over-sampling, SUDS ratings were acquired every 60-120 seconds during the experimental portion of the study, gauging emotional response before, during, and after the use of voluntary stuttering.

3.2.2.2 Questionnaires

As in Study One, participants completed informed consent, a demographic questionnaire (Appendix C), the OASES, and the STAI via Qualtrics before participating in the exposure portion of the study. Table 4 displays a subset of relevant demographic information, and the full demographic data can be found in Appendix E. Study Two participants' OASES and STAI scores are displayed in Tables 5 and 6, respectively.

Table 4: Study Two – Demographics

	Age	Gender	Race	Other Diagnoses	History of Stuttering Therapy	History of Stuttering Support
P(A)	28	Male	White	ADHD, Anxiety, Depression, Learning Disorder	Yes	No
P(B)	30	Male	White	Anxiety, Depression	Yes	No
P(C)	41	Female	Black or African American	-	Yes	No

Table 5: Study Two – Impact and Rating Scores on the Overall Assessment of the Speaker's Experience of Stuttering (OASES)

	General Information	Reactions to Stuttering	Communication Daily Situations	Quality of Life	Total Score
P(A)	3.25 Moderate-Severe	2.07 Moderate	2.12 Mild-Moderate	1.00 Mild	2.05 Mild-Moderate
P(B)	3.35 Moderate-Severe	3.97 Severe	2.42 Moderate	3.36 Moderate-Severe	3.31 Moderate-Severe
P(C)	3.16 Moderate-Severe	3.50 Moderate-Severe	3.16 Moderate-Severe	2.56 Moderate	3.11 Moderate-Severe

Table 6: Study Two – Standard Scores and Percentile Ranks on the State-Trait Anxiety Inventory (STAI)

	STAI-Trait	STAI-Trait Percentile	STAI-State	STAI-State Percentile
P(A)	49	90%	45	81%
P(B)	43	78%	45	80%
P(C)	43	80%	32	39%

3.2.3 Experiment Overview

Speaking can be a form of exposure for people who stutter, regardless of whether they use voluntary stuttering (Brundage et al., 2016). Therefore, it is necessary to differentiate the impact of being exposed to a speaking situation from the impact of using voluntary stuttering. To accomplish this, a quasi-single-case research design was implemented to assess the additive effect of voluntary stuttering. Despite the name, single-case research is different than a case study: it is experimental research in which participants serve as their own control, and more than one participant is studied (Gast & Ledford, 2018). Quasi-single-case research is slightly different than the traditional single-case experimental design, because "conditions of true experiments are approximated" (Kazdin, 2011). In this case, the study does not allow for treatment withdrawal and replication like a true ABAB single-case experimental design. Single-case research design requires a baseline condition (A) in which the participant acts as they typically would and an

intervention condition (B) in which they are exposed to novel stimuli. Using the previous example of desensitizing to snakes, the baseline condition would involve being in a room without any snakes, and the intervention condition would be having the participant encounter a snake in some fashion (e.g., looking at a picture of a snake, seeing an actual snake, or interacting with a snake). In this study, the intervention condition involved the use of voluntary stuttering, and will therefore be referred to as the voluntary stuttering condition. In a traditional single-case research design (ABAB), the "intervention," (or in this study, voluntary stuttering condition), would be introduced two separate times, allowing for replication, increased experimental control, and increased internal validity. However, given the irreversible nature of desensitization, it would be impossible to truly withdraw the experience of voluntary stuttering and return to baseline. Therefore, this study is classified as quasi-single-case research and followed an A-B design.

In this study, anxiety levels for each participant were compared across time and task. To help categorize tasks, the session was divided into six phases (silent baseline, baseline condition (A), introduce voluntary stuttering, voluntary stuttering practice task, silent baseline, and voluntary stuttering condition (B)). Details on each of these phases will be described in detail below, in the Procedures section.

Previous research has shown that an exposure therapy session typically lasts an average of 10-40 minutes (Anderson et al., 2013; Gujjar et al., 2019; Harris et al., 2002; Lee et al., 2007; Reger & Gahm, 2008; Šalkevičius et al., 2019; Strickland et al., 1997). To be consistent with prior literature, there were minimum and maximum time limits set on each phase. Using this timed structure, the three participant sessions lasted a total of 31-36 minutes.

Depending on the task, each phase ended either at a fixed time point (i.e., after 2 minutes), or once SUDS stability was achieved. Stability, the "predictability and consistency of data values" (Barton et al., 2018), was assessed using within-condition visual analyses in real time. Stability criteria was consistent with previous single-case research methodology and required three consecutive data points to stay within a 15% range before changing conditions (Lobo et al., 2017; Neuman & McCormick, 1995; Spriggs et al., 2018). The 15% range, known as a stability envelope, is calculated based on all possible data points. Because SUDS uses a 0-100 scale, the stability envelope of 15% was calculated based on 101 data points. Therefore, the stability envelope is a range of 15 SUDS values. In other words, before ending the baseline or voluntary stuttering condition, three consecutive SUDS levels had to fall within a 15-point range. For example, three consecutive ratings could be 35, 30, 20, or 35, 20, 30. Both of these examples have three consecutive ratings that all fall within a 15-point envelope (in this example the stability envelope is the values between 20 and 35). However, ratings of 40, 30, 20 would *not* meet the stability threshold since the ratings of 20 and 40 are more than 15 points apart and therefore do not fall within a 15-point stability envelope. To compute a stability envelope, and remain consistent with previous single-case research, SUDS were treated as an interval scale. It is worth noting that the majority of exposure research that measures distress using SUDS relies on a fixed time when changing conditions rather than measuring stability. However, accounting for stability and using a stability envelope minimizes the probability that a participant will be pulled from an exposure too soon, potentially reinforcing a fear structure.

Each participant session began with an introduction to SUDS, and their first distress rating. To start each subsequent phase, the participants recorded their distress and then were prompted to rate SUDS at regular intervals through the phase. During all phases, except for when

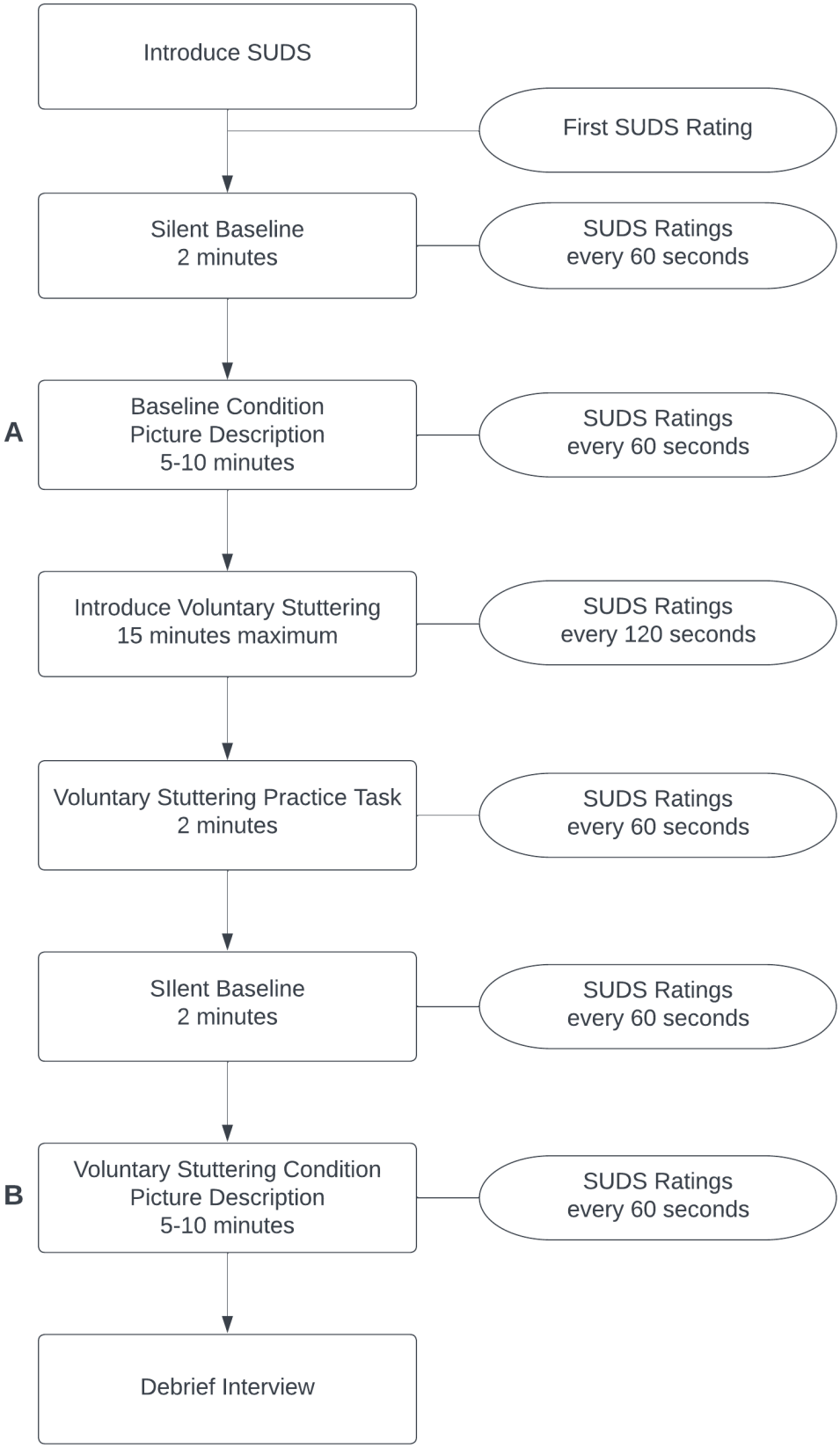
voluntary stuttering was introduced, SUDS ratings were collected every 60 seconds. It was decided that during the voluntary stuttering introduction phase, participants would only rate their distress every 120 seconds, to allow them to focus with less interruption.

The first phase, to assess anxiety during a non-speech task, was a 2-minute silent baseline. The participants then participated in the baseline picture description task (A), which lasted a minimum of 5 minutes and a maximum of 10 minutes, or until stability criteria were met. During the baseline condition, participants were asked to use their typical speech (e.g., open stuttering, stuttering techniques, avoidance, tension, struggle). Once the baseline condition was complete, voluntary stuttering was introduced and participants completed a hierarchy of reading practice activities (described below) for a maximum of 15 minutes. To ensure that participants were capable of voluntary stuttering during a non-scripted picture description task (the voluntary stuttering condition), they then completed a 2-minute voluntary stuttering practice task where they described a picture while being prompted to voluntary stutter at random intervals. The 2-minute silent baseline was then repeated before beginning the voluntary stuttering condition (B). Similar to the baseline condition, participants described pictures for a minimum of 5 minutes and a maximum of 10 minutes, or until stability criteria were met. However, rather than using their typical speech, participants were prompted to voluntary stutter at random intervals. Study Two concluded with qualitative debrief interviews to gain a better understanding of the experience of using voluntary stuttering for the first time. Figure 1 depicts this study procedure.

3.2.4 Procedures

Before initiating data collection, Study Two was deemed "exempt" by the Michigan State University HRPP / IRB under 45 CFR 46.104(d) 2ii and 3iB, stating that interviews and "research involving benign behavioral intervention" may be conducted and recorded. Because

Figure 1: Flow Chart Depicting Study Two Procedure



voluntary stuttering is a commonly used speech therapy behavioral technique, Study Two was deemed exempt. Similar to Study One, these exempt statuses require that in the event of a data breach, participants are not exposed to unreasonable risk for criminal or civil liability, or damage to their financial standing, employment, reputation, or educational advancement. To minimize the likelihood of a data breach, all data were collected using the secure Qualtrics platform and in person at a private speech therapy office. Similar to Study One, each participant session was video and audio recorded and saved confidentially on a password-protected external hard drive which was stored in a locked room. Additionally, all confidential information was removed from the debrief interview transcriptions, ensuring participant protection.

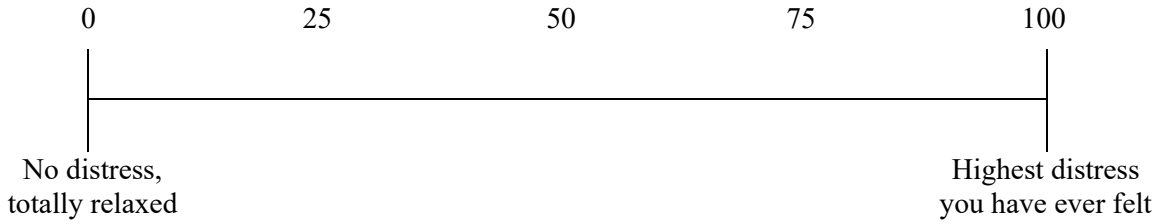
3.2.4.1 Introduce SUDS

The researcher began each session by orienting the participant to the SUDS ratings. Because the specific emotional reactions that participants might experience during the experiment were unknown, distress was used as a blanket term to describe any negative emotions including anxiety, fear, and discomfort. The researcher defined the word distress and then presented the participant with a printed horizontal line graphic (Figure 2) where 0 was labeled "no distress, totally relaxed" on the far-left end, and 100 was labeled "highest distress you have ever felt" on the far-right end. This printed graphic remained visible for the duration of the study for the participants to reference.

