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Title: Repetitive Negative Thinking, Temperament, and Adverse Impact in Adults Who Stutter.

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Abstract

Purpose: Prior research has explored how Repetitive Negative Thinking (RNT) contributes to both the increased persistence and severity of various disorders, such as depression, anxiety, and eating disorders. This study explored the potential role of RNT in the experience of stuttering, with a particular focus on the relationship between RNT, adverse impact, and temperament profiles.

Method: 313 adults who stutter completed a measurement of the frequency/severity of RNT (Perseverative Thinking Questionnaire, Ehring et al., 2011), 207 completed a temperament profile (Adult Temperament Questionnaire, Evans & Rothbart, 2007), and 205 completed a measurement of adverse stuttering impact (Overall Assessment of the Speaker's Experience of Stuttering, Yaruss & Quesal, 2016)**.** Analyses were conducted within and across instruments to ascertain how RNT, temperament markers, and adverse impact interrelate within individuals.

Results: Results indicated that RNT significantly predicts OASES impact scores with great effect and that certain temperament markers (specifically, Effortful Control and Negative Affectivity) moderate this relationship for specific sections of the OASES.

Conclusion: By assessing RNT in people who stutter, clinicians can better understand individual differences in their clients, and this will allow them to make targeted diagnoses and develop more tailored intervention plans.

1.1 REPETITIVE NEGATIVE THINKING

Repetitive thinking is the "repetitive, prolonged, and recurrent thought about one's self, one's concerns and one's experiences" (Watkins, 2008, p. 163). Repetitive thinking is characterized by active or passive thoughts that are self-reflective in nature (Morrow & Nolen-Hoeksema, 1990), and it may include thoughts about events, experiences, or emotions that have occurred, are occurring, or are anticipated to occur in the future (Ehring et al., 2011). Often, repetitive thinking has a negative valence with a focus on negative emotions (Nolen-Hoeksema, 1991, 2000; Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008). People who experience repetitive *negative* thinking (RNT) may experience thoughts such as, "Why can't I get going?" "What's wrong with me?" or "I don't feel I'll ever get over this" (Nolen-Hoeksema, 2004, p. 107). These thoughts are difficult to disengage from and are at least partly intrusive (Ehring et al., 2011). RNT can also be more passive, for example, when someone compares their life situations and circumstances to "some unachieved standard" (Treynor, Gonzalez, & Nolen-Hoeksema, 2003, p. 256), even if this occurs outside of immediate environmental triggers or demands (L. Martin & Tesser, 1996). While it is common for all people to experience short periods of repetitive thinking in daily life (Nolen-Hoeksema, 2004), RNT is reflective of a relatively stable trait over time (Smith & Alloy, 2010). It is a habit that develops as an individual copes with stress, threats, and feelings of vulnerability; and, it can be associated with reliving past events or anticipating future ones (Matthews & Wells, 2000). RNT can also develop as people see a failure to progress towards their goal(s) (L. Martin, Tesser, & McIntosh, 1993).

Current theory conceptualizes RNT as a transdiagnostic process, that is, a process that may occur across various disorders and populations, though certain manifestations of RNT may be particularly common in people with specific disorders (Ehring et al., 2011). RNT has been

called *rumination* in the depression literature (Nolen-Hoeksema, 1991; Nolen-Hoeksema & Morrow, 1991), as well as *worry* or *self-reflection* (Watkins, 2008). RNT is not merely a label that describes a person or a population; it is a condition with real-life personal and clinical consequences. Specifically, RNT has been shown to predict and be a risk factor for the increased persistence and severity of some mental health disorders, such as depression (Just & Alloy, 1997; Kuehner & Weber, 1999; Nolen-Hoeksema, 1987, 1991, 2000), anxiety (Reilly et al., 2018), and coping with degenerative diseases (Hecht et al., 2002). People who have chronic stress, poorer home lives, lower income, or less satisfying jobs are more likely to experience associated RNT (Nolen-Hoeksema, Larson, & Grayson, 1999). In such cases, repetitive negative thoughts are not merely an inconvenience; they can limit and interfere with quality of life (Wrosch & Scheier, 2003) and prevent a person from engaging in or seeking social support (Nolen-Hoeksema et al., 2008).

RNT may be a particularly useful construct for improving the understanding of stuttering, for people who stutter often experience negative thoughts, anxiety, and limitations in quality of life as they cope with being a person who stutters (Tichenor & Yaruss, 2018; Yaruss, 2010; Yaruss & Quesal, 2004). Applying an understanding of how RNT develops and relates to various life outcomes may yield valuable information about stuttering and its consequences.

