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**SUCCESS IN CHANGING STUTTERING ATTITUDES: A RETROSPECTIVE
ANALYSIS OF 29 INTERVENTION STUDIES**

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HIGHLIGHTS

- *POSHA-S* pre and post means classified 29 different samples into 4 success categories.
- Three factors of interventions predicted success in improving stuttering attitudes.
- These were: audience interest, personal connection, and relevant information.
- Demographic variables did not predict intervention success.
- Effective interventions reflect optimal matches between interventions and audiences.

INTRODUCTION

Assumptions to Improve Public Attitudes

The literature reporting public misinformation about stuttering and resulting stereotypes, stigma, and discrimination against those who stutter is voluminous (cf. reviews by Boyle & Blood, 2015; Gabel, 2015; Hughes, 2015; Langevin, 2015). Almost every exploratory study of public attitudes has ended with a call for education of the public about stuttering, with the stated or unstated assumption that providing accurate information about the disorder would be sufficient to improve public attitudes (e.g., Bellegarde, Mayo, St. Louis, Mayo, 2016; Cooper & Cooper, 1985; Dorsey & Guenther, 2000; Ham, 1990; Hughes, 2015; St. Louis, Przepiórka, et al., 2014; Xing Ming, Jing, Wen, & Van Borsel, 2001; Valente, St. Louis, Leahy, Hall, & Jesus, 2017). If such information were to be made available to the public, a further and often stated

assumption is that the quality of life of children and adults who stutter would be improved as a result of growing up and/or living in a more accepting and informed society.

Investigations to Improve Stuttering Attitudes

Compared to studies that stopped at documenting negative attitudes, relative few investigations have attempted, experimentally, to improve them. In her review of the extant literature in 2013, Abdalla (2015) identified 15 such studies (Abdalla & St. Louis, 2014; Coleman et al., 2013; Delaney, 2001; Flynn & St. Louis, 2011; Gottwald et al., 2011; Gottwald, Kent, St. Louis, & Hartley, 2014; Hughes, Gabel, Roseman, & Daniels, 2015; Junuzović-Žunić et al., 2015; Leahy, 1994; Langevin & Prasad, 2012; Mayo, Mayo, Gentry, & Hildebrandt, 2008; McGee, Kalinowski, & Stuart, 1996; Reichel & St. Louis, 2004; Reichel & St. Louis, 2007; Snyder, 2001). Abdalla concluded that “Studies that have attempted to ameliorate negative stereotypes toward people who stutter have been inconclusive. Some have reported positive changes, while others have found either no shift in attitude or a change in the reverse direction (i.e., intervention allegedly reinforced the negative stereotypes)” (p. 117). Factors identified by Abdalla (2015) that should be considered in evaluating the research related to changing attitudes included: (a) specific constructs targeted for change; (b) prior exposure of participants to people who stutter; (c) selection criteria for participants; (d) mode of the intervention (e.g., video, coursework, or direct interaction with a stuttering person); (e) actual content of the stimuli provided; and (f) methods of design, analysis, and interpretation. Stressing that these factors are interrelated, she noted, “While the stimuli used to change attitudes may partially explain the lack of consensus in changing attitudes of fluent speakers toward stuttering, the stimuli adopted in a study must be *meaningful* for the target population” (p. 124, italics added). This implies that both characteristics of the interventions as well as characteristics of the persons targeted are important in explaining the success of attitude change endeavors.

Considerations of Interventions and Audiences

The literature has explored a number of interventions, and it appears that the same or

similar interventions have been applied to different samples, often with improved attitudes but sometimes with little positive effect. For example, several investigators have chosen to use videos instead of live or other types of interventions because videos (a) can be carefully prepared and controlled beforehand, (b) can be replicated nearly exactly with different audiences, and (c) can rule out incidental changes in speakers' appearance, language, voice, and so on. Gottwald et al. (2011, 2014) developed a custom video on stuttering which was markedly successful with samples of SLP students, teachers, and professors. Abdalla and St. Louis (2014) also utilized a custom video with Kuwaiti education students and experienced teachers. The students changed their attitudes significantly, but practicing teachers did not.

Results have been mixed with professionally prepared stuttering films or video. Kestenbaum and Khnonov (2011) reported significant improvement in stuttering attitudes for a group of university students who watched the Academy Award winning movie, *The King's Speech* (King's Speech, 2015). The American professionally recorded video, *MTV I Stutter* (Schneider, 2007), designed specifically for teens and telling the stories of three young adults who stuttered, had a very strong, positive effect on the attitudes of high school students in the USA (Flynn & St. Louis, 2011). By contrast, a video adapted to Polish from a well-known British video on stuttering and shown to both high school and university students in Poland, had virtually no effect on their measured attitudes (Węsierska, Błachnio, Przepiórka, & St. Louis, 2015). Similarly, Kuhn and St. Louis's (2015) found that middle school students who were shown the video, *Stuttering, For Kids By Kids* (The Stuttering Foundation, 2017) also did not improve their subsequent stuttering attitudes. Mixed results in improving attitudes have been reported showing the touching, emotional videos, *Speaking of Courage* and *Voices to Remember* (Bonderenko 1992a, 1992b; McGee et al., 1996; Snyder, 2001). In all these cases, it cannot be known with any certainty what aspects of the videos were responsible for success or lack thereof. Important features may include the presence or absence of personal stories of stuttering, the age of the actors, the quality of the recordings, the connectivity of the messages, and cultural

differences between the actors and the audience.

Oral presentations on stuttering have also been used. Flynn and St. Louis (2011) reported a large improvement in attitudes in high school students after an oral (live) presentation on stuttering by the first author, a moderate-to-severe stutterer, who also was young and who very effectively utilized humor. Interestingly, the improvement occurred even though two-thirds of the students believed he was “faking” the stuttering. As further evidence of the impact, a recent study confirmed that a representative sample of these former students held more positive attitudes toward stuttering seven years later than a carefully-selected control group (St. Louis & Flynn, 2018).

Inclusion of interactions with people who stutter has been a factor in intervention studies. Lack of such inclusion may have been partly responsible for failure of Węsierska et al. (2015) to change Polish students’ attitudes. By contrast, including interactions with people who stutter likely contributed to the success of a similar intervention with Polish students and teachers (St. Louis Węsierska, & Polewczyk, 2018). Carrying out personal interviews with a person who stutters or did so in the past—or a parent of such a person—has been found to generate substantially improved stuttering attitudes (Beste-Guldborg, St. Louis, & Shorts, 2015; Stork & Johnson, 2016).