Participants were then presented with an iPad displaying a nearly identical graphic with a small needle indicating the current level of distress. The researcher explained that at regular intervals the rating scale will automatically refresh, bringing the marker back to zero. At that time, the participant should rate their current feelings by dragging the marker to their corresponding distress level on the iPad touchscreen. To reduce the potential demand of

checking the iPad, the researcher shared that she would motion toward the iPad when it was time for a SUDS rating. The first SUDS rating was then collected.

Figure 2: Subjective Units of Distress Rating Graphic



3.2.4.2 Silent Baseline

To obtain a baseline of SUDS before starting the speaking tasks, participants were asked to sit silently for two minutes. SUDS ratings were collected every 60 seconds, totaling three instances during the two-minute silent baseline condition (at the start, 60 seconds in, and at the end). During this time, the experimenter looked over paperwork, to minimize the potential discomfort of being watched.

3.2.4.3 Baseline Condition

Participants were then given a Where's Waldo book (Handford, 2019), consisting of 12 possible pictures to describe. Each participant began using a randomized picture from the standardized set. To introduce the task, the researcher stated:

> I am now going to show you a picture and ask you to talk about the picture for as long as possible, with as much detail as possible. You'll describe the picture for between 5-10 minutes, so no level of detail is too small. Feel free to talk about what you see or anything that the picture makes you think about. If you run out of things to talk about, you can flip to the next picture. I'll let you know when you can stop.

This baseline condition was designed to measure the participants' typical SUDS level while speaking, not necessarily during a difficult task. The participants were asked to speak typically

during the picture description task, meaning that they could speak in whatever way felt natural, whether openly stuttering, using fluency-enhancing strategies, using stuttering modification strategies, avoidance etc.

Throughout the speaking condition, participants were prompted to rate their current level of distress every 60 seconds. The speaking condition continued for a minimum of 5 minutes and concluded once the SUDS stability criterion was met. The initial plan was to terminate the baseline condition if stability was not achieved within 10 minutes, since without a stable baseline it would not be possible to later compare the voluntary stuttering condition. In that instance, the participant would not continue with the rest of the study. However, the distress ratings for all three participants stabilized within 10 minutes, so this time limit was not needed.

3.2.4.4 Introduce Voluntary Stuttering

Participants were then introduced to voluntary stuttering and given instructions on how to voluntarily stutter using a standard script. The researcher stated:

> I am going to introduce a speech technique called voluntary stuttering. Voluntary stuttering is a tool that is often used clinically to desensitize to stuttering and provide the speaker with more control. You will be asked to repeat the first sound, or syllable, of a word using a slow, gentle, tension-free bounce. For example, it might sound like ca-ca-ca-ca-cat, or pe-pe-pencil, or how-how-how-house. It's not important exactly how many times you repeat the first sound but try to do at least 3 repetitions. Most importantly though, just try to produce the voluntary stutters slowly with minimal tension. Let's try it on a few practice words.

To make this exposure more similar to the experience of being taught voluntary stuttering within therapy, participants were given a short rationale of why they are voluntary stuttering (i.e.,

desensitization and increased control). No additional information was provided to minimize the potential of bias. If the participants had questions about the utility of voluntary stuttering, they were informed that there would be time for questions and discussion at the end.

Similar to previous research studying voluntary stuttering (Davidow et al., 2019; Grossman, 2008), three words were presented to the participant. Participants were first asked to repeat the modeled words (cat, pencil, and house). After participants reported feeling capable and comfortable voluntary stuttering with a model, they were given a list of 50 words (Appendix F), and asked to practice voluntary stuttering. Once participants reported feeling confident voluntary stuttering at the word level, they were asked to voluntary stutter on a predetermined sound within a sentence. For example, the sentence "The cat jumped over the fence" was presented to a participant. The word "cat" was bolded and underlined, prompting the participant to voluntary stutter on that word. A standard list of 25 sentences was given to each participant (Appendix G). Participants read at least 10 sentences, but continued until both the participant and researcher felt confident in the participant's ability to voluntary stutter consistently and easily.

Based on previous research showing that voluntary stuttering can be taught with limited practice, it was anticipated that this practice would take between 5 and 10 minutes (Davidow et al., 2019; Grossman, 2008). The initial plan was to have a 15-minute time limit to minimize the likelihood of desensitization occurring during the practice phase. If the researcher felt that a participant was unable to reliably voluntary stutter after 15 minutes of practice, the participant would not continue with the exposure portion of the study. The participant would move directly to the debrief portion of the study to learn more about their experience. However, this was not needed as all three participants felt confident in their ability to voluntary stutter within 6-10 minutes.

Because struggle-free voluntary stuttering is being used in this study, the most important factor is that the moments of voluntary stuttering start out artificial and tension-free for the speaker. It is possible that using voluntary stuttering will transform into actual moments of stuttering and the sensation of loss of control and the inability to move forward with speaking (Martin & Haroldson, 1986; Perkins, 1983, 1984; Tichenor & Yaruss, 2019b). It is thought that voluntary stutters turn real more often when discomfort is high and turn real less often with desensitization. Therefore, it is anticipated that while participants are asked to voluntary stutter in a tension-free manner, some moments of voluntary stuttering will turn real. To reduce the likelihood of voluntary stutters turning real, the practice portion of the experiment will focus on voluntary stuttering without tension or struggle, as well as on increasing the participants' comfort with voluntary stuttering. It's difficult to know with certainty if moments are stuttering are voluntary or real since from the listener's perspective, since the sensation of loss of control isn't always visible (Perkins, 1983, 1990; Tichenor & Yaruss, 2018). To account for this challenge, the follow-up qualitative interview questions will explore the participant's experience.

Similar to previous conditions, participants were prompted to rate their distress while voluntary stuttering was introduced and practiced. However, given the mental tax of learning to voluntary stutter and the potential disruption of being prompted to rate distress every 60 seconds, the participants rated their distress every 120 seconds, using the sliding scale on the iPad touchscreen.

3.2.4.5 Voluntary Stuttering Practice Task

To prepare the participants for the voluntary stuttering condition in the study, the researcher explained that, just as in the first portion of the study, they will again be asked to describe pictures while rating their distress every 60 seconds. This time, however, they will be

asked to voluntary stutter. The participants were informed that a chime would periodically sound, and when they heard that, they should insert a voluntary stutter with at least three syllable repetitions on one of the next words they say (or as soon as is reasonable in their sentence). Using a practice picture, the participants practiced inserting moments of voluntary stuttering using an automated chime prompt (discussed in more detail below). The researcher provided feedback and examples of voluntary stutters to help the participant voluntary stutter in an easy, struggle-free manner. Practice continued for 2 minutes, followed by a brief check-in to gauge comfort level and if both the researcher and participant felt confident in their ability to insert voluntary stutters during spontaneous speech.

3.2.4.6 Silent Baseline

Before initiating the voluntary stuttering condition, a second silent baseline condition was conducted to minimize the likelihood that SUDS ratings during the voluntary stuttering condition reflected potential distress from the training period. As with the previous silent baseline condition, participants were asked to sit silently for two minutes. Participants were prompted to provide a SUDS rating every 60 seconds, totaling three ratings during the silent baseline condition. Identical to the initial silent baseline condition, the experimenter looked over paperwork and quietly preoccupied themself, to minimize potential participant discomfort of being watched.

3.2.4.7 Voluntary Stuttering Condition

> Before participants began the voluntary stuttering condition, the researcher instructed: Just like we practiced, while you're describing the picture, you'll randomly hear a chime alert. This will happen several times per minute. When you hear the chime, insert a voluntary stutter on one of the next words you say. Any questions?

The voluntary stutter prompts occurred at standard times across participants, between 8 and 16 seconds apart, consistent with previous research (Grossman, 2008). An interval timer was programmed, resulting in 25 chimes within the 5-minute speaking condition. Twenty-five prompts to voluntary stutter was chosen to maximize the number of data points while staying consistent with previous research to use voluntary stuttering every 8-16 seconds. As with the baseline condition, the voluntary stuttering condition continued for a minimum of 5 minutes and a maximum of 10 minutes, or until the stability criterion was reached, and participants were prompted to rate their distress every 60 seconds. The experimenter then let the participants know that they could stop the task.

3.2.5 Data Collection

To measure changes in distress across situations, SUDS ratings were collected throughout the experiment. Ratings were recorded by participants using a sliding scale on iPad touchscreen, linked to Qualtrics, as well as by the researcher as a precaution in the event of a technical malfunction. To ensure that changes in SUDS were due to voluntary stuttering and not just exposure to the speaking task SUDS were measured every 60 seconds as participants spoke as they normally do while completing a picture description task, as well as during the voluntary stuttering picture description task. SUDS levels were then compared to assess potential changes across conditions and the additive effect of voluntary stuttering.

3.2.6 Measurement Reliability

Given that all measures used in the study (OASES, SUDS, STAI) are self-report measures with well-documented reliability and validity, no inter- or intra-rater reliability testing was conducted in the exposure portion of Study Two. For the qualitative debrief portion, the same reliability and credibility protocols will be implemented that were used in Study One.

3.2.7 Data Analyses

SUDS values were graphed across time. Consistent with previous literature using single-case research methodology, visual analysis of the graphed SUDS data was used to interpret the results both *within* each participant and *between* participants. (Horner & Spaulding, 2010; Kratochwill & Levin, 2014; Wolery & Harris, 1982).

3.2.7.1 Within-Participant Visual Analyses

For each participant, both within- and across-phase analyses were conducted. Participants' SUDS data were graphed and evaluated using visual analysis consisting of absolute level, trend, range, variability, stability, and phase means. Absolute level refers to the amount of change or the range of SUDS values across the study (Kennedy, 2005). This was computed by collecting the first and last data points and subtracting the smallest from the largest. Once the "absolute level change" was calculated, the overall trend was noted (Gast & Spriggs, 2014). Trend describes the general direction of data movement within phases and across the study, providing information related to whether distress is increasing, decreasing, or remaining stable (Barton et al., 2018). To assess trend, or data shifts, from one phase to another, horizontal lines were superimposed within each phase to represent phase means that could be compared. To account for variability or fluctuation that were not perceivable using an absolute level value or directional trend descriptions, ranges of SUDS as well as a descriptive analysis of data movements were reported for each phase. As discussed above, stability, or the consistency of data (Hersen & Barlow, 1976), was defined as 3 consecutive SUDS ratings within 15 points of each other. For example, a participant's responses would be considered stable as long as three consecutive ratings were within between 20 to 35 (or any other 15-point envelope.)

3.2.7.2 Between-Participant Visual Analyses

In order to make broader impact claims of the impact of voluntary stuttering, similar trends and patterns of SUDS need to be apparent both within and between participants. Therefore, after visual analyses were conducted *within* participants, trends and patterns were compared *across* participants. To assess potential similarities across participants, participant graphs were overlayed and descriptively compared for patterns such as when increases and decreases in SUDS were observed.

3.2.8 Qualitative Debrief Interview

After the exposure portion of the study, each participant participated in a semi-structured debrief interview sharing their experiences. Participants were prompted using the opening question to better understand their first experience with voluntary stuttering, "What did you think about voluntary stuttering?" Follow-up questions were based on what each participant shared, using the specific terminology that the participant used. If specific topics were not organically brought up, the researcher asked this set of standard questions: 1) "How did it feel to voluntary stutter?" 2) "Did your experience with voluntary stuttering change during the course of the experiment?" 3) "Did you feel like there was enough time to practice voluntary stuttering?" 4) "Where you able to insert a voluntary stutter each time you were prompted? If no, what prevented it?" 5) "Did any moments of voluntary stuttering turn real? If so, did the occurrence change over time?" 6) "Did voluntary stuttering have an impact on how you felt about stuttering during the experiment?" 7) "Did voluntary stuttering have an impact on your perception of your fluency?" 8) "What did the term distress mean to you? Describe negative emotions you associate with distress." 9) "Is there anything else about this experience you'd like to share?"

Consistent with the previous portion of the study, all interviews were audio and video recorded. Interviews were then transcribed verbatim and reviewed. However, given the small number of participants, a full thematic analysis was not conducted. Rather, preliminary themes based on participant's shared experiences were identified, providing the groundwork for future research.