1.2 RNT AND ADVERSE IMPACT RELATED TO STUTTERING

The adverse impact of stuttering includes the environmental, personal, and physiological factors that can negatively affect the life of a person who stutters (Tichenor & Yaruss, 2019b; Yaruss & Quesal, 2004). Research and popular press books have given voice to the real-world experiences that many people who stutter report, including decreased participation in life events, and feelings such as shame, embarrassment, and anxiety (Ahlbach & Benson, 1994; Plexico,

Manning, & Levitt, 2009a, 2009b; Preston, 2013; Reitzes & Reitzes, 2012; St Louis, 2001; Tichenor & Yaruss, 2018; Trichon & Tetnowski, 2011; Yaruss & Quesal, 2006; Yaruss et al., 2002). The adverse impact of stuttering extends to external features as well. For example, many people who stutter experience various sources of stigma that can then limit them from engaging in social support or other activities (Boyle, 2013, 2018). Research evidence also suggests that being a person who stutters is associated with lower employment opportunities and earnings (Gerlach, Totty, Subramanian, & Zebrowski, 2018; Palasik, Gabel, Hughes, & Rusnak, 2012), as well as limitations in more general life activities (Yaruss & Quesal, 2006). These experiences may lead some people who stutter to engage in repetitive negative thinking regarding speaking and communicating, and this, in turn, may exacerbate these negative consequences and further promote the tendency to engage in RNT in a circular fashion.

1.3 RNT AND ANTICIPATION

In the broader RNT literature, worry and anticipation have been described as forms of repetitive negative thinking. Such concerns may be experienced when someone fears and is apprehensive of an event occurring in the future (L. Martin & Tesser, 1996). People who stutter have been reported to experience anticipation—the thought that a moment of stuttering may soon occur (Bloodstein, 1972; Brocklehurst, Lickley, & Corley, 2012; Garcia-Barrera & Davidow, 2015; Jackson, Yaruss, Quesal, Terranova, & Whalen, 2015; W. Johnson, 1959; R. Martin & Haroldson, 1967). If anticipation is experienced repeatedly, then it may become habitual, thereby making it a stuttering-specific example of repetitive negative thinking. In fact, one of the participants in Jackson et al.'s (2015) qualitative study exploring anticipation stated,

> "[Anticipation] can generate a lot of anxiety, leading up to the situations I mentioned…This anxiety, over time, creates a sort of speculation *habit* of always having

> to know how people are going to react, I guess as a form of protection so as to not get blindsided by negative responses" (p. 44. emphasis added).

The participant is describing anticipation in terms of on-going thought processes consistent with RNT. Other examples of possible RNT are also found in the stuttering literature. For example, Tichenor & Yaruss (2018) conducted a phenomenological analysis of the moment of the stuttering, in which the experiences of people who stutter were thematically analyzed. Some speakers reported repetitively thinking about what others might be thinking about their speech. For example,

> "And then that's usually when the listener starts giving me the look…why is this person not saying anything? And I know that I'm doing something. I'm trying to get my speech moving again but the listener is kind of sitting there looking at you and thinking what's this guy's problem?" (Tichenor & Yaruss, 2018, p. 1188)

Certainly, researchers and clinicians studying stuttering have long recognized the role that anticipation might play in the experience of stuttering. The concept of anticipatory struggle was one of the foundational theories in early study of the stuttering disorder (Bloodstein, 1972, 1958; Sheehan, 1953). At its core, anticipation of this sort involves a type of stuttering-specific RNT. Taken together, these quotes and past research evidence highlight both how the stuttering condition might develop and how some people who stutter might develop RNT naturally as a side-effect of dealing with commonly experienced aspects of stuttering, such as anticipation and the perceived negative perceptions of listeners.

1.4 RNT AND TEMPERAMENT

Negative emotionality is a term that describes a constellation of temperament characteristics including negative affective states, fear, and frustration (Mezulis, Priess, & Hyde, 2011). Negative emotionality during infancy strongly correlates with depression later in life (see Anthony et al., 2002; Compas, Connor-Smith, & Jaser, 2004). Mezulis, Priess, and Hyde (2011)

examined repetitive negative thinking as a mediator between negative emotionality earlier in life to depression later in life. They conducted a longitudinal study on 301 adolescents from ages 13 to 15 with parent reports of temperament at age 1. The authors found that RNT significantly mediated the association between negative emotionality in infancy and depression in adolescence. In a related study, Verstraeten et al (2009) measured temperament, depression, and repetitive thinking in middle school and high school students to determine how temperament profiles and repetitive thinking relate to depression symptoms. The specific measures of temperament were positive affectivity (defined as the amount of "pleasurable engagement with the environment and the extent to which the person feels active, happy, and enthusiastic"), negative affectivity (defined as "distress and an unpleasurable engagement with the environment"), and effortful control (defined as the ability to change, regulate, or modify one's behavioral or emotional responses) (Verstraeten et al., 2009, p. 390). The authors found that the association between affectivity and depression was moderated by effortful control and that higher levels of negative affectivity were associated with higher levels of repetitive negative thinking.