Most studies have successfully employed group settings for interventions, but a few have used individual settings (e.g., Gottwald et al., 2011, 2014; Holcombe & Eisert, 2013). Additionally, the actual location of the intervention can play a role in intervention success. In a pilot study with 12 students and a follow-up study with 36 students (Kuhn & St. Louis, 2015), the participants were shown the same aforementioned video, *Stuttering, For Kids By Kids*. While not an effective intervention for either sample, in the pilot study, students’ attitudes actually worsened overall after the video. The only difference in the two administrations was that in the pilot study, the investigator took a group of children to the school cafeteria and showed them the video. She noted that many of the youngsters (reportedly mostly boys) laughed when a child in

the video stuttered, especially the children featured early in the video who were considerably younger than the middle school students. Several other pilot students (girls) told the laughing students to “Shut up.” In the follow-up study, the video was shown in one of the students’ classrooms with their teacher present. No laughing occurred, and the participants made a slight improvement.

In two studies, workshops on stuttering have been used with teachers. Three groups of experienced teachers who were invited in successive years to participate in a half-day workshop on stuttering in the UK improved dramatically (Bolton, Gibson, Holmes, & Rowland., 2017). In addition to providing information on stuttering, it began with introductions and sharing of personal experiences with stuttering. In the recent study in Poland, St. Louis et al. (2018) also showed that a 2-hour workshop involving videos and a presentation on stuttering resulted in substantial improvements in stuttering attitudes. These interventions included relevant facts, direct participation with those who stutter, and information about the emotional impact of stuttering.

Coursework in fluency disorders for SLP students has been shown to have a positive influence on stuttering attitudes (Junuzović-Žunić et al., 2015; St. Louis. et al., 2018), and some of those improvements have been suggested to be due to additional information related to such topics as emotional intelligence, cultural diversity, and multidisciplinary collaboration (Reichel & St. Louis, 2004, 2007, 2011) In one sample, however, students in their second course on stuttering wherein the coursework was devoted almost entirely to therapy (Junuzović-Žunić et al., 2015), made only modest improvements in measured attitudes over their previous substantial improvements in their first stuttering course.

Content alone has been shown to be a factor as well. Comparing an information sheet and very short (5 min) video on stuttering (half of which focused on a personal story) with a parallel control information sheet and video on bullying and stress in a control group, the former resulted in very successful changes pre to post versus no changes in the latter (Holcombe & Eisert, 2012).

As noted, most intervention studies have documented measurable improvement in public attitudes; however, a substantial minority have failed to do so. It was such widely divergent results that motivated the current study. We hypothesized that characteristics of the interventions were most likely responsible for the different results. Yet, we also wondered if demographic differences might also provide insight into the failure of a few well-designed intervention studies to improve stuttering attitudes.

We recognize that a staggering number of interactive variables are in play in such comparisons, including respondents' age, sex, education, socio-economic status, citizenship, occupation, personality and motivation, all of which interact with the interventions' delivery medium (e.g., live, video, or print), location, duration, content, and intent (e.g., information sharing or emotion generating). Nevertheless, the purpose of this research was to take a first step to understand why some interventions designed to improve public attitudes toward stuttering have been more effective than others. The two research questions addressed were:

- (a) What intervention properties, if any, are predictive of least to most successful intervention samples?
- (b) What demographic characteristics, if any, are predictive of least to most successful intervention samples?

METHOD

Instrument

For nearly two decades, the International Project on Attitudes Toward Human Attributes (IPATHA) initiative, which has as its mission to improve attitudes toward stuttering among the public, has generated data from widely different samples of the nonstuttering public using a standard instrument, the *Public Opinion Survey of Human Attributes–Stuttering (POSHA–S)* (St. Louis, 2011). The first author of this report has maintained a large and growing database of results from the *POSHA–S* (or its very similar experimental versions) from nearly 250 different public and professional samples representing, at the time of this study, 43 different countries and

translations to 27 different languages. He followed a strategy of permitting responsible researchers to use the *POSHA-S* at no cost who had obtained human subject clearance at their respective institutions and who had agreed to send copies of their raw data to be included in the database. Circa January, 2018, over 16,500 respondents had filled out the *POSHA-S*.

Two outcomes of the non-intervention research that measured attitudes with the *POSHA-S* are noteworthy. The first is that public attitudes have been found to be negative in virtually every worldwide sample, ranging from intermittently insensitive to decidedly stigmatizing. Second, important differences have been found to exist across samples (St. Louis, 2015). Among the most significant findings are that (a) most adults have very limited experience with stuttering; (b) stuttering is ranked nearly as stigmatizing as obesity and mental illness; (c) uncertainty about the causes of stuttering exists; (d) the public is quite likely to ignore and not joke about stuttering but less likely to refrain from filling in stuttered words or advising “Slow down” or “Relax”; (e) respondents’ sex, age, education, income, religion, health, and life priorities, while sometimes emerging as predictors, are typically very weak predictors of attitudes; (f) different national identities are often associated with better or worse attitudes; (g) teachers tend to have stuttering attitudes equivalent to the general public; and (h) SLPs or SLP students tend to have better attitudes than control samples.

All the samples in this investigation utilized the *POSHA-S* or its experimental version. Described most fully in three publications (i.e., St. Louis 2011, 2012c, 2015), the *POSHA-S* can be described as follows. It begins with typical demographic questions relating to age, education, current work status, marital and parental status, residence, and citizenship. Included is a weighted rating of one’s income relative to the incomes of (a) one’s friends and family and (b) all the people in one’s country. The demographic section also includes self-identification of languages spoken, race, religion, physical and mental health, speaking and intellectual abilities, and 12 life priorities (e.g., being safe and secure). Next, a general section asks respondents to rate stuttering and four other “anchor” attributes that are typically regarded as positive