3.2.8.1 Summary

Study Two examined how adults who stutter experience being exposed to a voluntary stuttering task, utilizing an AB experimental design followed by a qualitative interview. The results of this study provide novel data about voluntary stuttering, more information about the time needed to achieve some reduction in reported distress, and the initial experiences of voluntary stuttering related to desensitization.

3.3 OVERALL SUMMARY OF STUDY ONE AND STUDY TWO

This project consisted of two studies: A qualitative study that explored the phenomenon of how voluntary stuttering affects desensitization (Study One), and a mixed methods study that observed changes in distress during and after the use of voluntary stuttering, followed by a debrief interview. Through semi-structured interviews, Study One provides a greater understanding of how individuals have previously used voluntary stuttering, how frequently they have used it, the types of voluntary stuttering used, and its overall impact on desensitization. Study Two utilized a single case research design to explore real-time reactions when adults who stutter are exposed to voluntary stuttering. The effect of voluntary stuttering was quantified by comparing SUDS across two speaking tasks (one picture description task where the participants spoke however felt natural to them, and one picture description task where the participant

voluntary stuttered). Study Two concluded with a qualitative interview which allowed participants to share additional information related to the experience.

4.0 RESULTS

4.1 STUDY ONE: PHENOMENOLOGICAL RESULTS

Transcripts of all nine participants, five of whom reported that voluntary stuttering was desensitizing and four of whom reported that voluntary stuttering was not desensitizing, were analyzed together. Although the inclusion criteria differed for the two groups, the thematic analysis were initially conducted across all participants together in order to limit potential biases based on prior experience. The two groups were then considered separately, to identify any potential between-group differences. Analysis of the semi-structured interviews uncovered four main themes and 12 subthemes related to voluntary stuttering and desensitization. These are shown in Table 7. Additional details for each theme and subtheme, as well as supporting quotes, are provided below. The highlighted quotes are not exhaustive; they are only a sampling of participant responses.

Table 7: Themes and Subthemes

Intent behind voluntary stuttering
Clinician's perspective
Affective changes
Increasing fluency
Effects of voluntary stuttering
Changing in control
Changes in affective reactions
Changes in overt fluency
Changes in physical tension
Continuing to use voluntary stuttering
Desensitization
Disclosing
Stuttering in a different way
Focusing on communication
Miscellaneous
Types of voluntary stuttering
Hitting rock bottom

4.1.1 Intent Behind Voluntary Stuttering

Participants reflected on their experiences of first being introduced to voluntary stuttering and the rationale that was originally provided by their speech therapist. All participants described that their initial intent of using voluntary stuttering was to achieve one of two goals: 1) affective changes (e.g., increased comfort, increased confidence, decreased fear) or 2) increased fluency.

> Participant 2 (P02): Intention is, I think, the biggest key. What is the intention of doing the voluntary stutter? Is the intention to stop yourself from stuttering and resisting that? Or is the intention to allow yourself to stutter?

4.1.1.1 Clinician's Presentation

Not surprisingly, the participant's underlying intent was consistent with the rationale given by the speech therapist. For example, if a speech therapist introduced voluntary stuttering as a tool to increase fluency, then the participant reported that their intent of using voluntary stuttering was to increase fluency. In contrast, if the speech therapist introduced voluntary stuttering as a tool to become more comfortable with stuttering, then the participant reported their intent of using voluntary stuttering was to desensitize to stuttering.

> The following responses reflect the theme of intent and clinician-provided rationale.
>
> P01: From the start I was doing whatever I was told to do, which is like completely have control of that sentence or that moment.
>
> P04: [My speech therapist] was the first person to really say to me 'oh maybe it's okay to stutter' and I liked that…I really trusted [my speech therapist]. I think it made sense to me um that [voluntary stuttering] would work. Yeah, I don't know, I really I believed it and I kept doing it.

P05: At first [the speech therapist] told me that in order to be in more control of my stutter, I would have to purposefully stutter.

P06: When I go for my first speech therapy, they recommend voluntary stuttering for me…the reason why I think they recommend that for me was just that um if you are pronouncing a word [stuttering] purposely…[like] repeat this word on purpose… slowly you can um overcome your stuttering.

P07: [My speech therapist] told me that it would help me control my stuttering…[If] I voluntarily stutter, I can choose not to stutter. That was the whole idea behind it.

4.1.1.2 Affective Changes

Within the general theme of intent, a subtheme of affective changes was uncovered. Some participants described that they tried voluntary stuttering to change how they felt about stuttering. Reported affective changes included: reducing fear and shame, increasing comfort, feeling okay about stuttering, and increased listener comfort.

P01: The rationale that I primarily internalized was um if you stutter on purpose you will not be terrified to stutter because it's out there…helps unpack the fear, unpack the shame.

P02: I do [voluntary stuttering] for myself so that I know that I'm being heard as a person who stutters…that can be a good way to put myself at ease.

P03: I think at its core [voluntary stuttering] is just a strategy for me to be able to speak and communicate in a way that is more enjoyable and feels easier and more comfortable.

4.1.1.3 Increasing Fluency

The other subtheme, within the larger theme of intent, was increased fluency and control. Participants shared that they initially tried voluntary stuttering to change their overt speech. Specifically, voluntary stuttering was used with the goal of overcoming or stopping stuttering.

P02: [My] intention was to make myself more fluent.

P08: My sole objective was to be in control of my speech so I can stutter less.

P09: Voluntary stuttering was to make me more fluent so I can be confident of who I am.

4.1.2 Effects of Voluntary Stuttering

As participants described their experience using voluntary stuttering, they all mentioned that voluntary stuttering affected other aspects of the stuttering experience. For example, participants shared that when they voluntary stutter, they experience changes in control, fluency, affective reactions, and/or physical tension. However, some of these effects were also perceived by the participants as negative; these negative effects reduced their desire to continue voluntary stuttering.

4.1.2.1 Changes in Control

Participants reported that voluntary stuttering resulted in increased control. These participants described control as having a greater sense of autonomy – being able to decide when they will stutter, how it will sound, and how it will feel.

P01: You're putting more stuttering in to gain control.

P02: [Voluntary stuttering] gave me the sense of like control over something that haunted me all day long.

P05: [Voluntary stuttering] kind of took away that feeling like every time I would speak I would just lose control…it was kind of more on my terms in like it was me taking control of my stutter… like it's my like decision in a way…like 'okay like I'm going to stutter' because that's what I'm choosing to do, rather than me like opening my mouth and stuttering and then getting really tense and feeling like I lost the control.

P08: [Voluntary stuttering] was like a way of helping me control the way I actually make my speech, like the way I stutter.

4.1.2.2 Changes in Affective Reactions

Participants also discussed changes in their thoughts and feelings as a result of voluntary stuttering. The described affective changes centered around feeling more confident, less anxious, and believing that “it’s ok to stutter.”

P03: [Voluntary stuttering] remind[ed] myself that regardless of the severity of the stuttering I'm experiencing, I'm gonna be okay.

P04: I do [voluntary stuttering] more to remind myself that it's okay to stutter and put it out there. I know that [voluntary stuttering] makes me feel happier, and prouder, and more free to say exactly what I want to say, and be authentic, and be passionate – like, it just leads to all the things l have learned to like about myself. Just doing the voluntary stuttering frees my brain up to like be me and talk. Sometimes, if I don't [voluntary stutter], my brain, I think, goes into this old pattern of like kinda still trying not to stutter. Like even if I'm not very aware of it, I do think it's happening unless I voluntary stutter. It [voluntary stuttering] really clicks my brain into 'it's okay to stutter' and it's just like very freeing.

P08: The outcome of [voluntary stuttering] was how I was able to restore my confidence and [reduce] my state of nervousness.

P09: Voluntary stuttering is uh, I did that to reduce my anxiety and fear, to interact with people, and also [it] boosts my confidence level.

4.1.2.3 Changes in Overt Fluency

Another reported effect of voluntary stuttering was increased fluency. Participants described that even though their speech had instances of voluntary stuttering, overall they experienced greater spontaneous fluency.

> P01: If I was stuttering on purpose it would like take away the need to stutter organically like the need in my brain sometimes.
>
> P02: [Voluntary stuttering] allows you to have more spontaneous fluency at times.
>
> P08: So even when we're trying to stutter [voluntarily], it decreases the possibility of actually stuttering, if that makes sense…
>
> P09: [Voluntary stuttering] helps me and it uh makes me be fluent with my speaking…I tend to stutter less.

In contrast, some participants reported that voluntary stuttering resulted in increased stuttering. Two participants shared that they "overdid" voluntary stuttering and were ultimately stuttering "too much."

> P06: When I started using um voluntary stuttering, when I started um stuttering purposely, I discovered that, at that point in time, [real moments of stuttering] started um reducing. But, when I continued with the voluntary stuttering, it um, I get used to it and um start over doing it… Like um I started just doing it purposely continually. So um, it had a negative effect on me that I have to stop it… I was 'okay, it makes my stuttering to be much.
>
> P07: I realize that over time, I tend to overdo it and it tends to make me nervous. And I don't like uh the feeling I get… [Voluntary stuttering] made me stutter more. Yeah, it was not working.

4.1.2.4 Changes in Physical Tension

Participants also reported changes in physical tension. Participants shared that due to voluntary stuttering, tension and struggle were reduced, resulting in an easier and more comfortable form of stuttering.

> P01: Like the minute I start trying to [voluntary] stutter, like that all the tension just like evaporates… a way less tense way of stuttering where I just don't feel that in my body.
>
> P03: [With voluntary stuttering], it definitely feels like I stutter with a lot less struggle…it would make that moment of stuttering easier to work through – shorter and less of a struggle.
>
> P04: [Before being introduced to voluntary stuttering], I had no idea that I could [stutter more easily]. It was always, just like, push. Like, push the word out to try to be fluent, and then this new thing of like letting it come out and sound like a stutter really freed my body.
>
> P06: [Voluntary stuttering] helped me…towards reducing that reaction and tension, and leaving me with a more comfortable form of stuttering.

4.1.3 Continuing to use Voluntary Stuttering

Some participants reported that while they were originally introduced to voluntary stuttering years ago, they still use voluntary stuttering. Participants shared that the main reasons that they continue to use voluntary stuttering are to feel more comfortable, to disclose stuttering to others, to modify moments of stuttering, and to refocus on effective communication.

4.1.3.1 Desensitization

Participants described experiencing ongoing desensitization as a result of voluntary stuttering. Many participants shared that by continuing to use voluntary stuttering, they were able

to tolerate how stuttering felt and sounded, as well as listener reactions, which helped remind them that "stuttering is ok" and allowed them to stutter with less emotional distress.

> P01: [It's] desensitizing to let somebody hear me stutter…like desensitizing to know you can stutter and communicate.
>
> P02: I went through many stages where I was internally and externally afraid to make the sound that stuttering could have...with voluntary stuttering…it's okay to make those sounds and to make other people aware… allowing your body to get used to that feeling allows you, when those real ones come up, to not be as taken a back or as shocked when they happen…...being desensitized.
>
> P03: For me, for such a long period of my life, every moment of stuttering that I ever had was linked to lots of emotions and feelings of discomfort, and feeling like all these negative feelings… decoupling some of those emotions from the moment of stuttering itself was really critical for me. And part of that journey was just stuttering a lot in front of people. It's just that whole concept of desensitization.
>
> P04: For me, the desensitization piece is the biggest piece [of voluntary stuttering] because I was so afraid to stutter that I didn't really know what it felt like to be able to stutter…My brain and my body need reminders that it's okay to stutter. And so I do it [voluntary stuttering] more to remind myself that it's okay to stutter and put it out there.

4.1.3.2 Disclosing

Participants shared that one of the reasons they voluntary stutter is to self-disclose or "advertise" the fact they stutter. Some participants explained they use voluntary stuttering to educate the listener and ensure that the listener knows they stutter. Other participants reported

that in addition to using voluntary stuttering to disclose their stuttering to the listener, their main intent is to remind themselves that they do not need to be fluent and can stutter openly.

> P03: Eventually if I spend enough time with this person they're gonna know that I stutter. So do I wanna have this weird mental gymnastics of like 'When that's gonna happen? Do they know? Do they not know?', or can I just start, get this out of the way, and just when I meet them do voluntary stuttering. They can see that I stutter. I feel pretty good about it because um, you know, I'm a little bit more in control of how everything's gonna go.
>
> P04: I really liked that [voluntary stuttering] was something I could use almost to advertise to show the person that I stuttered… and sort of set it up so that they felt more comfortable…like putting my listener more at ease - I liked that…it does still even to this day help me feel comfortable talking to a new person…being able to keep eye contact while voluntary stuttering taught me a lot about 'oh this person doesn't care as much as I thought that they would.' and that made me feel more comfortable in moments of stuttering…I don't always say I stutter, but I often voluntary stutter even now.
>
> P05: I'm telling them 'this is me, I'm a stutterer' without even having like to say anything. So I'm just letting them know, without actually like saying 'I'm a person who stutters.'…It's like textbook stuttering, you know? That's how I voluntary stutter. It's very similar to like those like cartoons we would see, so I feel like people know more what's going on.
>
> P09: When talking to a total stranger or someone that I am not as familiar with, I tend to use [voluntary stuttering] so I don't feel embarrassed.