This research evidence raises questions about whether there may be links between temperamental profiles and RNT in people who stutter. A growing research evidence base shows that children who stutter are more reactive to and less adaptive to environmental stimuli (Wakaba, 1998) and have greater negative affect (K. Johnson, Walden, Conture, & Karrass, 2010; Ntourou, Conture, & Walden, 2013), decreased attention skills (J. D. Anderson, Pellowski, Conture, & Kelly, 2003; Eggers, De Nil, & Van den Bergh, 2012), and lower inhibitory control (Eggers, De Nil, & Bergh, 2010). Lower effortful control has been shown to strongly correlate with the severity of stuttering behavior in multiple cohorts of children who stutter (Kraft,

Ambrose, & Chon, 2014; Kraft, Lowther, & Beilby, 2018). Though there is little temperament-related research with adults who stutter, the literature that does exist shows that some adults who stutter may have higher rates of concomitant anxiety than other people who do not stutter (Alm & Risberg, 2007; Craig, A., Hancock, K., Tran, Y., & Craig, 2003; Craig, 1990; Iverach et al., 2018), though questions remain about the relationship between anxiety and stuttering (see Manning & Beck, 2011, 2012, 2013). These differences in adults and children who stutter are often interpreted in terms of baseline traits that are characteristic of people who stutter as a group. Yet, according to the broader RNT literature, if individual differences in a person's temperament profile include lower levels of effortful control or higher levels of negative affectivity, then he or she may have difficulty inhibiting the frequency and severity of negative thoughts when they occur (Hilt, Armstrong, & Essex, 2012). This may, in turn, lead to a higher rate of repetitive negative thinking—and its adverse sequelae.

1.5 PURPOSES AND AIMS OF THE PRESENT STUDY

Given that some children who stutter have been shown to have differences in temperamental factors (see for review Conture, Kelly, & Walden, 2013), and that certain temperament markers moderate the development of RNT in children/adolescents (see, Verstraeten et al., 2009), it is likely that some adults who stutter may experience repetitive negative thinking. This may then put them at increased risk for experiencing negative impact of the stuttering disorder on their life (see Yaruss & Quesal, 2004). As noted, however, RNT has not previously been studied in people who stutter. A better understanding of how RNT might relate to stuttering would support better diagnosis and treatment of adverse impact and provide clearer insights into the experience of stuttering. Therefore, the purposes of this study were: 1) to determine if adults who stutter engage in RNT at higher rates than the general population and 2)

to explore whether effortful control and negative affectivity might be related to RNT and adverse impact in people who stutter.

2.0 METHOD

2.1 Participants and Procedures

This study involved a series of detailed online surveys widely distributed to adults who stutter via electronic and personal channels. The surveys, described below, included the following instruments: the *Perseverative Thinking Questionnaire* (PTQ, Ehring et al., 2011), the *Adult Temperament Questionnaire* short form (ATQ, Evans & Rothbart, 2007), and the *Overall Assessment of the Speaker's Experience of Stuttering* (OASES, Yaruss & Quesal, 2016). A total of 313 people completed the PTQ, 207 completed the ATQ, and 205 completed the OASES. A total of 8 participants who completed at least two of the survey instruments were excluded from the analyses: 1 due to a lack of self-reported history of stuttering and 7 for being under the age of 18. Demographic data, including age at the time of the survey, age of stuttering onset, history of participation in self-help/support and speech therapy, and ethnicity; some demographic data were missing for questions occurring at the end of the survey due to attrition. Table 1 summarizes the available demographic characteristics of the participants whose data were analyzed in this study across the three surveys.

Recruitment procedures were similar to those found in other recent surveys exploring aspects of stuttering (see Boyle, 2013, 2017, 2018; Boyle, Beita-Ell, Milewski, & Fearon, 2018; Boyle & Fearon, 2018; Tichenor & Yaruss, 2019b, 2019a). Participants were recruited using a mix of convenience sampling (e.g., recruiting from personal contacts) and snowball sampling (in which recruitment cascades from one or more outlets or respondents to others: see Goodman,

1961). Specifically, various research registries from previous studies, social media outlets, personal contacts of the authors, word-of-mouth, and national and international stuttering associations were used to recruit respondents. These various outlets were also asked to share the survey with as many adults who stutter as possible to encourage a broad sampling of people who stutter from different backgrounds and with different experiences. Because recruitment was conducted in these varied ways, response rates cannot be calculated because it is impossible to determine how many people were ultimately contacted.

The survey was conducted via the Internet using Qualtrics (Qualtrics, 2018). All respondents were adults age 18 or older (*Mean age* = 38.86, *SD* = 16.86), who self-reported to be people who stutter; and, who completed an informed consent prior to receiving and completing the survey. The study was deemed to be exempt from institutional review by the Michigan State University Human Subjects Research Protection Office under statute 45 CFR 46.101(b) 2.