(intelligent), neutral (left handed), or negative (obese and mentally ill). These five attributes are rated for Overall Impression, Want to Be/Have, and Amount Known. Additionally, respondents are asked to indicate by a check mark whom they know with each attribute as follows: nobody, acquaintance, close friend, relative, oneself (“me”), and other. Choices on this stuttering item are differently weighted to generate a Persons Known score. A detailed stuttering section contains 39 items, the means of which are calculated and clustered into eight different components. Means for these components are further combined into two subscores, namely, Beliefs About People Who Stutter (Beliefs) and Self Reactions to People Who Stutter (Self Reactions). Beliefs relate to the items and components that are external to the respondents (e.g., “People who stutter are nervous or excitable”) while Self Reactions relate to items and components that are internal to the respondents (e.g., “I would be concerned or worried if my neighbor stuttered.”) The mean of the Beliefs and Self Reactions subscores is the Overall Stuttering Score (OSS). Additionally, the pairs of items in the general section related to obesity and mental illness make up components for Impression, Want to Be/Have, and Amount Known about these two negative attributes, and their mean is the third *POSHA-S* subscore, that is, Obesity/Mental Illness. The two other non-stuttering “anchor” attributes, intelligence (positive) and left handedness (neutral) are not included in standard *POSHA-S* summary ratings but are included as demographic items in this study. All scaled ratings are converted to a -100 to +100 scale, with 0 being neutral, with ratings for some items being inverted so that, consistently, higher ratings reflect more positive attitudes (more closely aligned with research-based findings and/or greater sensitivity), and lower ratings reflect more negative attitudes.

Studies of the *POSHA-S*'s sociometric and practical qualities, namely, reliability, validity, internal consistency, translatability, responding format, sampling frame possibilities, and user friendliness, have all been shown to be satisfactory (Al-Khaledi, Lincoln, McCabe, Packman, & Alshatti, 2009; Junuzović-Žunić et al., 2015; Özdemir, St. Louis, & Topbaş, 2011; St. Louis, 2012b, 2012c; St. Louis, Lubker, Yaruss, Adkins, & Pill, 2008; St. Louis, Lubker,

Yaruss, & Aliveto, 2009; St. Louis & Roberts, 2010; St. Louis, Reichel, Yaruss, & Lubker, 2009; St. Louis, Williams, Ware, Guendouzi, & Reichel, 2014; Valente, Jesus, Roberto, Leahy, & St. Louis, 2016; Valente et al., 2017). Additionally, the summary scores of the *POSHA-S* are distributed normally.

Respondent Samples

About 85% of the *POSHA-S* database consists of respondents who filled out the instrument once. However, at the time of the current study, a subset of the database contained more than 2700 respondents from 41 different pre versus post comparisons wherein respondents filled out the *POSHA-S* two or more times. Twenty-nine of the pre-post comparisons evaluated interventions designed to improve public attitudes toward stuttering; 12 had no interventions and were either control groups for the intervention studies or evaluations of test-retest reliability of the *POSHA-S*. This paper summarizes results from the 29 different intervention samples, including several reviewed above, that involve the same respondents who filled out the *POSHA-S* two (and in a few cases, three) times. Most of the samples were from separate studies, but a few involved more than one separate comparison within a single investigation. Through a variety of interventions, all of them attempted to improve the attitudes of people toward stuttering (Abdalla & St. Louis, 2014; Beste-Guldborg et al., 2015; Bolton et al., 2017; Chandrabose, St. Louis, Pushpavathi, & Raoof, 2010; Flynn & St. Louis, 2009; Flynn & St. Louis, 2011; Gottwald et al., 2014; Gottwald et al., 2011; Holcombe & Eisert, 2012; Junuzović-Žunić et al., 2015; Kestenbaum & Khnonov, 2011; Kuhn & St. Louis, 2015; Reichel & St. Louis, 2004, 2007, 2011; Spears et al., 2015; St. Louis & Enoch, 2012; St. Louis, Przepiórka, et al., 2014; Stork & Johnson, 2016; Węsierska et al., 2015). A total of 934 respondents were involved. The majority of the samples were from the USA, but Kuwait, Poland, India, Bosnia-Herzegovina, and the UK were also represented.

Interventions

In fact, 23 different specific interventions were included in the 29 samples. Each

intervention was intended either to generate more positive attitudes toward stuttering or subsequently considered as likely to do so. Characteristics and percentages related to content were reported or estimated individually by each study's principal investigator(s) as follows. Given that the first author had first-hand general or specific knowledge of every intervention used in any study using the *POSHA-S*, he developed a list of descriptors that would apply to all 23 interventions. These included all the different intervention characteristics mentioned by Abdalla (2015) (see Introduction) as well as several more. All of the principal investigators were asked to evaluate or rate their own interventions by filling out their relevant row(s) in an Excel table very similar to that in Supplemental Materials A. First, they checked a choice or all that applied for the presentation medium (live, video, or print), presence or absence of a live person who stutters or relative of a stutterer, passive versus active participation of the respondent in the intervention, setting, and location. After estimating the total duration of the intervention in hours or minutes, they were asked to determine the relative percentage (which had to total 100%) relating to the amount of the total content of the intervention devoted to definition and/or symptomatology of stuttering, causes of stuttering, emotions related to stuttering, reactions to or interactions with people who stutter, facts and research related to stuttering, dos and don'ts in terms of interacting with people who stutter, personal stories of people who stutter, therapy for stuttering, and an "other" unspecified category. Finally, investigators judged whether or not their intervention included humor or not based on previous speculations by Flynn and St. Louis (2011). All of these were descriptive characteristics of the interventions that the first author judged could be easily determined. He considered the addition of more subtle nuances, such as familiarity of speakers' language or accent, but did not include them because it was doubtful that the investigators would be able to judge them similarly. Supplemental Materials A provides a brief description and summary characteristics of all 29 interventions.

Procedures and Rationale for Categorization of Samples According to Success

[Table 1 about here]

Table 1 provides a description of the division of the 29 intervention samples into four success categories. First, we subtracted the mean pre values from the mean post values for the two *POSHA-S* stuttering subscores (i.e., Beliefs, and Self Reactions) and the Overall Stuttering Score (OSS). These mean differences would be indices used for the amount and direction of attitude change each intervention induced. (Although not used in categorization [see below], we did the same for the Obesity/Mental Illness subscore.) Investigations have shown that Beliefs and Self Reactions are closely related, but distinct concepts (e.g., Arnold & Li, 2016), so, logically, the most successful programs would improve ratings substantially on both subscores. Less successful interventions would likely generate improvement in only one of them, and unsuccessful interventions would result in little change in either. Because the OSS is the mean of Beliefs and Self Reactions, it is not orthogonal to either of them; however, if an intervention occasioned a large improvement in either Beliefs or Self Reactions, but not the other, the OSS would be likely to differentiate it from an intervention resulting in a small to moderate change in one of the subscores. Accordingly, we categorized the intervention samples into the four levels of success as follows. If all three summary ratings, namely, Beliefs, Self Reactions, and OSS, improved by greater than 5 or more units (or 3 out of 3), the sample was deemed “very successful” (VS). If 2 out of 3 improved, the sample was labeled “successful” (S). If 1 out of 3 improved, we labeled the sample “marginally successful” (MS), and if 0 out of 3 improved, we labeled it “unsuccessful” (U).