4.1.3.3 Stuttering in a Different Way

Participants reported that another reason they use voluntary stuttering is to stutter differently. Some participants described voluntary stuttering as a type of stuttering modification, in which they actively modified their speech before, during, or after a moment of stuttering. Other participants considered voluntary stuttering to still be stuttering, but described it as being "different," "easier," and something they can "play around with."

> P01: [Voluntary stuttering] is like a form of like a pullout…if I had a real stutter that I could tell was going to happen, like really leaning into it and having it be sort of like half fake stuttering half actual… it wouldn't make it fake but it would make it would definitely make it different.
>
> P02: [Voluntary stuttering] is almost at times a form of stuttering modification… you're modifying it by allowing…[Voluntary stuttering] didn't feel like stuttering. I mean I was still disfluent, but I didn't feel any pressure, I wasn't stuck, I wasn't trying to like get something out with struggle, but I was still stuttering, just on my own terms I guess.
>
> P03: If I was worried about a word coming up or a sound coming up. And then I like started voluntary stuttering before that moment cause I think like I had a habit before of like really working myself up. And then once that moment of stuttering would hit, then I would also have my emotional reaction to it and then it would just really be a thing. Whereas if I already was allowing myself to stutter prior to that big scary moment, it would make that moment of stuttering easier to work through - shorter and less of a struggle.
>
> P04: [Voluntary stuttering] was taking ownership of it [my stuttering] because when I did stutter, it was very struggled. I think I also ended up liking voluntary stuttering a lot, to be

honest, because it changed my stuttering… it changed my real stuttering be more forward moving and like easy bouncy you know.

P05: Voluntary stuttering wasn't as different as the times that I didn't choose to voluntary stutter because when I didn't choose to voluntary stutter, I would stutter anyway. So it felt like okay, if I'm gonna stutter let me stutter...on my terms…I was stuttering more but it felt like less heavy.

4.1.3.4 Focusing on Communication

Participants shared that voluntary stuttering allowed them to focus on effectively communicating, rather than fluency. For example, participants reported that voluntary stuttering made it easier to remain present, focus on the content of what they wanted to say, maintain eye contact if they chose to, and reduce avoidance behaviors.

P01: Voluntary stuttering takes away some of the struggle so I can enjoy stuttering more. So I can like enjoy the experience of it more. Not necessarily stuttering less or trying not to stutter but trying to enjoy it more…looking someone in the eye, you know staying on topic when you're stuttering, like mentally staying present. Those were all things that you could do a lot easier when you were voluntary stuttering.

P02: …allowing your intention to drive the conversation and allowing your voice to truly be heard however it comes out without hiding it or trying to not have like the secondary behaviors or avoidance behaviors and just kind of speak.

P03: I think at it's core it's [voluntary stuttering] just a strategy for me to be able to speak and communicate in a way that is more enjoyable and feels easier and more comfortable…[it] just really took the edge off so that I could be the communicator that I needed to be in the moment regardless of how much real stuttering I was experiencing.

P04: Voluntary stuttering changed my stutter tremendously because I started to realize that um it was possible to talk to a person and show stuttering and still be liked, and um get my point across, and you know get the food I want from the waiter, and all that kind of stuff.

P05: When I'm just stuttering normally, I'm just too tense and my mind is like racing. I can't even be in the moment. Whereas with voluntary stuttering, I feel slightly more in the moment…more in the back of my mind. Like I can do something to maybe make conversations easier for me.

4.1.4 Miscellaneous

There were a few subthemes that did not fit into a clear theme but were described by numerous participants and are relevant to the exploration of voluntary stuttering. This miscellaneous theme was created to discuss two miscellaneous subthemes: types of voluntary stuttering and hitting rock bottom.

4.1.4.1 Types of Voluntary Stuttering

When asked about how participants used voluntary stuttering, numerous variations were described. Types of voluntary stuttering included simulating blocks or actual moments of stuttering in a "struggled way," producing "easy bounces" or repetitions, and "playing" with an actual moment of stuttering by holding onto it and making it partially fake.

P01: The kind of voluntary stuttering that I've done more of is sort of really wanting stuttering to happen in a certain situation. So it's not a total fake stutter. It's also sometimes a real stutter. Um but being really like leaning into it and really like moving forward with it and wanting it to happen…hold on to it and prolong it and like play around with it…to voluntary stutter and try to make it really real to me it didn't feel

comfortable. and maybe that doesn't have to feel comfortable and it's not supposed to…it doesn't really feel feasible to me like I almost can't do it like I can't replicate the same thing.

P02: …all different kinds. Like sometimes I'll do little bounces, little repetitions, sometimes I'll really hold them out, sometimes I'll do an intermix of the two just to kind of hear the sounds.

P03: I started doing some voluntary stuttering, specifically just sort of simulating some blocks, and then just kind of doing some lighter repetitions to just move forward with speech…just started voluntary stuttering in a similar struggled way as the way that I was speaking. And what it does for me is immediately reminds me in a visceral way that like it's okay to stutter.

P04: I was sort of taught to do more of these easy bounce kind of voluntary stutters…sometimes I play around with putting more struggle in my voluntary stuttering more to like show the person I'm talking to a variety of stuttering and it's my own little game I guess because I feel like as a voluntary stuttering is a way for me to play around with stuttering.

4.1.4.2 Hitting Rock Bottom

Another shared experience among participants was needing to exhaust options for trying to be more fluent through speech modifications. Participants shared that only after being unable to obtain fluency, accepting that they would likely continue to stutter, and hitting "rock bottom," were they open to voluntary stuttering.

P01: I was like really wanting to try to make the fluency shaping part of it work… within months of the program [I] realized like this [fluency shaping is] not gonna work for me...I

tried to do it and I was like oh I can't do it…I was like okay so that one thing [voluntary stuttering], that was actually very obvious to me, that changed the way stuttering felt, where not many other speech tools that I came across really obviously in my body changed the way stuttering felt.

P03: I still hated stuttering. I just wanted to not stutter. Yeah. I was like literally practicing fluency shaping every morning until it like slowly stopped working, and then everything imploded again…[Before trying voluntary stuttering], I think it's like you gotta get to that like deep level of acceptance where you're like 'wow I actually truly believe that I will stutter my entire life, and like this is part of who I am.' And I think that, at first, with [speech therapy], I never could get to that point cause like that carrot of fluency was so strong…which made the crash all that much worse really…change is super hard and you have to make fundamental changes with stuttering and sometimes it's easiest to change when you're in such a bad place that it becomes pretty clear that changing is the only option to reduce the negative stuff in your life. um so in that way, I think it can kind of be a catalyst for change.

P04: So my first exposure to voluntary stuttering...I was struggling immensely. Like kinda rock bottom in that stuttering and the fear of stuttering was dictating everything that I did and I felt as ashamed as humanly possible.

Other stuttering-related themes that were unrelated to the topic of voluntary stuttering were also identified during the analysis. For example, participants commented about educating and normalizing stuttering for others. P02 shared, “I know that putting stuttering out into the world...is not only going to help me, but also…little Jimmy who's ten years old and having trouble on his words, or [someone] who is retired in Florida and stutters.” Because the purpose of

this analysis was to explore the experience of voluntary stuttering related to desensitization, these additional general stuttering-related themes are not described further in this dissertation paper; they will be analyzed at a later date.

4.1.5 Between-Group Comparison

After the thematic analyses were completed, the participants' data were separated into their original inclusion groups (i.e., those who found voluntary stuttering to be desensitizing and those who did not) to assess if there were differences between groups. One between-group difference was the participant's general feelings towards voluntary stuttering. The group of participants who reported that voluntary stuttering was desensitizing all shared that voluntary stuttering was helpful and/or reduced adverse affective reactions. For example, participants shared that voluntary stuttering "just opens up something in your body where it's like okay, it's okay" (P01), that voluntary stuttering "brings my emotions down and anxiety level down" (P03), and voluntary stuttering "made me feel more comfortable in moments of stuttering…and I was just less afraid to stutter" (P04). However, the group of participants who reported that voluntary stuttering was not desensitizing all commented either their dislike for voluntary stuttering or that it was only helpful because of increased fluency. For example, voluntary stuttering "had a negative effect on me" (P06), "I thought it was going to be helpful, but afterwards I began to see um like that um it has more disadvantage" (P07), and "the voluntary stuttering was to make me more fluent so I can be confident of who I am" (P09).

Interestingly, some of the participants who reported that voluntary stuttering was not desensitizing, also shared that voluntary stuttering made them feel more comfortable. However, they ultimately reported not liking voluntary stuttering as it did not make them more fluent. For example, P06 (who was in the group who did *not* find voluntary stuttering to be desensitizing)

shared that voluntary stuttering "helped me…reducing that reaction and tension, and leaving me with a more comfortable form of um uh stuttering." However, a few minutes later P06 stated, "[voluntary stuttering was making] my stuttering to be much…it was making me uncomfortable and um it was getting worse too." In contrast, when participants in the other group (who reported that voluntary stuttering *was* desensitizing) were asked if voluntary stuttering impacted their overt fluency, participants reported both an increase and decrease in overt stuttering, suggesting the perceived helpfulness of voluntary stuttering was independent of fluency changes. Some participants even seemed insulted by the insinuation that voluntary stuttering would be used to change fluency. For example, when asked if voluntary stuttering had an impact on fluency, P02 shared that voluntary stuttering "allows you to have more spontaneous fluency at times." However, when asked how long the spontaneous fluency typically lasts, P02 responded, "I don't know. No comment…I don't think about that" and then reinforced that voluntary stuttering is "just an empowerment of again putting stuttering out there." Thus, although participants in both groups reported increased comfort after using voluntary stuttering, for one group overall helpfulness was reliant on fluency changes.

This group difference in the perceived helpfulness of voluntary stuttering related to fluency seems to be related to the clinician's rationale for using voluntary stuttering. The four participants who did *not* find voluntary stuttering to be desensitizing all shared that the clinician's rationale for using voluntary stuttering in therapy was for the speaker to be more fluent. They described that when voluntary stuttering was introduced, the clinician presented it as a way to "overcome your stuttering" (P06), to "choose not to stutter" (P07), to "control my level of stuttering" (P08), and to "make me more fluent" (P09). In contrast, all five participants who reported that voluntary stuttering *was* desensitizing explained that their intent – and the rationale

provided by the clinician – was "not be[ing] terrified to stutter" (P01), "allow[ing] yourself to stutter" (P02), seeing that "not all stuttering is the same…not like fluency good stuttering bad" (P03), "show[ing] the listener that I stutter" (P04), and "be[ing] more in control of my stutter" (P05). Thus, it appears that the clinician's rationale for using voluntary stuttering and how it is presented during therapy impacts the resulting desensitization.

4.2 STUDY TWO: MIXED METHOD RESULTS

To explore the experiences of adults who stutter during their initial exposure to voluntary stuttering, three participants regularly rated their distress while voluntary stuttering for the first time, and then participated in a debrief interview. These three participants were different from the nine participants in Study One. To minimize confusion with Study One participants, Study Two participants are identified as Participants P(A), P(B), and P(C). Visual analysis of the graphed SUDS data, as well as reported participant experiences, were interpreted within each participant and then compared across participants.

4.2.1 Within-Participant Results

For each participant, both within-phase and across-phase visual analyses were conducted. Within-phase and across-phase visual analyses evaluated absolute level, trend, range, variability, stability, and phase means of SUDS ratings. The first SUDS rating was collected directly after the rating scale was introduced. Continuous ratings then occurred every 60-120 seconds depending on the phase. Because phase length varied across participants (i.e., the time spent introducing voluntary stuttering and during the voluntary stuttering condition differed depending on SUDS stability), participants provided between 29-30 SUDS ratings over 33-35 minutes. To assist with visual inspection, each participant's SUDS ratings were graphed across time and

phase. Additionally, horizontal lines were superimposed to represent the average SUDS ratings within each phase.

4.2.1.1 Participant A

P(A) reported 29 SUDS ratings. The graphed visual representation can be found in Figure 3 and the related numeric data are presented in Table 8. Absolute level was calculated by subtracting the last SUDS rating from the first. Because the initial SUDS rating was 3, and the final SUDS rating was 13, the absolute level was 10. Visual inspection confirmed this level, suggesting a slight rising trend of SUDS ratings. Within each phase, trends varied between increasing, decreasing, and remaining stable, although regardless of the trend direction, the absolute level within each phase remained low with a range of 0-8.