2.2 The Survey

Three separate surveys were created to encourage a high response rate and to facilitate completion of the individual surveys while limiting potential fatigue and attrition in the participants' responses. Each of the three surveys contained the same demographic questions, but respondents had the option of only completing this part of the surveys once, if they provided personal identification codes and/or email addresses so data from the different surveys could be linked to each other for comparisons across measures.

The *Perseverative Thinking Questionnaire* (PTQ, Ehring et al., 2011) was used to measure participants' tendency to engage in RNT. The PTQ contains 20 questions that explore how intrusive and repetitive thoughts are in one's daily life. It has been shown to have good internal consistency across samples and within subscales (Ehring et al., 2011). The short form of

the *Adult Temperament Scale* (Derryberry & Rothbart, 1988; ATQ, Evans & Rothbart, 2007; Rothbart, Ahadi, & Evans, 2000) was used to measure temperament. The ATQ short form contains 77 questions operationalizing four broad factors each containing numerous sub-scales. It has been shown to have adequate-to-good reliability coefficients across constructs (Evans & Rothbart, 2007), and it is widely used in various field of psychology for describing temperament. The *Overall Assessment of the Speaker's Experience of Stuttering* (OASES, Yaruss & Quesal, 2016) was used to assess the impact of stuttering on participants' lives. The OASES assesses stuttering impact via the WHO's International Classification of Functioning, Disability, and Health (ICF, WHO, 2001), by asking people who stutter to self-report how much their reactions to stuttering limits them, how much stuttering negatively impacts communication in daily situations, and how much their stuttering negatively influences their quality of life on a 100 item self-report measure. It has been shown to be a reliable and stable measure of the impact stuttering has on a person's life (Yaruss & Quesal, 2006, 2016).

All items from each of the instruments were reproduced and scored according to the instrument specific instructions. Given that these instruments are standard assessments in their respective fields, no editing of items was done. The three surveys were piloted for errors with a small group of people who stutter prior to larger subject recruitment.

2.3. Data Analysis

Data recorded in Qualtrics were exported to and analyzed in R-studio (Rstudio Team, 2018), a companion program to R (R Core Team, 2019). Various R packages were used for data manipulation, analysis, and visualization (likert, Bryer & Speerschneider, 2016; ggplot2, Chang et al., 2018; sjplot, Daniel Lüdecke, 2018; ggiraph, Gohel, Bostock, Kokenes, Shull, & Book, 2018; ggpubr, Kassambara, 2018; ggiraphextra, Moon, 2018; psych, Revelle, 2017; dplyr, H.

Wickham, François, Henry, & Müller, 2018; plyr, Hadley Wickham, 2016, reshape2, 2017). All data were manually checked for data entry or coding errors.

Though each of the three instruments have reliability data in the broader research literature of their fields, reliability measures were conducted to determine internal stability of the measure factors within this sample of people who stutter with Cronbach's Alpha. Reliability was adequate to excellent for each for the PTQ factors (*Core Characteristics of RNT:* $\alpha = .92$; *Unproductiveness of RNT:* $\alpha = .77$; *Capturing Mental Capacity:* $\alpha = .83$). Reliability was adequate-to-good for each of the ATQ factors (*Effortful Control:* $\alpha = .80$; *Orienting sensitivity:* $\alpha = .73$; *Extraversion/surgency:* $\alpha = .72$; *Negative Affect:* $\alpha = .85$). Reliability was good-to-excellent for each of the OASES factors (*General Information:* $\alpha = .87.$; *Reactions to Stuttering:* $\alpha = .96$; *Communication in Daily Situations:* $\alpha = .93$; *Quality of Life:* $\alpha = .97$). Simple and multiple linear regression were performed to determine whether effortful control, RNT, or their interaction predicted adverse impact as measured by the OASES. Multicollinearity (i.e., the situation in which specific predictors can be determined from other predictors in regression models) was evaluated to assess the statistical power of the models through variance inflation factors (VIF). PTQ scores and the temperament factors (Negative Affectivity and Effortful Control) did not demonstrate VIF values high enough to be concerned about multicollinearity (see Kennedy, 2003; Neter, Wasserman, & Kutner, 1985).

3.0 Results

The primary research questions were to evaluate how variables across the instruments related to one another (e.g., RNT on adverse impact), though each survey instrument was first analyzed individually to evaluate the key constructs of RNT, temperament, and adverse impact

in this sample of people who stutter. Simple and multiple linear regression analyses were used to determine if RNT could predict adverse impact and, more specifically, if effortful control, negative affectivity, and RNT combined could predict adverse impact.