The rationale for using a ≥ 5 -unit change derived from prior research. St. Louis (2012c, 2015) indicated that more than a 5-unit improvement (on the -100 to +100 rating scale) for these summary scores were typically associated with significant improvement, while less than a 5-unit improvement signaled little or no change in attitudes. For example, in the studies reviewed above, improvements in OSSs, from pre to post, of the three most successful interventions (Abdalla & St. Louis, 2014; Flynn & St. Louis, 2011; St. Louis et al., 2018¹) ranged from +25 to +38. Similar changes in Beliefs and Self Reactions subscores ranged, respectively, from +32 to

+37 and from +18 to +39. By contrast, OSS differences of the three least successful interventions (Abdalla & St. Louis, 2014; Kuhn & St. Louis, 2015; Węsierska et al., 2015) ranged from -4 to +2. Beliefs and Self Reactions changes in these unsuccessful interventions ranged, respectively, from -8 to +4 and -2 to +2.

We evaluated the pre, post, and difference distributions of the two stuttering subscores and OSS from which success categories were derived for normality using SPSS. Skewness values ranged from -.050 to +0.52, and kurtosis values ranged from -0.67 to +1.78. All of these were within acceptable limits for normality, namely, -2.0 to +2.0 for skewness and <4 for kurtosis (subtracting 3 from a <7 cutoff for “kurtosis proper” to arrive at “excess kurtosis”) (West, Finch, & Curran, 1995).

None of the investigators targeted obesity or mental illness in any of their interventions, so ratings on those items would not be expected to change as much as the stuttering-related items. As such, the Obesity/Mental Illness subscore could be regarded as a control value. It should be noted that two studies (i.e., Abdalla & St. Louis, 2014; Chandrabose et al., 2010) omitted the Obesity/Mental Illness items. As well, a few investigators omitted one or more stuttering or demographic items. The reasons for these differences were: (a) one item in the final version was added to the previous experimental version, (b) the items were deemed too sensitive by human ethics committees, or (c) items were deemed irrelevant to the investigations. In every sample, however, *all respondents filled out exactly the same version in their pre and post administrations*, permitting valid mean difference comparisons on all respondents.

Data Analysis

Success Categorization

Upon classifying each sample by success, all the respondents in all the samples within each category were then combined for analysis. We calculated, and showed graphically, the means for each of the four categories, and for all the samples within each category, according to pre, post, and post-minus-pre difference scores for the three *POSHA-S* subscores and OSS.

Additionally, we calculated the Cohen's d effect size of change for each category from pre to post. For most social science research, Cohen suggested that a d equal to 0.2 would signify a "small" effect size, 0.5, a "medium effect size, and 0.8, a "large" effect size (Cohen, 1988).

Predictors of Success of Various Interventions

To address both research questions that sought to identify intervention property and demographic predictors of least to most successful interventions, we utilized stepwise discriminant function analyses utilizing the Statistical Package for the Social Sciences (SPSS Statistics, Version 24; Microsoft, 2016). Unlike a regression strategy that explores the relationship between predictor independent variables and one or more continuous dependent variables (i.e., with numeric values), this procedure explores the relationship between predictor independent variables and a set of pre-determined categorical dependent (i.e., classification) variables. It seeks to identify a set of prediction equations based on multiple independent variables in order to determine if and what independent variables predict group membership. Parsimony was utilized as the strategy to select the final predictor model. In other words, the subset with smallest number of predictors that generated the largest combined percentages of prediction for all four categories was selected. In other words, the best model was considered to be the one (or more than one) that generates the highest percentages of predictions for *all* of the pre-determined classification variables. If a variable predicts most or all of the respondents that fall into one, two, or three of the four categories but very few or none in the remaining categories, then other variable combinations are run until the highest combined percentages are achieved. Accordingly, we entered each variable one at a time and noted the percentages of classification of the data into all the categories. Next, we entered combinations of the best individual predictors, that is, those with some accurate classifications in all four categories, into the same model. We stopped when we were confident that we had identified the best combined predictors.

Discriminant function analysis requires normal distributions and homoscedasticity of independent variables. Tests of normality of the difference distribution of the Overall Stuttering Score (OSS), from which success categories were derived revealed acceptable skewness = -.0061 and kurtosis = +0.836. Levene's test of homogeneity of variances of the OSS difference scores among the four success categories indicated they were not significantly different ($W = 1.904; 3, 930; p = 0.125$). Discriminant function analysis also requires that none of the variables in a model are highly correlated (Spicer, 2005; Whitaker, 1997), called non-multicollinearity. Accordingly, we carried out all possible pairwise Pearson product-moment correlations between any models that contained more than one variable. If two were correlated at $R < -0.70$ or $R > +.70$, one of them was left out of the model. The results of these correlations are shown in Table 2.

[Table 2 about here.]

RESULTS

Respondents

The VS category contained 15 samples, totaling 480 respondents. The S category had three samples with 109 respondents, the MS category consisted of four samples with 92 respondents, and the U category contained seven samples with 253 respondents (see Table 1). Table 3 provides a summary of demographic characteristics of the 934 respondents organized by success category. Supplemental Materials B displays these characteristics, in addition to some non-quantitative descriptions, for each of the 29 samples.

[Table 3 about here.]

For the four categories, the mean sample size ranged from 23 to 36 respondents. Mean age ranged from 18 to 27 yr, and mean education from 11 to 15 yr. Of respondents who identified their sex, female respondents were more prevalent for all categories (64% to 83%) than males (17% to 36%). Marital and parental status varied widely among the categories, from

none to nearly all of the respondents. Mean relative income ranged from -20 to +17 for categories. (The *POSHA-S* database median is near the neutral value of +1.) The mean percentage of self-reported stuttering among respondents ranged from 0% to 2%, and the mean percentage reporting knowing no one who stuttered was 19% to 33%. Mean responding time for the first (pre) *POSHA-S* ranged 8 to 12 min and 7 to 9 min for the second (post) *POSHA-S*.