Figure 3: Participant A Graphed Subjective Units of Distress

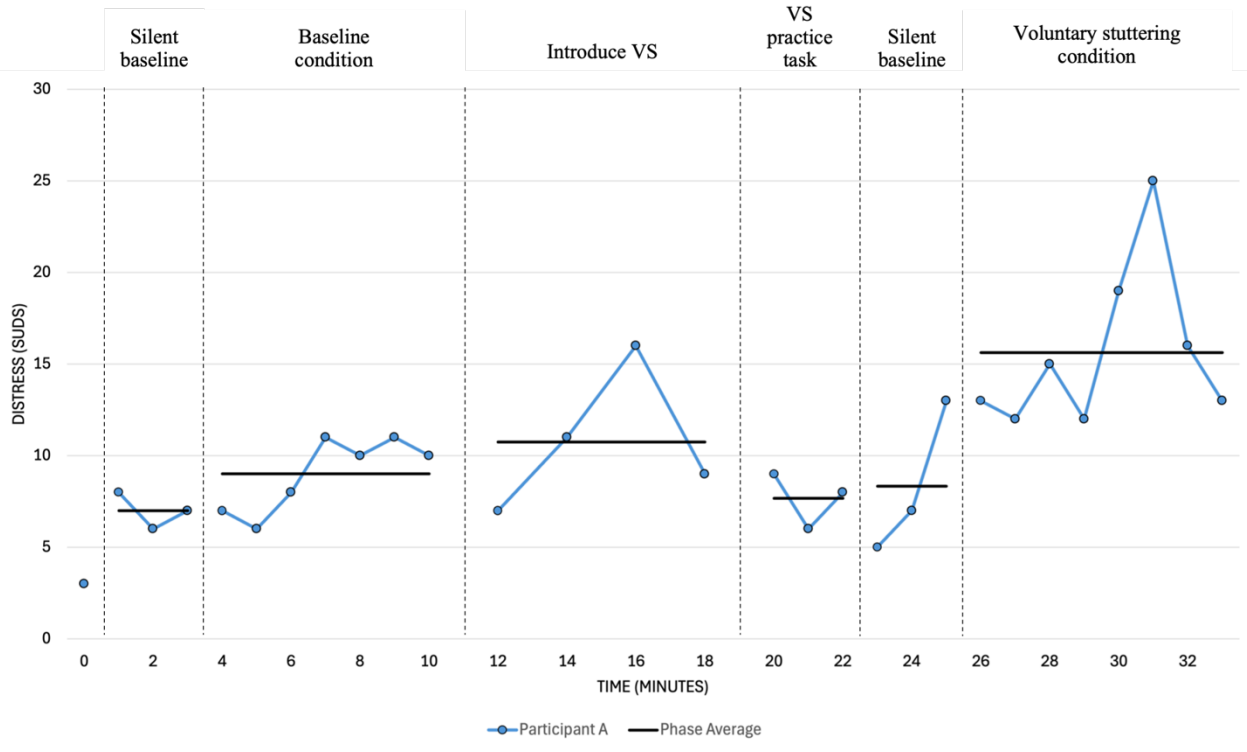


Table 8: Participant A Visual Analysis Numeric Values

Phase	First SUDS	Last SUDS	Absolute Level	SUDS Range	Mean SUDS	Trend	Stability Reached
Across Phases	3	13	10	22	10.45	Increase	-
Silent Baseline	8	7	-1	2	7.00	Decrease	Yes
Baseline Condition	7	10	3	5	9.00	Increase	Yes
Introduce VS	7	9	2	9	10.75	Increase	Yes
VS Practice Task	9	8	-1	3	7.67	Decrease	Yes
Silent Baseline	5	13	8	8	8.33	Increase	Yes
VS Condition	13	13	0	12	15.62	Stable	Yes

Although absolute levels within each phase did not suggest much data movement, visual inspection showed more variability. Throughout the study, P(A) reported SUDS ratings that ranged from a minimum of 3 to a maximum of 25. Noteworthy are the drastic increases and then steep decreases in SUDS ratings during both voluntary stuttering phases. When voluntary stuttering was first introduced, P(A) peaked with a SUDS rating of 16, and then quickly decreased to 9. Similarly, during the voluntary stuttering condition, P(A) rated their distress at 25 before again quickly returning to 13. The repeated increase and then decrease of SUDS ratings after being exposed to voluntary stuttering suggests a pattern. This pattern indicates that initial exposure to voluntary stuttering results in a rapid yet short-lived increase in distress, followed by habituation and a quick decrease in distress.

When comparing phase means, visual analysis showed that both times voluntary stuttering was used (i.e., during the introduction of voluntary stuttering (VS) phase and the VS condition phase) there was an increase or upward shift in SUDS means. While there was notable variability with both increasing and decreasing trends, stability was reached by the end of each phase with 3 consecutive SUDS ratings falling into a 15-point envelope.

After the experimental portion of the study, P(A) answered a few questions during a debrief interview. The participant shared that voluntary stuttering is “not really my favorite

thing…because I feel like when I have to think about it, the more likely I am to actually stutter…like it triggered something." P(A) also described that during some instances, voluntary stuttering turned real: "I was gonna [voluntary stutter] for like this long, but then some of it was longer… they felt fake but then sometimes they felt real afterwards, like when I wasn't trying to [voluntary stutter]." He went on to say that "they were turning more real at the end because I kinda let it in…I guess it like opens the door to you know it happening more naturally." While P(A) shared that voluntary stuttering "let [himself] lose control" and gave him permission to stutter, he "would prefer to not have to like all of that [stuttering] like come back in."

4.2.1.2 Participant B

P(B) rated distress 30 times across the study. Graphed and numeric representations of this data can be found in Figure 4 and Table 9, respectively. Visual inspection across phases revealed a rising trend of SUDS ratings with an absolute level of 23 (initial rating of 0 and final rating of 23.) Within each phase, trend directionality varied between increasing, decreasing, and remaining stable, though a decreasing trend was noted in both the baseline and voluntary stuttering experimental conditions.

Throughout the study, P(B) reported a range of experienced distress that spanned SUDS ratings of 0 to 62. The highest rating of distress (i.e., SUDS rating of 62) was reported during the introduction of voluntary stuttering phase. However, it does not appear that this large range of SUDS was strictly due to random variability or fluctuations. Rather, a pattern was revealed when the baseline condition and the introduction of voluntary stuttering phase were compared. In both instances, within the phase, there was a sharp increase of SUDS followed by an immediate and drastic decrease.

Figure 4: **Participant B Graphed Subjective Units of Distress**

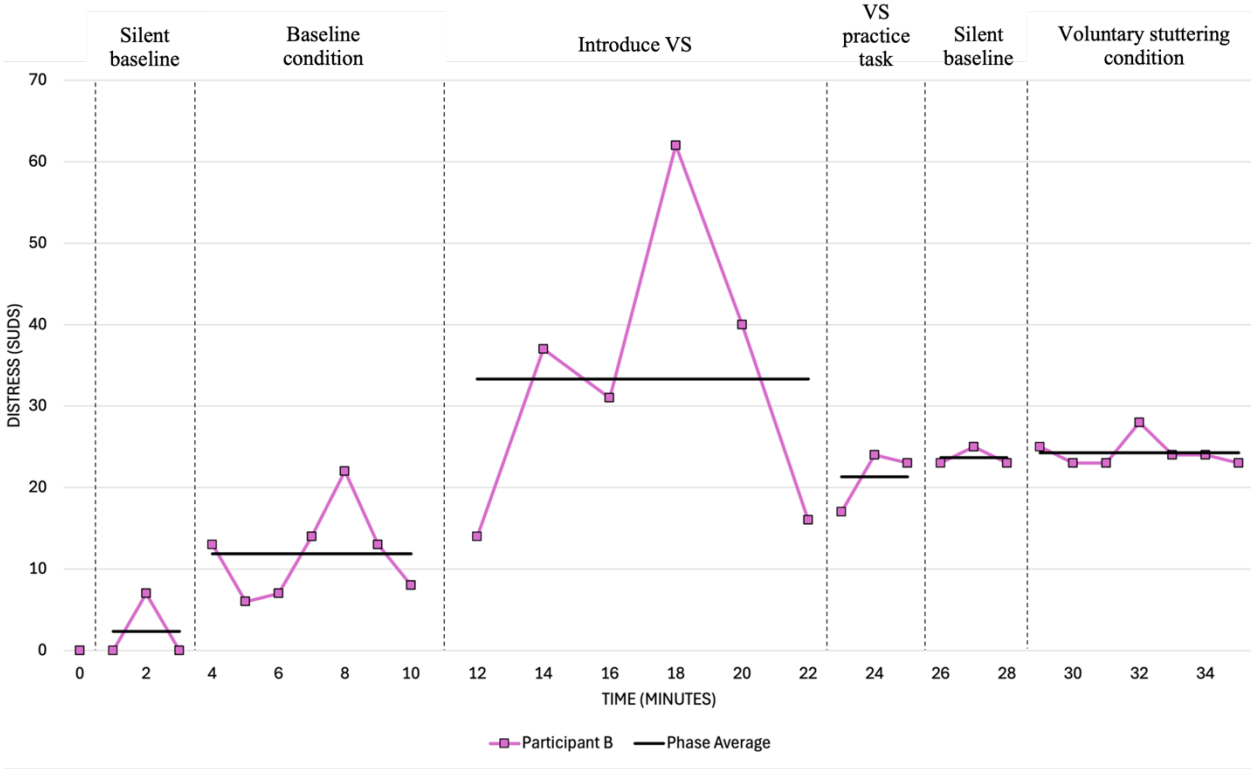


Table 9: Participant B Visual Analysis Numeric Values

Phase	First SUDS	Last SUDS	Absolute Level	SUDS Range	Mean SUDS	Trend	Stability Reached
Across Phases	0	23	23	62	19.83	Increase	-
Silent Baseline	0	0	0	7	2.33	Stable	Yes
Baseline Condition	13	8	-5	16	11.86	Decrease	Yes
Introduce VS	14	16	2	48	33.33	Increase	No
VS Practice Task	17	23	6	7	21.33	Increase	Yes
Silent Baseline	23	23	0	2	23.67	Stable	Yes
VS Condition	25	23	-2	5	24.29	Decrease	Yes

Consistent with this pattern, visual analysis revealed that the largest changes in phase means occurred between the silent baseline and the baseline condition, and between the baseline condition and the introduction of voluntary stuttering phase. Stability was reached by the end of both experimental conditions (i.e., the baseline condition and the voluntary stuttering condition),

with 3 consecutive SUDS ratings falling within a 15-point envelope. However, stability was not achieved after the introduction of voluntary stuttering phase and before the initiation of the voluntary stuttering practice task phase.

During P(B)'s debrief interview, he shared that voluntary stuttering helped him acknowledge and accept his stuttering:

> It's really interesting it's like another level of acknowledging my stutter…because I'm already voluntary stuttering it's like what's the difference between that and a real stutter? At this point it's just not as stressful because I'm like already stuttering…There's nothing at stake here like I'm just gonna say the word that I tend to say… I think it's about feeling like I was owning it.

When asked about the term distress, P(B) defined it as "any sort of discomfort um like any feeling that's related to discomfort." He went on to say that his distress "was very low throughout the whole process…like when I started the voluntary stuttering that was like the highest it got… and to me that's still not aggressively high." Following the participant's lead, the investigator asked questions about their rated distress levels when voluntary stuttering was first introduced. P(B) described the first increase of SUDS ratings, around minute 14, was due to "accepting that I'm stuttering a little bit; as a covert stutterer, it's just naturally the distress level is higher…confronting it was somewhat distressful, but not extreme."

Although P(B) reported that voluntary stuttering "did get easier as [he] went," he also stated:

> There was a couple times that I would stutter on a word that would typically be tough for me and then it would be harder to get out of that sequence…like I would try to do it like

three times and it would happen four or five um not even sure if that's noticeable but like I knew going into it. It was more of like a real stutter when I got going.

Specifically, P(B) described that the second peak in SUDS (around minute 18) was related to an increase of real stuttering. He explained that as he voluntary stuttered reading practice sentences (Appendix E):

> It was all good up until here, and then I like actually started stuttering a little bit and was getting more and more tense and distressed. And then with five [sentences] left, I was just kind of like that's the whole point of this and it completely calmed down again.

P(B) shared that his distress was lowered overall during the rest of the study, even during moments when voluntary stuttering turned real:

> Doing it more and more and like on the random chime…and after a couple it didn't feel distressing at all…Yeah and even when I would get stuck toward the end it still really wasn't distressing…it was less panicked and I was just working through it.