3.1 Individual Measure Results

Scores on the Perseverative Thinking Questionnaire (the measure of RNT) results yielded a range of 0 to 59 (M = 27.92, SD = 11.15). In order to determine whether the sample of people who stutter as a group had higher rates of RNT than the general population, a pooled t-test was conducted using published data from the general population as a comparison group (see O'Haver, 2015). The range of PTQ results from the general population sample is 0 to 60 (M= 25.98*, SD = 12.37*), with a normal distribution (O'Haver, 2015, p. 117). Normality of the data collected in this survey was determined via a probability plot. PTQ scores in this sample of people who stutter were significantly higher than published norms, suggesting a higher degree of RNT in this group of people who stutter ($t(641) = 2.00$, $p < .05$). Because the data from the present study and the general population data in O'Haver (2015) had roughly the same sample sizes (n = 317, n = 326) and similar standard deviations *(*SD = 11.15 and SD = 12.37*)*, respectively, Cohen's d was calculated to measure the effect size of this significant difference. The effect size for this analysis (d = .17) was smaller than Cohen's (1988) cut-off for a small effect (d = .20). This indicates that, although this sample of people who stutter did demonstrate significantly higher PTQ scores than the general population (indicating greater levels of RNT), the effect size of this group difference was very small.

Evans and Rothbart (2007) provided means and standard deviations for the sub-factors of the Adult Temperament Questionnaire (ATQ), yet the authors did not provide them for the 4 main factors of the short version of the ATQ. Therefore, no further comparisons are made to past

literature. Means and standard deviations from participants responses to both the ATQ factors and sub-factors are presented in Table 2.

Respondents demonstrated a wide range of negative impact scores across the four OASES sub-sections: General Information (M = 2.83, SD = .67), Reactions to Stuttering (M = 2.83, SD = .80), Communication in Daily Situations (M = 2.67, SD = .75), Quality of Life (M = 2.42, SD = .98), and OASES Total Impact (M = 2.73, SD = .70). These means and standard deviations are similar to published norms of the OASES (Yaruss & Quesal, 2016, p. 43). An independent samples t-test confirmed that no difference between OASES Total Impact scores in existed between this study and published norms ($t(376) = -.76$, $p = .078$), suggesting that the adverse impact in the present sample of individuals who stutter is comparable to that seen in other samples.

3.2 Relationships between RNT and Participants' Sex, Age, and Adverse Impact

Age, sex, and adverse impact were explored as possible predictors of repetitive negative thinking (RNT). The sample of respondents in this study were divided by sex, and an independent samples t-tests were performed to determine whether there was a statistically significant difference between sex and RNT responses. Results indicated no significant difference between male (M =27.87, SD = 11.86) and female (M = 27.49, SD = 10.47) respondents ($t(248) = .28$, $p = .78$). RNT and age were mildly negatively associated $r(278) = -.26$, $p < .001$, though the total variance explained and effect size was small, as measured by simple linear regression ($F(1,278) = 20.4$, $p < .001$, $R^2 = .07$, $R^2_{Adjusted} = .07$, $f^2 = .08$).

Simple linear regression was performed to investigate the relationship between PTQ total score and each of the four OASES sub-section total impact scores. One model was built for each of the four OASES sub-sections. Scatterplots revealed a positive linear relationship between

PTQ total score and the OASES sub-section impact scores. These relationships were confirmed by statistically significant Pearson's correlation coefficients: General Information $r(195) = .35$, $p < .001$; Reactions to Stuttering $r(192) = .53$, $p < .001$; Communication in Daily Situations $r(193) = .46$, $p < .001$; and Quality of Life $r(190) = .64$, $p < .001$. Findings reveal weak-to-strong significant positive linear relationships between RNT and each OASES sub-section impact score. Table 3 contains more specific regression statistics; Figure 1 visualizes these effects.

3.3 The Influence of RNT, Effortful Control, Negative Affectivity on Adverse Impact

In order to determine how repetitive negative thinking, effortful control, and negative affectivity relate to adverse impact, multiple linear regression models were built for the four sections of the OASES. The three predictors were total PTQ score, effortful control or negative affectivity, and the interaction term, respectively.

3.3.1 Effortful Control

PTQ total score and Effortful Control explained a significant amount of the variance of *General Information* impact score ($F(3,153) = 8.95$, $p < .001$, $R^2 = .15$, $R^2_{Adjusted} = .13$, $f^2 = .18$), *Communication in Daily Situations* impact score ($F(3,151) = 13.51$, $p < .001$, $R^2 = .21$, $R^2_{Adjusted} = .20$, $f^2 = .27$), *Reactions to Stuttering* impact score ($F(3,151) = 20.04$, $p < .001$, $R^2 = .29$, $R^2_{Adjusted} = .27$, $f^2 = .40$), and *Quality of Life* impact score ($F(3,148) = 32.65$, $p < .001$, $R^2 = .40$, $R^2_{Adjusted} = .39$, $f^2 = .66$). Effect sizes ranged from medium to very large. Details concerning the significance of individual variables in the models are presented in Table 4. As can be seen by the significance of the interaction terms, Effortful control moderated scores on *General Information* and *Communication in Daily Situations* but not *Reactions to Stuttering* or *Quality of Life*. Figure 2 contains scatterplots between *General Information* and *Communication in Daily Situations* sections and PTQ total score with each observation colored to indicate the Effortful Control