The majority of respondents in all four categories were students, and each category contained middle school and/or high school students as well as speech-language pathology (SLP) and non-SLP university students. The VS and U categories also had practicing teachers, and the U category had practicing SLPs. Supplementary Materials B reveals that the 29 sample means within each category varied more widely than the means of all the combined respondents within the four categories, especially with respect to age and education. Most samples were predominantly to overwhelmingly female, with only one sample having more males.

Success Categories

In consideration of the categorization scheme, Table 4 lists *POSHA-S* subscores and the OSS from pre to post in each of the success categories. It also shows the mean OSS improvement in terms of Cohen's *d* effect sizes. Supplemental Materials C lists the parallel values for all 29 samples. Table 4 indicates that mean difference values of the samples within the VS category showed improved attitudes in all three *POSHA-S* subscores and the OSS. Uniformly, Beliefs, Self Reactions, and OSS improved by +16 units. In the S category, Beliefs improved by +11 units, Self Reactions by +5 units, and OSS by +8 units. Within the MS category, improvement of +1 unit was observed for Beliefs, +7 units for Self Reactions, and +4 units for OSS. Finally, for the U category Beliefs, Self Reactions, and OSS were virtually unchanged, namely, -1 unit, 0 units, and +1 unit, respectively. Within the four categories, Obesity/Mental illness values were also little changed, ranging from -1 unit to +4 units. These results are also shown graphically in Figure 1.

[Table 4 and Figure 1 about here]

Improvements in the OSS, from pre to post, in terms of Cohen's *d* effect sizes progressively increased from 0.09 (no effect size) in the U category, to 0.20 ("small" effect size) in the MS category, to 0.37 ("small to moderate" effect size) in the S category, and to 0.71 ("moderate to large" effect size) in the VS category. Importantly, these further confirm that the categories progressively differentiated the samples in the expected direction.

Predicting Success among Success Categories

Intervention Property Predictors

For the first research question, we sought first to identify characteristics and content of the interventions that might be associated with the most to least successful interventions (see Supplementary Materials A). We excluded the variable for location of intervention (e.g., classroom, laboratory, clinic) because it aligned in predictable ways with the context or setting of the intervention (i.e., individual, group, both) with group-level interventions using the classroom location for sampling and individual-level interventions using lab or clinic settings (See Supplementary Materials A). Stepwise discriminant function analyses (SPSS Statistics) were carried out as follows. Using the four success categories as grouping variables, all the intervention features were entered as independent variables separately and then together in combinations driven by the most effective individual analyses. The best four-level success classification involved all variables entered at once. Regarding multicollinearity, as shown in Table 2, of the 15 variables, the mean of all 105 pair-wise correlations was -0.01, with 55% between ± 0.2 and 85% between ± 0.4 . Only one correlation exceeded ± 0.7 (i.e., 0.78 between Content: Causes versus Content: Facts/Research). Therefore, the Content: Cause variable was excluded in the discriminant function analysis.

It correctly classified VS = 79%, S = 100%, MS = 83%, and U = 91%, with an overall classification rate of 86%. The variables and Wilks' Lambdas are shown in Table 5.

[Table 5 about here]

Three discriminant functions were identified in the model shown in Table 6. The first

function (Eigenvalue = 4.730; canonical correlation = .909; 58% of the variance) involved increased levels of humor, personal stories, and direct participation. We labeled it “High Interest and Involvement.” In the second function (Eigenvalue = 2.231; canonical correlation = .831; 27% of the variance), which we termed “Personal Connection,” success was characterized by relatively less content related to facts/research and with larger percentages of content related to emotions typically associated with stuttering. We labeled the third function, “Other Factors” (Eigenvalue = 1.231; canonical correlation = .743; 15% of the variance). It included educational content relating to dos and don’ts, therapy, reactions of—or interactions with—those who stutter, and definition or symptoms. Additionally, it involved less “other” (nonspecified) content, inconsistent live, video, or live-video combined presentations, less interaction with people who stutter, shorter interventions, and more individual (and fewer group) settings.

[Table 6 about here]

Demographic Predictors

For the second research question, we sought first to identify typical and other demographic characteristics that might be associated with the most to least successful interventions. Stepwise discriminant function analyses were similarly applied to all the demographic characteristics identified or rated on the *POSHA-S* (excluding student and/or professional levels and affiliations because these were not well represented in all the categories). A total of 43 demographic and related variables were entered, one at a time as shown in Table 6. Nineteen of the variables did not generate statistically significant Wilks’ Lambdas and hence were not predictive at all of any of the four success categories. Twenty-four resulted in significant Wilks’ Lambdas and thereupon were assigned prediction classifications. Table 7 lists the means for each category as well as the percentage of predictions for each category for those classified.

[Table 7 about here]

None of the variables generated predictions for all four categories. All of the significant

variables were predictive of the VS category from 83% to 100%, but all the predictions for the S or MS categories were 0% predictive. A few variables were marginally predictive of the U category, but only two beyond the one-in-four chance (25%), i.e., male versus female (VS = 83%, S = 0%, MS = 0%, and U = 49%) and life priority of having exciting and potentially dangerous experiences (VS = 85%, S = 0%, MS = 0%, and U = 34%). In that none of the variables predicted well beyond chance for all four categories, the analyses indicated that the *POSHA-S* demographic variables were not predictive of success of the interventions.

In spite of the lack of prediction for all categories, a few minor deviations from the typical pattern were noted. For education, of all of the respondents *misclassified* for the MS category, 35% were predicted for the S category and 65% for the VS category. For male versus female, as noted while 49% of the U category respondents were correctly predicted, 26% were incorrectly predicted for MS, 31% for S, and 18% for VS. For the priority of having exciting but potentially dangerous experiences, whereas 34% of the U respondents were correctly classified, 20%, 30%, and 16%, respectively, were incorrectly predicted for the MS, S, and VS categories.