4.2.1.3 Participant C

P(C) reported a total of 29 SUDS ratings. The graphed visual representation is presented in Figure 5 and the related numeric data can be found in Table 10. The initial SUDS rating was 24, and the final SUDS rating was 37, making the absolute level 13, suggesting an overall increasing trend across SUDS ratings. Within each phase, trend directions varied between rising and falling, with absolute levels within each phase ranging from 4-30.

Across phases, visual analysis showed more variability with SUDS ratings ranging from a minimum of 21 to a maximum of 51. There were 3 instances of drastic increases and then immediate decreases in distress. During the silent baseline phase, consecutive SUDS ratings rose from 23 to 51, and then immediately decreased to 24 once the phase concluded. Similarly, when

Figure 5: **Participant C Graphed Subjective Units of Distress**

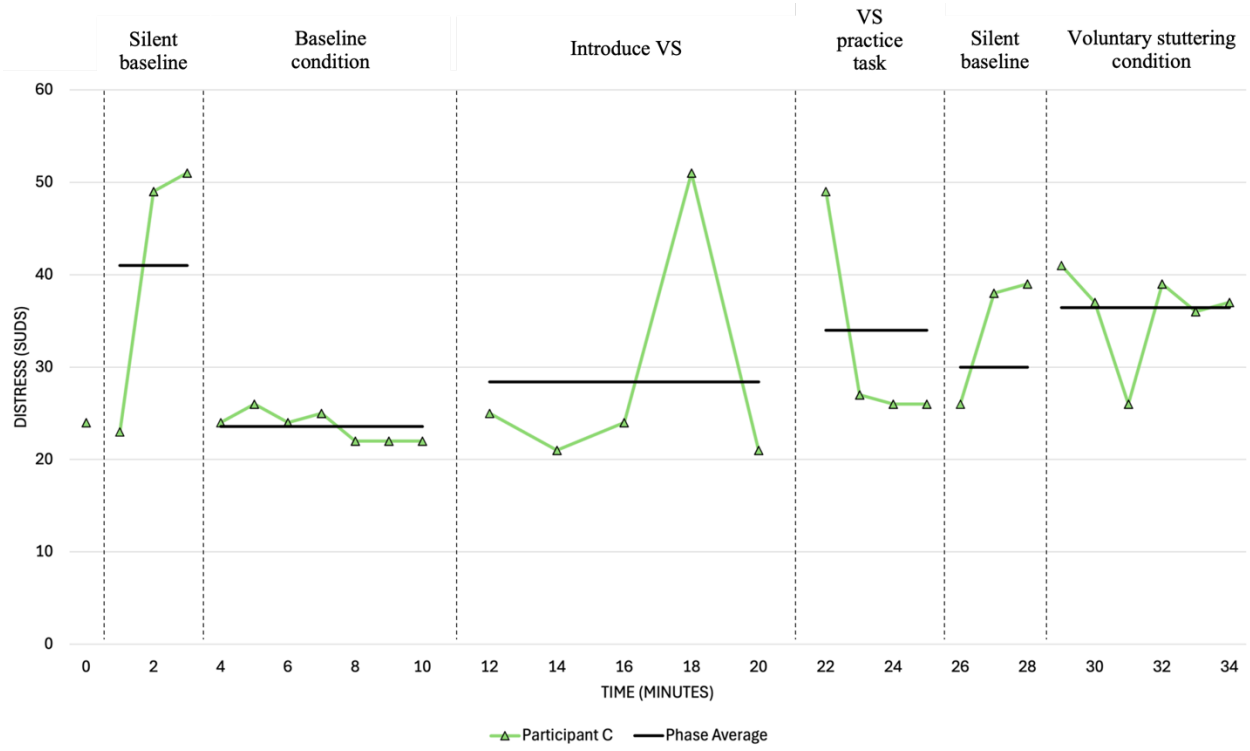


Table 10: Participant C Visual Analysis Numeric Values

Phase	First SUDS	Last SUDS	Absolute Level	SUDS Range	Mean SUDS	Trend	Stability Reached
Across Phases	24	37	13	30	31.07	Increase	-
Silent Baseline	23	51	28	25	41.00	Increase	No
Baseline Condition	24	22	-2	4	23.57	Decrease	Yes
Introduce VS	25	21	-4	30	28.40	Decrease	No
VS Practice Task	49	26	-23	23	34.00	Decrease	No
Silent Baseline	26	38	12	12	30.00	Increase	Yes
VS Condition	39	37	-2	15	36.43	Decrease	Yes

voluntary stuttering was introduced, consecutive SUDS ratings jumped from 24 to 51 and then immediately returned to 21. Lastly, a similar pattern was observed during the voluntary stuttering practice task, as SUDS ratings increased to 49 and then immediately fell to 27.

When comparing phase means, visual analysis indicated a slight rise both times voluntary stuttering was present (i.e., during the introduction of voluntary stuttering phase and the voluntary stuttering condition). However, the average SUDS ratings for both phases were

lower than the phase mean calculated during the initial silent baseline. During both of the experimental conditions and the second silent baseline phase, stability was reached. However, 3 consecutive SUDS ratings within a 15-point envelope was not achieved during other phases.

During the debrief interview, P(C) shared that, “it wasn’t easy, but it wasn't bad…[and it got] easier over time.” When asked about the experience, P(C) explained that she typically avoids stuttering, so “the first picture was easy because I could mask it all.” She went on to say, “I’m so used to masking… I know when a word is not gonna come out right. So I’ll substitute the word for something else. Um or I won’t say anything.” However, despite being fairly covert, she reported “want[ing] to try to put it [voluntary stuttering] into practice.” She explained that “when I felt like it would be a word that I was gonna stutter on, doing the voluntary stuttering helped it become easier.” P(C) did share that occasionally voluntary stuttering “began fake and then it then it turned a little real,” but that “it felt easier” than other moments of stuttering.

4.2.2 Across-Participant Results

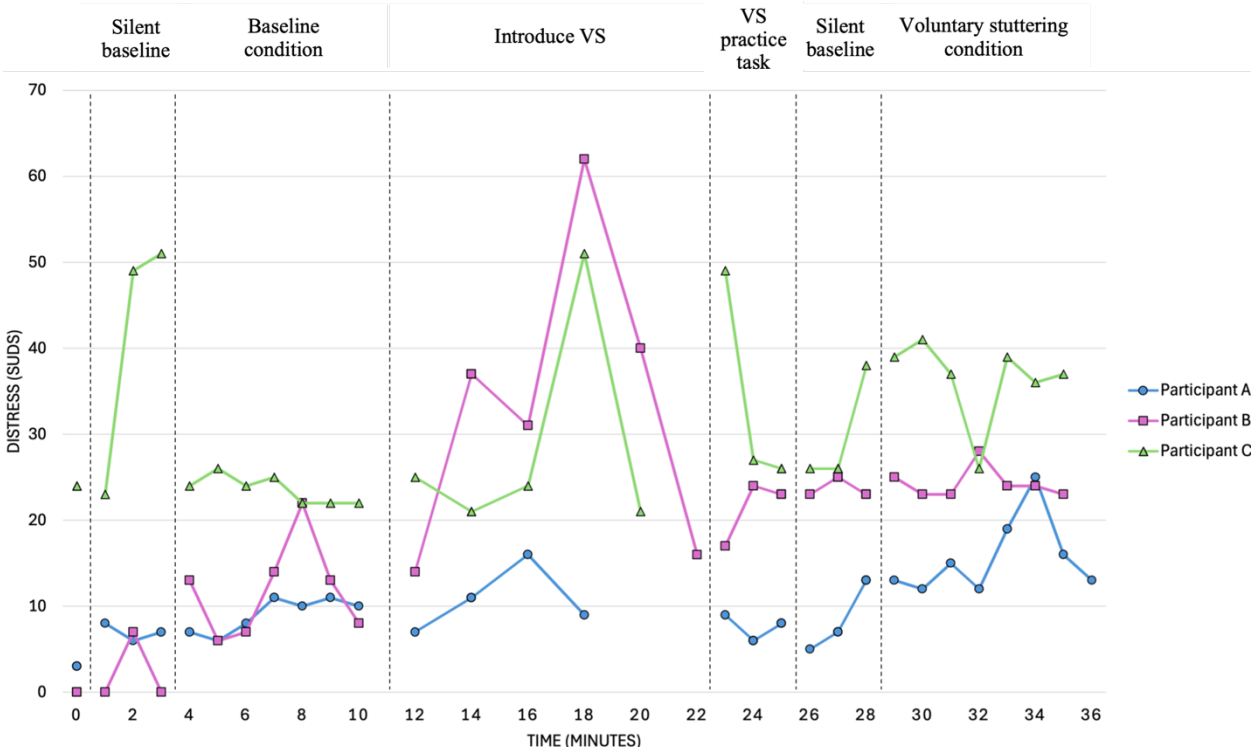
To assess patterns across participants, the graphed SUDS data for the three participants were overlayed in Figure 6. Because the length of the introducing voluntary stuttering phase varied slightly across participants, the graphs for P(A) and P(C) were adjusted across the time axis to better align the phases for visual inspection. Visual analyses of the introduction of voluntary stuttering phase revealed a consistent pattern across participants.

All three participants reported increased distress followed by a fast reduction of SUDS ratings. Visual inspection also indicated that participants shared an overall increased trend, as SUDS ratings rose over the course of the experiment. The last pattern observed across participants was the elevation of SUDS when voluntary stuttering was first introduced. Visual

inspection showed that for all 3 participants, there was an increased shift in phase means from the baseline condition to the introduction of voluntary stuttering phase.

Even though each participant expressed individualized feelings after the voluntary stuttering exposure, there were also some shared experiences across participants. All three participants reported that voluntary stuttering occasionally turned real. Additionally, P(B) and P(C) shared that voluntary stuttering became easier with time, and P(A) and P(B) shared that voluntary stuttering gave them permission to stutter.

Figure 6: Subjective Units of Distress Graphed Across Participants



5.0 DISCUSSION

This two-part, mixed-methods, study explored the relationship between voluntary stuttering and desensitization for adults who stutter. In Study One, semi-structured interviews were qualitatively analyzed to better understand how voluntary stuttering has been used in prior therapy and to explore its potential role in the desensitization process. In Study Two, a single case experimental design and debrief interviews were used to examine both quantitative and qualitative measures of emotional distress when participants were first exposed to voluntary stuttering. Together, the studies provide a more comprehensive understanding of the affective changes associated with voluntary stuttering.

5.1 STUDY ONE

Voluntary stuttering has long been used as a clinical tool to facilitate desensitization (Byrd, Gkalitsiou, et al., 2016; Healey & Scott, 1995; Meissner, 1946; Murphy, Yaruss, et al., 2007a; Van Riper, 1973; Yaruss et al., 2018; Yaruss & Reardon, 2002). However, previous literature has largely focused on *behavioral* changes in overt fluency without exploring potential affective and cognitive effects (Davidow et al., 2019; Fishman, 1937; Grossman, 2008; Meissner, 1946; Sheehan & Voas, 1957). Consistent with the limited existing research examining affective and cognitive reactions to voluntary stuttering (Byrd, Gkalitsiou, et al., 2016; Grossman, 2008), findings from Study One indicate that voluntary stuttering can facilitate a reduction of stuttering-related distress. Participants reported that as a result of voluntary stuttering, they experienced less fear, greater comfort, and improved tolerance of stuttering, all of which contributed to a reduction in emotional distress. This has significant clinical implications, for it reinforces the idea that voluntary stuttering is a desensitization tool with benefits that parallel those seen with therapeutic exposure approaches in the broader psychology literature.

In addition to confirming previous literature, this study expanded current understandings by introducing novel findings. One such discovery is the identification of an apparent relationship between the *clinician-provided rationale* for using voluntary stuttering, the *client's intrinsic motivation* for using voluntary stuttering, and the potential desensitization effects that were reported. Participants who found voluntary stuttering to be desensitizing explained that the clinician's rationale and their personal motivation for using voluntary stuttering were linked to feeling more comfortable with stuttering. Conversely, participants who did not find voluntary stuttering to be desensitizing reported that the clinician's rationale and their intent for using voluntary stuttering were focused on achieving fluency.