profile for that subject. Individual regression lines are overlaid for each whole number value of Effortful Control. Not only were higher degrees of RNT associated with higher OASES scores (which indicates greater adverse impact from stuttering), but effortful control moderated this relationship. Specifically, lower levels of effortful control were associated with higher OASES and PTQ scores (more positively sloped regression lines), while higher levels of effortful control were associated with lower levels of OASES and PTQ scores (flatter/more negatively sloped regression lines).

3.3.2 Negative Affectivity

Multiple regression models were again built to explore the effect of Negative Affectivity and RNT on adverse impact in stuttering. PTQ total score and Negative Affectivity explained a significant amount of the variance of the *General Information* impact score ($F(3, 153) = 9.61$, $p < .001$, $R^2 = .16$, $R^2_{Adjusted} = .14$, $f^2 = .19$), *Reactions to Stuttering* impact score ($F(3,151) = 22.46$, $p < .001$, $R^2 = .31$, $R^2_{Adjusted} = .30$, $f^2 = .45$), *Communication in Daily Situations* impact score ($F(3, 151) = 15.58$, $p < .001$, $R^2 = .24$, $R^2_{Adjusted} = .22$, $f^2 = .19$), and *Quality of Life* impact score ($F(3,148) = 35.1$, $p <.001$, $R^2 = .42$, $R^2_{Adjusted} = .40$, $f^2 = .71$). The effect sizes ranged from medium to very large. Table 5 contains more specific information concerning the variables within each model. The interaction of Negative Affectivity and PTQ scores were significant in three of the four models, but inclusion of the interaction term caused RNT to no longer significantly predict the respective OASES sections (see Section 3.2). To further evaluate if this occurred because Negative Affectivity and RNT were significantly correlated regressors (multicollinearity), the variables were plotted via scatterplots and Pearson's correlation coefficients were calculated. Plots revealed a positive linear relationship between Negative Affectivity and the OASES sub-section impact scores. These relationships were confirmed by

statistically significant Pearson's correlation coefficients: General Information $r(156) = .25$, $p < .002$; Reactions to Stuttering $r(154) = .39$, $p < .001$; Communication in Daily Situations $r(154) = .34$, $p < .001$; and Quality of Life $r(151) = .39$, $p < .001$. Findings reveal weak significant positive linear relationships between Negative Affectivity and each OASES sub-section impact score.

Increased levels of Negative Affectivity were still associated with greater adverse impact as measured by *General Information, Communication in Daily Situations, and Quality of Life.* This can be seen visually in Figure 3 where scatterplots between these OASES sections and PTQ total score are plotted. Individual data points are colored by each respondent's Negative Affectivity scores. Different regression lines are plotted for each whole number level of Negative Affectivity. Higher levels of Negative Affectivity are associated with more adverse impact and higher PTQ scores (more positively slopped regression lines).

4.0 Discussion

Individual differences in adverse impact from stuttering were strongly associated with repetitive negative thinking in this study. Specifically, people who engaged in higher levels of RNT also demonstrated significantly more adverse stuttering impact, as measured by the OASES. This pattern of higher RNT being associated with higher adverse impact was further moderated by Effortful Control and Negative Affectivity. People who stutter who have lower levels of Effortful Control and higher levels of Negative Affectivity demonstrated both significantly higher levels of RNT *and* higher levels of adverse stuttering impact. The reverse was also true. For example, people who stutter with the highest levels of effortful control and the lowest levels of negative affectivity were predicted to have lower *Communication in Daily Situation* scores despite having high rates of RNT (See Figure 2 and 3, respectively). These data suggest that person-centered traits, including temperament characteristics (e.g., high effortful control and lower negative

affectivity) and RNT are vital for understanding how and why some people develop and experience adverse impact associated with stuttering. Understanding this process of developing the habit of RNT helps to explain why some people tend to experience greater adverse impact from stuttering compared to others: individuals who engage RNT more frequently and often are more likely to experience higher levels of adverse impact, and this relationship is affected by the person's individual temperament characteristics. In summary, some people who stutter experience more adverse impact because of *who they are* (e.g., based on their temperament traits) and *how they cope* with the stuttering experience (e.g., habit of RNT).