DISCUSSION

Summary

This report of 29 different samples wherein respondents rated their attitudes toward stuttering on the same standard measure, the *POSHA-S*, on at least two occasions constitutes the first compilation of such data into a single investigation. The study sought to explain discrepancies in intervention studies designed to improve public attitudes wherein about two-thirds of the attempts had been successful but about one-third were unsuccessful. Properties of the interventions did predict the four categories of success. On the other hand, demographic variables, either independently or in various combinations, were found not to predict intervention success. The following discussion addresses both probable and possible explanations for these findings.

Properties of the Interventions

Relative to the first research question, the stepwise discriminant function analyses yielded useful intervention predictors. As shown in Table 5, by themselves, all the variables had some predictive potential. However, when all of the 14 variables with correlations that fell below the criterion of $\pm.70$ were entered into the stepwise discriminant function analysis, three different discriminant functions were identified (Table 6). The “High Interest and Involvement” function identified greater success for interventions containing humor, personal stories, but, surprisingly, somewhat less direct participation with people who stutter. Humor was a major factor in the two studies by Flynn & St. Louis (2009, 2011), both of which were in the S and VS categories, and it did not occur at all in the MS and U categories. Personal stories of stuttering were central to both the oral (live) presentation and MTV video *I Stutter* interventions in the Flynn and St. Louis studies, *The King’s Speech* movie (Kestenbaum & Khnonov, 2011), and the student interviews of people who stutter (Beste-Guldborg et al., 2015; Stork & Johnson, 2016). The lower percentage of content devoted to direct participation with stuttering is somewhat puzzling. However, none of the interventions were entirely direct participation but, instead, featured either listening and observing or listening and observing combined with direct participation. The means, as seen in Table 5, did not systematically increase or decrease from VS to U in either category and the pooled within-group correlations between the variable and the standardized canonical function was the lowest of all the structure matrix correlations. As such, this intervention characteristic might be questionable in the model.

Success in the “Personal Connection” function had lower percentages of facts and research related to stuttering, which was interpreted as being material that respondents found less able to absorb. It should be recalled that content related to stuttering causes was quite highly correlated with facts and research, and hence was excluded from the discriminant function analysis. The less successful interventions appear to have been more heavily loaded with such facts than the more successful ones. Factual presentations and translated videos shown to Polish high school and university students had little effect (Węsierska et al., 2015) similar to the

Stuttering: For Kids By Kids video for American middle school students (Kuhn & St. Louis, 2015). It is not clear exactly why these did not connect with the Polish students, but the American video was likely regarded as too juvenile by some of the middle school students. By contrast, American high school students were captivated by the oral and video interventions (Flynn & St. Louis, 2011) and maintained positive attitudes seven years later (St. Louis & Flynn, 2018). The “Personal Connection” function contained content containing emotions associated with stuttering (e.g., fear, embarrassment, or shame). This was the second lowest correlation between any variable and its discriminant function (Table 6) no doubt because the category means for associated emotions deviated considerably from a progressive increase or decrease as a function of intervention success (i.e., VS = 18.2%, S = 20.6%, MS = 30.4%, and U = 18.4%). It is more likely that the emotions the *respondent* might feel toward a person who stutters was more likely reflected in the first function, “High Interest or Involvement,” especially in very successful interventions (Bolton et al, 2017; Gottwald et al., 2011, 2014; Reichel & St. Louis, 2004, 2007).

Nine variables were classified in the remaining function, identified as “Other Factors.” These involved group or individual settings, various intervention content, and modes of delivery. Again, these variables did not reflect progressive increases or decreases according to category success, with the minor exception of content related to definition and symptoms of stuttering. It should be noted that the duration of the interventions varied greatly with means from about a half hour to more than 13 hours. Some coursework interventions were very long and occurred in the VS, S, and MS categories, but not in the U category. Medians were much more similar, from .5 hour to 0.9 hour.

If these interpretations are correct, successful interventions to improve public attitudes toward stuttering are likely to (a) be captivating and interesting to the target audience, (b) deal with material that has meaning to the audience, and (c) contain sufficient information about the disorder. Conversely, unsuccessful interventions are likely to be less captivating and interesting, contain material that is dry or difficult to grasp, and contain either insufficient or excessive

Demographic Characteristics

None of the 43 different demographic variables, or related variables that are not included in the *POSHA-S* summary ratings under Beliefs, Self Reactions, or Obesity/Mental Illness, were predictive of the four success categories together. The majority were predictive of the VS category, and only two were predictive beyond chance for the U category, that is, male versus female and priority to have exciting but potentially dangerous experiences. Females were more likely to be in the VS categories and males in the U category, and lower priority for exciting experiences predicted VS intervention compared to U interventions. No combination of variables was more predictive of the four categories than these and, hence, combination models were not attempted.

While it is puzzling that none of the demographic variables emerged as predictors of the success categories, interactions among them may be present and have prediction potential. For example, inspection of the means in Table 7 may offer some insight. Very few of the means show substantial progressive increases or decreases from VS to U among those that were classified by the discriminant function analysis model. Additionally, differences among the variables that could not be classified were typically very similar or identical. This suggests that the lack of predictive power of the various demographic variables could well be due to the inherent variability within the 29 samples analyzed. If so, this finding is encouraging to those who would attempt to improve stuttering attitudes because it suggests that different population characteristics, while clearly important, may not be as critical as the interventions applied. Only careful, comparative research would be able to further elucidate this issue.

The literature, reviewed above, illustrates both that demographic differences sometimes make a difference in intervention outcome and sometimes do not. For example, after interventions, teachers have been found to improve *POSHA-S* measured attitudes quite dramatically (e.g., Bolton et al., 2017; Gottwald et al., 2011; Węsierska, et al., 2018) but also not

to improve (Abdalla & St. Louis, 2014). The experienced teachers in the Abdalla and St. Louis (2014) study were all men, but a careful analysis revealed that being male was not a cogent reason underlying the difference in their receptivity to the intervention compared to less experienced female education students (e.g., St. Louis, 2012a). Instead, it was most likely a difference in the teachers' openness to change. For reasons the authors could not identify, the seasoned teachers had somehow made up their minds about stuttering such that the video intervention had little effect. Similarly, high school students made dramatic improvements in some studies (e.g., Flynn & St. Louis, 2011), but not in others (e.g., Węsierska, et al., 2015). SLPs or SLP students typically have more positive attitudes than non-SLPs due to a hypothesized "halo effect" (St. Louis, Przepiórka et al., 2014), which they defined this as "a conscious or unconscious predisposition of SLP students to regard stuttering in a more positive light than those with other majors" (p. 36).