Further evidence of this relationship was revealed during the qualitative analysis of the four participants who reported that voluntary stuttering was *not* desensitizing (P06, P07, P08, and P09). Three of these four participants (P06, P08, and P09) made seemingly contradictory statements that seemed to indicate that voluntary was actually helpful for them. For example, participants stated that voluntary stuttering: made "me more comfortable" (P06), helped "restore my confidence and my state of nervousness" (P08), and "reduce[d] uh my anxiety and fear…and boost[ed] my confidence level" (P09). Initially, the investigator assumed that these conflicting comments were due to a miscommunication or a misunderstanding about the term "desensitization." To address this, the investigator provided an additional definition of desensitization, stating "by desensitization, I mean helpful in reducing fears, negative thoughts, and/or negative feelings related to stuttering." Even with this clarification, the participants confirmed their previous responses, maintaining that they did not find voluntary stuttering to be desensitizing despite acknowledging its role in reducing anxiety and boosting confidence. Thus, it appeared that the participants were saying that stuttering was not desensitizing for them even

though they reported that it increased confidence and reduced other negative affective or cognitive reactions.

To ensure that the participants' fear of stuttering did not impact their communication and affect what they reported, the investigator again sought to clarify responses via email sent after the study was completed. When asked again about how voluntary stuttering could increase confidence but not be desensitizing, Participant 09 elaborated:

> Yes, voluntary stuttering made me overconfident and didn't help me to be more fluent. In the process of voluntarily stuttering sometimes I overdo it and that makes things worse for me and it reduces my confidence level a lot that I begin to fear that I would lose value as a person.

This response suggests that the participant's focus on fluency, shaped by the clinician's presentation of voluntary stuttering as a means of enhancing fluency, affected their perception of desensitization. Because participants understood voluntary stuttering as a method to achieve fluency, their interpretation of its success was closely tied to fluency outcomes. Had voluntary stuttering been introduced as a tool for desensitization (as it is intended to be) rather than as a tool for increasing fluency, participants might have perceived the reduction in anxiety and fear as evidence of that desensitization.

This association between clinician-provided rationale, participant's intent for using voluntary stuttering, and the resulting desensitization, emphasizes the importance of ensuring that SLPs present voluntary stuttering correctly. For clients to benefit from the reduced adverse affective and cognitive reactions and increased desensitization as a result of voluntary stuttering, SLPs should not introduce voluntary stuttering as a fluency-enhancing technique.

Another novel theme identified in study 1 related to types of voluntary stuttering that participants used. Consistent with previous literature (Brundage & Hancock, 2015; Byrd, Gkalitsou et al., 2016; Davidow et al., 2019; Dayalu et al., 2001; Fishman, 1937; Grossman, 2008; Meissner, 1946; Sheehan, 1975; Sheehan & Voas, 1957; Van Riper, 1973), participants reported using two types of voluntary stuttering: struggle-free voluntary stuttering (e.g., bounce or slide), and effortful voluntary stuttering. Expanding upon Byrd, Gkalitsiou, et al. (2016)'s previous research showing that effortful voluntary stuttering is more fear-reducing than struggle-free voluntary stuttering, current findings suggest that the desensitization benefits of different voluntary stuttering types *vary by individual*. For example, both P03 and P05 reported desensitization as a result of voluntary stuttering; however, P03 found effortful voluntary stuttering to be helpful ("simulating some blocks…voluntary stuttering in a similar struggled way as the way that I was speaking"), while P05 preferred struggle-free voluntary stuttering ("I always prefer repetitive stutter just because how it [is] physically - it's a lot less uncomfortable than blocking…I haven't ever voluntarily blocked"). Interestingly, the participants who were introduced to more than one type of voluntary stuttering, reported that they chose to "play around" and "intermix" different types of voluntary stuttering as the situation suited them. This finding reinforces that there are multiple ways to voluntary stutter and that different types of voluntary stuttering can be used concurrently, all resulting in desensitization.

Previous research has broadly examined the affective impacts of voluntary stuttering (Byrd, Gkalitsiou, et al., 2016; Grossman, 2008). Current findings expand upon that work and provide new insights into the long-term desensitization effects of voluntary stuttering. Among the participants who found voluntary stuttering to be desensitizing, all five reported that they continued to use voluntary stuttering, albeit less frequently than they once did. For instance, P03

shared, “I actually used [voluntary stuttering] uh in some meetings last week for work…it just really took the edge off so that I could be the communicator that I needed to be.” Likewise, P04 stated, “I do still voluntary stutter when I order food for the most part.” This indicates that, although all five participants experienced reduced adverse affective reactions as a result of voluntary stuttering while in therapy, they continued to use voluntary stuttering long after their formal therapy concluded. This suggests that desensitization achieved through voluntary stuttering does not have a fixed endpoint; rather there may always be room for growth, with ongoing voluntary stuttering leading to increased comfort over time.

Moreover, P01 explained that “[voluntary stuttering is] a really good reminder in your head [to] like let yourself stutter,” implying that voluntary stuttering also helps people maintain the desensitization effects that they had previously attained. Similarly, P05 shared that voluntary stuttering, “help[s] reinforce that this is how you talk.” This suggests that ongoing use of voluntary stuttering is necessary to sustain desensitization benefits.

Taken together, the findings from Study One suggest that the process of desensitization is ongoing. This has important clinical implications, providing a framework for incorporating voluntary stuttering into one’s life while emphasizing realistic expectations for communication both inside and outside of the clinical setting. To maintain long-lasting desensitization effects, it may be necessary for speakers to continue using voluntary stuttering over time. Still, additional research is needed to better understand how voluntary stuttering and the desensitization process evolves with added practice and exposure.

5.2 STUDY TWO

Previous research has explored the concept of exposure therapy for people who stutter (Brundage et al., 2006, 2016; Brundage & Hancock, 2015; Menzies et al., 2008; Scheurich et al., 2019). In addition, previous qualitative and survey research has established a solid foundation showing that voluntary stuttering is effective in facilitating desensitization (Byrd, Gkalitsiou, et al., 2016; Grossman, 2008). However, no prior research has *quantified* the desensitization effects of voluntary stuttering. The findings from Study Two findings expand current understanding of voluntary stuttering as a form of exposure therapy by quantifying real-time emotional changes as measured by changes in reported levels of distress during voluntary stuttering exposure.

The initial plan in Study Two was to assess a potential additive effect of voluntary stuttering by comparing SUDS levels collected during the baseline and voluntary stuttering conditions. When comparing these two conditions, phase means increased for all participants, suggesting no quantifiable additive effect of voluntary within the session. However, this is consistent with previous research (Finn et al., 2009; Foa & Kozak, 1986), which has found that distress often increases during initial exposure sessions. As noted in prior studies, the desensitization effects of exposure therapy typically require numerous sessions (Abramowitz et al., 2019; Deng et al., 2019; Foa et al., 2005). Therefore, Study Two may not have allowed enough time to observe an additive desensitization effect of voluntary stuttering.

Interestingly, two of the three participants (P(B) and P(C)) experienced reduced peak SUDS ratings during the voluntary stuttering condition compared to the introduction of voluntary stuttering phase, indicating a decreased emotional response to voluntary stuttering across time. Further research would need to be conducted to confirm this potential finding, but this could suggest that voluntary stuttering leads to decreased distress across exposures.

Although an additive effect was not observed within this study, the findings are nevertheless clinically significant. The increased SUDS levels reported during the voluntary stuttering condition, compared to the baseline condition, reinforce the previous finding (Byrd, Gkalitsiou, et al., 2016) that initial use of voluntary stuttering can be distressing. Importantly, visual analysis shows that distress levels decrease over time. Thus, clinicians must be prepared for this initial increase in discomfort and allow for the necessary time within the exposure session for distress to stabilize.

In addition to confirming previous research findings showing that adults who stutter often experience increased discomfort when first exposed to voluntary stuttering (Byrd, Gkalitsiou, et al., 2016). This study also expands current understandings of how distress may change *while* using voluntary stuttering by providing ongoing measurement of distress after voluntary stuttering is introduced. As predicted by the non-stuttering exposure therapy literature (Hayes et al., 2008), the three participants examined in Study Two displayed considerable fluctuation in their reported levels of distress throughout the session. Within this expected variability, clear patterns emerged that are consistent with both previous exposure therapy literature (Benjamin et al., 2010; Donahue et al., 2009; Hayes et al., 2008) and the Emotional Processing Theory (Foa & Kozak, 1986). Specifically, Study Two's findings reflect the anticipated rise and fall in distress that often occurs with fear activation and habituation. Participants initially experienced a rapid increase in distress when first exposed to voluntary stuttering, indicating fear activation, followed by a swift decrease in distress, suggesting an increased tolerance for voluntary stuttering. These results show that voluntary stuttering affects emotional distress in a predictable way, mirroring traditional exposure therapy for non-stuttering-related fears (Benjamin et al.,

2010; Donahue et al., 2009; Hayes et al., 2008). The presence of this pattern reinforces its value as a form of exposure that can be applied in stuttering therapy.

Another potential pattern emerged during the silent baseline phase that occurred prior to the voluntary stuttering condition. The phase was intended to "reset" and stabilize distress levels, minimizing any carryover from the previous phase, and ensuring that subsequent changes in SUDS were due to voluntary stuttering. However, for P(A) and P(C), distress levels were somewhat variable during this silent baseline phase, with distress increasing before the voluntary stuttering condition. This suggests that the rise in SUDS ratings may not have been directly related to the introduction of voluntary stuttering. However, because the first two SUDS ratings during the silent baseline were lower and distress increased just before initiating the voluntary stuttering condition, it is plausible that the heightened distress was an anticipatory response, and still related to the discomfort of voluntary stuttering. Additional research is needed to better understand whether this increase in distress was anticipatory or unrelated to the voluntary stuttering condition.

One unexpected finding of Study Two was the apparent fear activation and habituation that occurred during the introductory phase of voluntary stuttering. Although elevated and reduced SUDS ratings were anticipated during the voluntary stuttering condition itself, the most notable change in SUDS was observed during the initial instruction on *how* to voluntary stutter. It was not anticipated that phase would activate participants' fear structure. In other words, participants reported increased and then decreased distress even upon simply learning about voluntary stuttering. Within this phase, SUDS ratings continued to increase as participants practiced voluntary stuttering at the word level, with the highest reported distress occurring when voluntary stuttering at the sentence level. In fact, for two of the three participants (P(B) and

P(C)), peak SUDS ratings of the entire session occurred during the introduction phase, suggesting that this was the most distressing part of the process. Because this effect was not anticipated, SUDS ratings were collected less frequently during the introduction of voluntary stuttering phase. This phase was viewed primarily as a necessary training step before the exposure phase of the study. Because fear activation was not anticipated in this phase, no stability criteria were set. Thus, the phase concluded when both the participant and researcher felt confident in the participant's ability to voluntary stutter, rather than when the participant reported a predetermined stability of distress.

This finding has significant clinical implications, highlighting the need for careful introduction of voluntary stuttering by clinicians who use this skill in therapy. Clinicians should be prepared for increased distress with higher communication demands (e.g., moving from word level to sentence level.) To avoid reinforcing a fear structure, it may be necessary for SLPs to systematically introduce and then continue exploring voluntary stuttering until distress stabilizes. This could help clients achieve a reduction in fear that occurs with habituation and learning to tolerate stuttering. Further research is needed to determine the best clinical approach for introducing voluntary stuttering.

In addition to providing quantitative evidence supporting voluntary stuttering as a desensitization tool that can be used in therapy, the debriefing interviews from Study Two revealed real-time insights into how voluntary stuttering affects participants' emotional states. These qualitative findings contribute to previous research that has explored personal experiences with voluntary stuttering retroactively (Byrd, Gkalitsiou, et al., 2016; Grossman, 2008). By conducting the debrief interview immediately following the exposure session, the study uncovered crucial contextual information that helped interpret increases and decreases in distress

ratings closer to the time that they occurred. For instance, P(B) was able to elaborate that one instance of increased distress was not due to the exposure itself, but instead related to an increase in real stuttering.

Findings from Study Two also highlighted individual differences in how participants responded to voluntary stuttering, showing that people may experience voluntary stuttering in unique ways. For example, voluntary stuttering fostered a sense of acceptance and ownership of stuttering for P(B), while P(A) experienced an increased feeling of loss of control. Similarly, willingness to continue using voluntary stuttering varied; P(A) was reluctant to continue using voluntary stuttering, while P(C) expressed a desire to use voluntary stuttering outside of the session immediately. These individual differences are clinically significant, underscoring the need to tailor the introduction of voluntary stuttering based on client feedback and individual preferences.

5.3 SYNTHESIS OF STUDY ONE AND STUDY TWO

Several findings were consistent across studies, regardless of whether participants had prior experience with voluntary stuttering (Study One) or were introduced to it for the first time (Study Two). For example, participants from both studies reported that voluntary stuttering became easier over time. They also reported that voluntary stuttering influenced moments of real stuttering. The consistency of findings across studies suggests that voluntary stuttering has a broad impact, regardless of participants' prior experience with it. This implies that the process of desensitization and its effects (such as voluntary stuttering becoming easier over time and impacting real moments of stuttering) may be inherent to voluntary stuttering itself, rather than being dependent on the participants' familiarity with the skill.