4.1 Clinical Applications

Prior research has shown that a better understanding of why, when, and how people develop RNT has led to improved treatment in several clinical fields other than stuttering. For example, treatment of RNT in depression targets the process of engaging in RNT by increasing awareness in the client of how often and how pervasive the habit is, addressing the often-occurring thought that RNT is uncontrollable, and confronting the belief that RNT is beneficial (Wells & Papageorgiou, 2004). Interestingly, treatment of RNT often targets decreasing the frequency and severity of the thoughts themselves, rather than the specific construct about which the person is thinking (M. C. Anderson & Levy, 2009; Jha, Stanley, Kiyonaga, Wong, & Gelfand, 2010; Mcmillan, 2004; Purdon, 2004; Robinaugh, Crane, Enock, & Richard, 2016; Wells & Papageorgiou, 2004). Once the habit of repetitively thinking decreases, the negative outcomes associated with the negative thoughts also decrease. In depression, specifically, this is often done by increasing socialization, using various forms of cognitive restructuring to detach or defuse thoughts/emotions, and increasing attention/mindfulness to present stimuli and situations

(Wells & Papageorgiou, 2004). Such therapeutic approaches are successful and may be more effective than pharmacology for alleviating depressive symptoms (Watkins et al., 2007).

In many ways, mindfulness principles, such as increased proprioception, attending/being present to the moment in which you are, acceptance/allowance of self, and allowing thoughts to be thoughts without emotional attachment, work against the processes that are involved in RNT. Research evidence specifically shows that therapy aimed at increasing mindfulness decreases the frequency and severity of RNT in various disorders (Burg & Michalak, 2011; Chambers, Lo, & Allen, 2008; Heeren & Philippot, 2011; Huffziger et al., 2013; Ramel, Golden, Carmona, & McQuaid, 2004; Snippe et al., 2015). These findings have direct implications for the diagnosis and management of stuttering. Because data in this study show that some people who stutter may be more prone to engage in or develop RNT as a consequence of coping with stuttering, assessing RNT may give clinicians a better understanding of their client's thought and behavior patterns. By targeting the development of unhelpful, intrusive, and repetitive thoughts regarding stuttering, adverse impact may be decreased. Many therapeutic approaches for stuttering recognize the effectiveness of directly addressing where people who stutter are directing their thoughts. For example, various authors over decades have discussed the benefits of cognitive-based therapies (Blood, 1995; Emerick, 1988; Helgadóttir, Menzies, Onslow, Packman, & O'Brian, 2014; Elaine Kelman & Wheeler, 2015; Menzies, O'Brian, Onslow, & Packman, 2008; Menzies, Onslow, Packman, & O'Brian, 2009; Van Riper, 1973) and, more recently, mindfulness-based therapies as they apply to stuttering clinical work (Beilby, Byrnes, & Yaruss, 2012; Boyle, 2011; Cheasman, 2013; Gupta, Yashodhara, & Vasudha, 2016; Harley, 2018; Palasik & Hannan, 2013; Plexico & Sandage, 2011). In describing the benefits of mindfulness-based therapy to stuttering, Cheasman (2013) stated,

> "I believe it can be illuminating to look at [stuttering] as occurring on automatic pilot. Behaviours are highly habituated and people are often caught up in a blur of negative emotion and cognition during the actual moment of stammering and so are not in touch with the direct 'in the moment' experience." (p. 233)

This view is in line with a person-centered definition of stuttering, in that people who stutter experience a disconnect between what they want to say and what they are able to say (Perkins, 1990; Tichenor & Yaruss, 2018). Many authors have highlighted how the treatment of stuttering often attempts to decrease the learned negative reactions (e.g., pushing, struggling, avoiding) that people who stutter develop as a *natural* consequence of living with the condition (Sheehan, 1970; Van Riper, 1973, 1982). In many ways, successful management of stuttering involves learning to become more comfortable with the sensation of being out of control for a time when speaking and reacting as little as possible. Mindfulness principles, such as allowing thoughts to be thoughts without attaching emotion to them, being present, and remaining in the moment of stuttering, are critical components to successful stuttering management. In fact, when describing the process of desensitization in stuttering therapy, Van Riper (1973) discussed this process of unlearning deeply-ingrained reactionary thoughts by stating,

> "Stutterers feel shame because others have placed a stigma on the disorder, because the impacts of scorn and other penalties have been keenly felt….Our purpose in desensitization therapy is to reduce the strength of the attendant emotional upheaval enough to enable the stutterer to learn new ways of coping." (p. 267)

Thus, although developing the habit of RNT may be a natural consequence of dealing with stuttering in one's life, speech-language pathologists can play a notable role in helping people who stutter learn to develop different ways of thinking about stuttering and different reactions to the underlying sensations associated with stuttering. Such thoughts may not necessarily be positive, but they can be more frequently neutral, and this can help to reduce the occurrence and consequences of RNT. As such, findings from this study suggest clinicians should assess RNT in

their clients who stutter and individualize their therapy in order to address RNT when it is present. Doing so will allow clinicians to better understand who their clients are as an individual and what they are bringing to the therapy table; thus, increasing the effectiveness of their therapy.