In this sample comparison, however, while typically improving in interventions, SLP students did not generate the largest improvements. In one case, practicing SLPs made no improvement (Gottwald et al., 2011), but this was probably not due to anything in the intervention or even in the motivation of the individuals to consider adopting some new ideas about stuttering. Very likely, failure of these SLPs to improve was that they had already reached a ceiling level; compared to the *POSHA-S* database (St. Louis, 2011), their pre-*POSHA-S* ranks were mostly above the 95th percentiles. Nevertheless, we wondered if the amount of change was related to pre-test values on the *POSHA-S*, so we ran correlations between the mean pre ratings and the mean post-minus-pre ratings (or amount of change) of the 29 samples for Beliefs, Self Reactions, and OSSs. The respective correlations were -0.009, 0.065, and 0.041, or near zero. Clearly, there was no relationship for the sample mean values.

A Hypothesis to Explain the Variability of the Results

Our results, and especially the first factor of high interest or involvement for the interventions, are in clear agreement with Abdalla's (2015) assertion that it is the

“meaningfulness” of an intervention to improve stuttering attitudes that is critically important.

This immediately implies that interventions cannot be considered in a vacuum, that is, that a “good” intervention will likely not be equally “meaningful” to any sample of the nonstuttering public.

Accordingly, we hypothesize that, in order for an intervention designed to promote better public attitudes toward stuttering to be effective, (a) the intervention must be tailored and captivating to the intended audience and (b) members of the audience must be open to changing their beliefs and reactions. If either of these is not met, it is unlikely that the intervention will have its desired effect. In hindsight, it would seem obvious that past research would have addressed this issue, but it is clear that the literature on public stuttering attitudes has scarcely dealt with it. For that reason, therefore, it appears that those interventions through foresight or luck that introduced various groups of people to stuttering in ways that drew them to absorb the information with open minds were successful. Those interventions, for whatever reason, that did not do so were likely unsuccessful. Our results suggest that the important reasons appeared more likely to be the nature and content of the intervention. Other times, however, it was probably characteristics of the audience. Most likely, success or lack thereof appears to be related to a mismatch between the intervention and the people targeted (St. Louis et al., 2018).

Openness to changing one’s opinions or attitudes is likely an important factor in mitigating negative attitudes toward stuttering (e.g., Abdalla & St. Louis, 2014). This variable may be related to readiness for change in therapeutic contexts, such as Prochasta and DiClemente’s (1992) five stages of change: precontemplation, contemplation, preparation, action, and maintenance.

Even considering the three factors that predicted the four successful categories, it would be simplistic and possibly erroneous to assume that these factors are sufficient to explain the wide inconsistencies in outcomes of the 29 samples. We submit, therefore, that predicting the success of various interventions designed to foster more positive public attitudes toward

stuttering involves complex interactions between the interventions and the audience. Only careful research in the future can further elucidate the factors and interactions that are most important.

Strengths and Limitations

The primary strength of this study is the breadth of the samples that were subjected to different interventions but that were evaluated on the same attitude measure. Twenty-nine samples containing nearly 1000 respondents from six different countries with data in four different languages were involved. The largest number of samples and respondents were from the USA, with four different states predominately represented. This permits inferences beyond the typical sample from one population in one location. In fact, being able to generalize to the public worldwide was one of the primary reasons for initiating the International Project on Attitudes Toward Human Attributes (IPATHA) initiative at its outset (St. Louis, 2005, 2011, 2015; St. Louis et al., 2008).

We recognize that slight differences in *POSHA-S* versions are a limitation. Three intervention samples utilized an earlier version of the *POSHA-S* (i.e., Chandrabose et al., 2010; Flynn & St. Louis, 2009; Reichel & St. Louis, 2004, 2007), which used a different scale than the final version (St. Louis, 2012c). Also a few samples omitted one or more items after human subject ethics directives or decisions that they would not be useful. Nevertheless, we submit that such differences are mitigated by the fact that (a) the summary *POSHA-S* stuttering scores were distributed normally in all pre, post, and difference scores within the 29 samples, (b) every respondent filled out exactly the same pre and post questionnaires, and (c) the degree of success focused not on pre test or post test values but on the differences between them.

Another potential limitation of the study was that at least a 5-unit improvement on Beliefs, Self Reactions, or the OSS was used to categorize the samples according to success. It was based on reports of important differences in studies comparing one sample with another (e.g., Ip, St. Louis, Myers, & AnXue, 2012; St. Louis, Williams, et al., 2014); however, if

another value had been chosen, some of the samples in the four success categories could have been assigned to a different category. As it turned out, the zero-, one-, two-, or three ≥ 5 -unit improvements in Beliefs, Self Reactions, and OSS differentiated the four success groups unambiguously in terms of differences between their mean pre and post OSS and stuttering subscores as well as the effect sizes of the changes (see Table 4 and Figure 1). Had more stringent criteria been used to generate more categories of success, it is likely that even fewer predictors of the various categories would have occurred.

A further limitation is that the intervention features targeted for study could identify only general differences among the interventions. Clearly, all the nuances involved in any given intervention versus another, for example, enthusiasm of the speakers, clarity of the videos, or the influence of various environmental factors during the interventions, were not captured in this compilation of interventions. Neither was it possible in this overview study to accurately measure such important demographic variables as empathy or openness to change. Only careful qualitative analyses could address such variables but, in turn, would generate data that might be difficult to generalize.

One final caveat is that stepwise discriminant function analysis has limitations. Although widely used to identify predictor variables for predetermined categories in social science, the algorithms utilized cannot discriminate which ones, documented from other research, for example, might be meaningful (Whitaker, 1997). Additionally, capitalization on chance or “picking and choosing” which variables to analyze has been shown to generate too many Type I errors (identifying a significant difference when one does not exist) (Hill & Lewicki, 2006). Whereas this may have occurred in our analysis, the limited number of significant predictors—and none in the demographic analyses—suggests this was not a serious limitation.

Suggested Future Research

St. Louis (2015) advanced the assertion that developing a science of changing attitudes toward stuttering is important and imperative if stakeholders are to most efficiently mitigate the

stereotypes, stigma, and discrimination faced by many people who stutter. The following research projects would logically extend the results of the current study.