Additionally, findings from both studies emphasize the importance of how voluntary stuttering is introduced by clinicians. Results from Study One suggest when voluntary stuttering is presented as a strategy to enhance fluency, the desensitization effects are not achieved. Findings from Study Two indicate that fear activation, measured by a rapid increase of distress, was most evident during the initial introduction of voluntary stuttering, highlighting the importance of incorporating exposure therapy principles from the onset. Thus, clinicians play a vital role in facilitating the desensitization effects of voluntary stuttering. It is essential that clinicians introduce voluntary stuttering as a desensitization tool, rather than a fluency-enhancing tool, and ensure it is presented systematically with sufficient time for the individual to habituate to the experience.

When considered together, Studies One and Two offer a more comprehensive view of the desensitization process. Study One provides qualitative depth by allowing participants to reflect retrospectively on how and why voluntary stuttering influenced their thoughts and feelings about stuttering. In contrast, Study Two offers quantifiable evidence that supports and reinforces these desensitization effects through real-time measurements and reflections while voluntary stuttering. Together, these studies provide both a snapshot of immediate effects and a longitudinal perspective, enabling speculation about the timeline and overall desensitization process. Consistent with broader exposure therapy literature (Foa & Kozak, 1986), the findings suggest that initial exposure is likely to increase distress, but that with time and repeated exposures, long-term desensitization can be achieved. These findings bridge a critical gap in the literature, providing empirical support for the clinical use of voluntary stuttering within the framework of exposure therapy. This integration advances EBP by equipping speech-language

pathologists with evidence-based insights to inform and optimize desensitization approaches in stuttering therapy.

5.4 LIMITATIONS AND FUTURE DIRECTIONS

Study One and Study Two were designed to provide a foundational understanding of voluntary stuttering as a tool to facilitate desensitization and to capture the reported experiences of individuals first exposed to the technique. Both studies established procedures and laid the groundwork for future research, though several limitations must be noted.

Both studies had small sample sizes, a limitation that reduces the generalizability of the findings and makes it difficult to draw broad conclusions about the experience of voluntary stuttering across diverse populations of adults who stutter. Still, there was consistency in participants' reports even though the participants varied in gender, ethnicity, and in their response to voluntary stuttering. Notably, some found voluntary stuttering to be desensitizing, while others did not have the same experience. Some even reported contradictory feelings such as increased confidence but no reduction in distress. These differences ultimately underscore the subjective nature of the voluntary stuttering experience and reinforce the need for a larger sample.

Another limitation was the limited exposure that participants experienced during Study Two. Desensitization typically requires repeated exposure over time (Abramowitz et al., 2019; Deng et al., 2019; Foa et al., 2005; Foa & Kozak, 1986), and the measurement of the apparent effects of voluntary stuttering during a single session may not have been sufficient to assess the long-term impact of voluntary stuttering as an exposure therapy technique. Study Two was able to capture initial and immediate reactions when participants were first introduced to voluntary stuttering, providing clinically significant findings and laying the groundwork for future

research. However, multiple sessions over a longer period would provide a clearer understanding of the long-term effects of voluntary stuttering, how distress might evolve with continued exposure, and whether the desensitization effects of voluntary stuttering are sustained over time.

These limitations point to areas for further research, including conducting longitudinal studies and expanding sample size and diversity. Additionally, during the qualitative interviews, several important topics related to voluntary stuttering, but seemingly distinct from desensitization, emerged. For example, participants described voluntary stuttering as a stuttering modification strategy, similar to a pull-out (Van Riper, 1973), and shared that they often use voluntary stuttering as a form of disclosure. Though these topics are less central to the current research questions and the focus on desensitization, they do present interesting avenues for future exploration of voluntary stuttering.

5.5 SUMMARY

This two-part study investigated voluntary stuttering as a desensitization tool for adults who stutter. Study One showed that participants who used voluntary stuttering over time, including those who reported that it was not desensitizing, experienced reduced fear and increased comfort with stuttering. This suggests long-term effectiveness of voluntary stuttering in facilitating desensitization. However, the clinician-provided rationale and intent behind using voluntary stuttering played a significant role in the individuals' reported experience and overall satisfaction with the technique. Study Two provided real-time, measurable changes in distress, offering foundational evidence that voluntary stuttering produces desensitization effects similar to other exposure therapies. Together, these studies offer a more comprehensive understanding of the desensitization process and the affective and cognitive changes associated with voluntary

stuttering and point toward future research that can deepen our understanding of how voluntary stuttering can be used as a desensitization tool in therapy with people who stutter.

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APPENDIX A: STUDY ONE SCREENING QUESTIONNAIRE

1. Do you currently consider yourself to be a person who stutters? If yes, why?
2. At what age did you first begin stuttering?
3. Have you previously received therapy for stuttering? If so, when and in what setting?
4. I am going to ask you about a speech technique called voluntary stuttering. Voluntary stuttering is when you purposely produce speech that sounds like stuttering. For example, you may intentionally repeat the first sound or syllable. Have you previously used voluntary stuttering under the guidance of a speech-language pathologist or speech therapist?
5. Did you find that using voluntary stuttering led to any desensitization, meaning you experienced fewer negative thoughts and/or feelings due to using voluntary stuttering?

APPENDIX B: STUDY ONE DEMOGRAPHIC QUESTIONNAIRE

1. How old are you?

2. What is your gender?
    a. Male
    b. Female
    c. Non-binary or another gender identity

3. What are your preferred pronouns?
    a. He/ him/ his
    b. She/her/hers
    c. They/them/theirs
    d. Other: please list
    e. Prefer not to say

4. What is your race? (select all that apply)
    a. White
    b. Hispanic, Latino, or Spanish
    c. Black or African American
    d. American Indian or Alaska Native
    e. Native Hawaiian or Pacific Islander
    f. Asian
    g. Other

5. What is your native language?

6. What is your highest level of education?
    a. Did not complete high school
    b. Completed high school
    c. Some college or technical program (did not complete)
    d. Completed 2-year college or technical program
    e. Completed undergraduate degree
    f. Completed graduate or professional degree

7. What is your occupation? (If no current occupation, please state this)

8. Aside from stuttering, have you ever had any speech, language, or communication difficulties?
    a. Yes (if yes, please list)
    b. No

9. Have you ever been diagnosed with any of the following?
    a. Anxiety
    b. Attention deficit
    c. Autism spectrum disorder

d. Depression
e. Intellectual disability
f. Learning disorder
g. Obsessive-compulsive disorder
h. Other (please list)
i. None

10. At what age did you first begin stuttering?

11. Does/did anyone else in your family stutter?
    a. Yes (if yes, who?)
    b. No
    c. Not sure

12. Have you ever received stuttering therapy?
    a. Yes
    a. No

13. If yes, approximately how many years have you participated in stuttering therapy in your life?

14. If you have participated in stuttering therapy, what did you work on?

15. Do you currently participate in stuttering therapy?
    b. Yes
    c. No

16. Do you currently participate in stuttering self-help or support groups like the National Stuttering Association (NSA), Friends – The National Association of Young People who Stutter, or SAY: The Stuttering Association for the Young?
    a. Yes
    b. No

17. Approximately how many years have you participated in stuttering self-help/support groups in your life?

18. Are you a speech-language pathologist?

APPENDIX C: TABLE 11: COMPLETE STUDY ONE DEMOGRAPHICS

Table 11: Study One – Complete Demographics

	Group	Age	Gender	Race	Ethnicity	Native Language	Highest Attained Education	Occupation	Other Diagnoses	Age When Began Stuttering	Family History of Stuttering	History of Stuttering Therapy	History of Stuttering Support
P01	D	34	Female	White	Not Hispanic or Latinx	English	Graduate Degree	Nurse Practitioner	-	3	No	Fluency, stuttering modification, desensitization -5 years	Friends, NSA -10 years
P02	D	36	Male	White	Not Hispanic or Latinx	English	Undergrad Degree	Artist	Depression	4	No	Fluency, stuttering modification, desensitization -Throughout life	Friends, NSA -13 years
P03	D	39	Male	White	Not Hispanic or Latinx	English	Graduate Degree	Electrical Engineer	Anxiety	5	Brother	All popular therapies -Throughout life	NSA -10 years
P04	D	41	Female	White	Not Hispanic or Latinx	English	Graduate Degree	SLP	Anxiety	5	Father	Stuttering modification, avoidance reduction -5 months	Friends, NSA -17 years
P05	D	28	Male	White	Not Hispanic or Latinx	English	Undergrad Degree	Life Insurance	Anxiety, ADHD, Depression	3	Cousins	Easy onsets, CBT, voluntary stuttering -24 years	Friends -10 years
P06	N	25	Male	Black or African American	Not Hispanic or Latinx	English	Undergrad Degree	IT Specialist	Anxiety, Depression, Learning Disorder	3	Father	-6 months	No
P07	N	30	Male	Black or African American	Not Hispanic or Latinx	English	Graduate Degree	IT Specialist	-	3	Mother	On and off for 5 months	No
P08	N	30	Male	Black or African American	Not Hispanic or Latinx	English	Graduate Degree	Administrative Officer	-	4	No	6 months	No
P09	N	20	Male	Black or African American	Not Hispanic or Latinx	English	Undergrad Degree	Unemployed	Anxiety, Learning Disorder	5	Mother	6 years	No

Note: D = Voluntary stuttering was desensitizing, N = Voluntary stuttering was *not* desensitizing

APPENDIX D: STUDY TWO SCREENING QUESTIONNAIRE

1. Do you currently consider yourself be a person who stutters? If yes, why?
2. At what age did you first begin stuttering?
3. Have you ever been diagnosed with an anxiety disorder, depression, and/or obsessive-compulsive disorder?
4. I am going to ask you about a speech technique called voluntary stuttering. Voluntary stuttering is when you purposely produce speech that sounds like stuttering. For example, you may intentionally repeat the first sound, or syllable, of a word using a slow, gentle, tension free bounce.
5. Have you ever been introduced to the concept of voluntary stuttering?
6. Have you tried it under the guidance of a speech-language pathologist? If not, why not?

APPENDIX E: STUDY TWO DEMOGRAPHICS

Table 12: Study Two – Demographics

	Age	Gender	Race	Ethnicity	Native Language	Highest Attained Education	Occupation	Other Diagnoses	Age When Began Stuttering	Family History of Stuttering	History of Stuttering Therapy	History of Stuttering Support
P(A)	28	Male	White	Not Hispanic or Latinx	English	Undergrad Degree	Sports Auction House	Anxiety, ADHD, Depression, Learning Disorder	7	No	Throughout Highschool	No
P(B)	30	Male	White	Not Hispanic or Latinx	English	Graduate Degree	Executive Recruiter	Anxiety, Depression	5	No	2nd Grade	No
P(C)	41	Female	Black or African American	Not Hispanic or Latinx	English	Some College	Unemployed	-	2	No	Throughout Elementary School	No

APPENDIX F: VOLUNTARY STUTTERING PRACTICE – WORD LEVEL

1. Day
2. Long
3. Each
4. Man
5. Print
6. Tree
7. Fall
8. Glow
9. Meet
10. Yard
11. Bread
12. What
13. Three
14. Cake
15. And
16. Have
17. Zebra
18. Is
19. Jam
20. News
21. Old
22. Raise
23. Seep
24. Vine
25. Water
26. Perfect
27. Future
28. Happy
29. Able
30. Broken
31. Many
32. Welcome
33. Second
34. Even
35. Little
36. Zero
37. Other
38. Loving
39. Color
40. Dental
41. Growing
42. Ideal
43. Joyful
44. Never
45. Retail
46. Taken
47. Very
48. Thoughtful
49. Stormy
50. Open

APPENDIX G: VOLUNTARY STUTTERING PRACTICE – SENTENCE LEVEL

1. The **cat** jumped over the fence.
2. **Sally** wrote a letter.
3. He was **walking** and chewing gum.
4. **Goats** live on farms.
5. We wake up **early** in the morning.
6. **They** have a computer.
7. The **teacher** is wearing blue.
8. **Did** he cook dinner?
9. She loves to **play** with kids.
10. You should drink 8 cups of water every day
11. **I** like to run in the morning.
12. **My** sister is older than me.
13. I like to read mystery **books**.
14. Does she **live** in Michigan?
15. He **always** talks so much.
16. **Feathers** are really soft.
17. I brush my **hair** every day.
18. **Never** play in the street.
19. I have gold and silver **jewelry**.
20. **Lucy** goes swimming on Fridays.
21. Can you **open** this jar?
22. **Raspberries** are good this time of the year.
23. **Truly**, I'm not a morning person.
24. I wear jeans **very** often.
25. My brother **sleeps** until noon