4.2 Future Directions

An additional benefit of mindfulness-based therapeutic approaches is that such practices build empathy, compassion, and counseling skills in therapists themselves (see for review, Davis & Hayes, 2011). This is especially relevant for stuttering, given that qualitative evidence has shown that effective therapeutic alliances between clinicians and people who stutter greatly benefit from empathy on the part of the clinicians (Plexico, Manning, & DiLollo, 2010; see also Quesal, 2010). Given that past clinical research evidence has also shown that stuttering is poorly understood by many speech language pathologists (Cooper & Cooper, 1985, 1996; St. Louis & Lass, 1981; Tellis, Bressler, & Emerick, 2008; Yaruss et al., 2016), mindfulness-based therapy approaches may help to bridge gaps in understanding between clinicians and the clients they wish to serve. Indeed, many efforts in recent years have sought to improve clinicians' empathy for and understanding of stuttering so they can better incorporate counseling skills in their treatment of people who stutter (Manning, 2010). Future studies should explore this client-clinician dynamic as it relates to RNT.

Future studies exploring how RNT develops in people who stutter should also directly explore the effectiveness of therapy targeting RNT and the role that family dynamics plays in the development of RNT in preschool and school-aged children who stutter. Research outside of stuttering has shown that poor family dynamics (e.g., over-controlling parenting and other negative parenting styles) may contribute to the development of RNT in children (Hilt et al.,

2012; Nolen-Hoeksema, 1991; Spasojević & Alloy, 2004). Although the limited prior research evidence that exists has revealed conflicting differences as to whether the parenting styles/home environments of parents of children who stutter are different than parenting styles/homes of children who don't stutter (see discussion in Yairi, 1997), such work has not considered the potential interaction of parenting style and the development of RNT in children who stutter. Given the data from this study and other research evidence suggesting that children who stutter have differences in temperament (see for review Conture et al., 2013), children who stutter may be at risk for developing RNT as a function of personal factors (e.g., temperament) and environmental factors (e.g., family parenting styles). Future research should explore this possibility and connect it to the importance of family-centered therapy approaches to preschool and school-age children who stutter (see Franken & Putker-de Bruijn, 2014; E. Kelman & Nicholas, 2017; Onslow, Packman, & Harrison, 2003; Yaruss, Coleman, & Quesal, 2012; Yaruss & Reardon-Reeves, 2017).

4.3 Limitations

The main findings of this study highlight limitations that should be considered in future research and in the interpretation of the present data. First, these data were collected at a single point in time. Therefore, the current investigation cannot answer questions about the origins of the relationship between temperament and adverse impact with respect to stuttering. It is unclear if people with certain temperament profiles are predisposed to higher rates of adverse impact or if adverse impact influences the ongoing development of people's temperament profiles. These findings highlight the need for continued research on individual differences between and among people who stutter. Likewise, data from this study can only be used to speculate about the development of RNT in accordance with principles in the larger RNT literature; findings cannot

be interpreted as indicating a causal relationship between RNT and various experiences related to stuttering. Because respondents in this study were skewed towards a history of therapy and higher levels of education, future research should strive to better evaluate the population of people who stutter via more heterogeneous samples.

4.4 Summary

This study evaluated how repetitive negative thinking (RNT) and key aspects of temperament relate to the experience of adverse impact in adults who stutter. Results indicate that, compared to people who do not stutter, people who stutter experience very slightly higher levels of RNT. More importantly, within the group of people who stutter, higher levels of RNT are significantly associated with higher rates of adverse impact. Furthermore, certain temperament characteristics, specifically, higher levels of negative affectivity and lower levels of effortful control, moderate this relationship. These findings have significant implications for supporting various therapy approaches that focus on reducing repetitive negative thoughts as a way of minimizing adverse impact. Findings also support the continued need for research on individual differences between people who stutter to better explain why different people who stutter experience stuttering in different ways.

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Figure Captions

Figure 1. Scatterplots show each of the four OASES sub-sections and Perseverative Thinking Questionnaire (RNT measure) total score. Simple linear regression lines are plotted with standard errors, showing the significant positive linear relationship between RNT and each OASES sub-section.

Figure 2. Scatterplots show General Information about Stuttering and Communication in Daily Situations OAESES sub-sections and Perseverative Thinking Questionnaire (RNT measure) total score, with each observation colored to indicate the Effortful Control profile for that subject. Effortful control moderates the prediction of OASES scores by RNT. Lower levels of Effortful Control are reflected by more positively sloped regression lines.

Figure 3. Scatterplots show the three OASES sub-sections and Perseverative Thinking Questionnaire (RNT measure) total score, with each observation colored to indicate the Negative Affectivity profile for that subject. Negative Affectivity significantly moderates the prediction of General Information, Reactions to Stuttering, and Quality of Life by RNT. Higher levels of Negative Affectivity are reflected by more positively sloped regression lines.