It would be useful to determine the relative effectiveness of interventions with and without personal contact with one or more persons who stutter. One way to investigate this would be to compare the effectiveness of a live and videotaped version of the same intervention. Another useful research effort would be to carefully explore the role of humor in interventions designed to change attitudes, perhaps by comparing the effectiveness of two videos of the same speaker giving the same overall message, but one with appropriate humor and the other without.

Setting of the intervention is also important (e.g., Kuhn & St. Louis, 2015). It would be revealing to learn from a future study how the intervention setting influences attitude change. A study could employ exactly the same intervention (e.g., a video) with a substantial number of similar respondents assigned to treatments randomly. Pre testing, the video, and post testing could occur in two group and two individual settings either with instructions provided by video and then switched off or with instructions provided by a person who then sits in the room during the pre and post testing.

To date, very few studies have explored the effectiveness of interventions designed to improve stuttering attitudes of young children versus older children or adolescents and adults. Weidner developed an intervention termed the *InterACT* program that consisted of two group lessons for preschool children about differences in general and about stuttering in particular (Weidner, St. Louis, & Glover, 2018). She showed that this puppet-based video program followed up with group discussions and coloring books was effective in changing attitudes, as measured by the *POSHA-S/Child* (Weidner, St. Louis, Burgess, & LeMasters, 2015). Following this model, the effectiveness of the *InterACT* program and other interventions that are carefully matched to their intended audiences should be explored.

Lastly, it is important to document which interventions are most likely to promote long-term attitude improvement that will be maintained versus those that produce temporary

improvement. St. Louis & Flynn (2018) showed that a representative subset of their former high school respondents who heard the oral presentation and/or the MTV video maintained improved stuttering attitudes for seven years.

FOOTNOTE

¹ The St. Louis, Węsierska, & Polewczyk (2018) study was not included in the current study because the data were unavailable in early 2018.

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Table 1.

Samples in intervention comparison sorted into four categories of success according to number of mean sample improvements of ≥ 5 units from pre to post in three *POSHA-S* summary measures (Beliefs, Self Reactions, and Overall Stuttering Score [OSS]) (0 to 3 of 3).

Unsorted				
	Intervention			
Samples	29			
Respondents	934			
Sorted by Mean Sample Improvement Pre to Post				
	Very Successful (VS): 3/3	Successful (S): 2/3	Marginally Successful (MS): 1/3	Unsuccessful (U): 0/3
Samples	15	3	4	7
Respondents	480	109	92	253

Table 2.

Correlations between all pairs of intervention characteristics for all respondents.

	Live 1 Video 2 Combination 3	Stutterer Relative: Yes 1 No 2	Listen/Observe 1 Plus Direct Participation 2	Individual 1 Group 2 Both 3	Duration Minutes	Content: Definition & Symptoms	Content: Causes	Content: Emotions	Content: Reactions/ Interactions	Content: Facts/Research	Content: DOs & DON'Ts	Content: Personal Stories	Content: Therapy	Content: Other	Content Humor: Yes 1 No 2
Live 1 Video 2 Combination 3	—	-0.09	-0.11	-0.07	0.14	-0.23	0.23	-0.27	-0.10	0.15	0.02	-0.14	0.47	-0.37	0.16
Stutterer Relative: Yes 1 No 2		—	-0.34	0.10	-0.18	-0.13	-0.43	-0.04	0.44	-0.25	0.09	0.14	-0.04	-0.39	0.25
Listen/Observe 1 Plus Direct Participation 2			—	0.55	0.53	0.50	0.17	-0.04	0.12	0.18	-0.12	-0.39	0.07	0.41	-0.13
Individual 1 Group 2 Both 3				—	0.36	0.16	-0.05	-0.16	-0.08	-0.10	-0.06	-0.14	0.23	-0.06	0.04
Duration Minutes					—	0.22	-0.04	-0.13	-0.16	-0.04	-0.21	-0.32	0.44	0.61	-0.24
Content: Definition & Symptoms						—	0.15	0.23	0.39	0.09	-0.04	-0.33	-0.39	0.24	0.26
Content: Causes							—	-0.42	0.03	0.78	0.09	-0.25	0.05	-0.10	-0.06

Table 3.

Demographic means and standard deviations (in italics) of four success categories wherein the POSHA–S was administered twice to evaluate interventions designed to improve public attitudes toward stuttering. Samples are organized according to Very Successful (VS), Successful (S), Marginally Successful (MS), Unsuccessful (U), and Control/Reliability (C/R). Values reflect the mean of the sample means in each category.

Intervention Category	Sample Size	Age (yr)	Education (yr)	Males (%)	Females (%)	Parent (%)	Married (current and/or past) (%)	Relative Income (-100 to +100)	% Stuttering	% Knowing No Stutterers	Response Time Pre (min)	Response Time Post (min)
VS	32	26.5	15.0	17%	83%	37%	57%	8	2%	24%	9.5	9.0
	<i>17.5</i>	<i>10.7</i>	<i>3.3</i>	<i>19.8%</i>		<i>41.3%</i>	<i>41.0%</i>	<i>14.8</i>	<i>3.6%</i>	<i>9.7%</i>	<i>2.3</i>	<i>3.3</i>
				<i>19.7%</i>								
S	36	18.2	11.5	27%	72%	0%	12%	-20	1%	33%	7.5	7.2
	<i>8.3</i>	<i>4.1</i>	<i>4.4</i>	<i>21.2%</i>		<i>–^a</i>	<i>–^a</i>	<i>–^a</i>	<i>1.2%</i>	<i>24.2%</i>	<i>3.1</i>	<i>3.4</i>
				<i>21.2%</i>								
MS	23	21.9	13.2	20%	80%	19%	37%	0	0%	20%	11.5	8.5
	<i>10.6</i>	<i>7.7</i>	<i>4.7</i>	<i>24/1%</i>		<i>26.9%</i>	<i>35.4%</i>	<i>16.5</i>	<i>0%</i>	<i>8.7%</i>	<i>2.0</i>	<i>2.3</i>
				<i>24.1%</i>								
U	36	25.4	12.5	36%	64%	90%	100%	17	1%	19%	11.4	8.1
	<i>21.0</i>	<i>12.8</i>	<i>4.2</i>	<i>33.5%</i>		<i>–^a</i>	<i>–^a</i>	<i>14.5</i>	<i>1.9%</i>	<i>14.2%</i>	<i>1.9</i>	<i>1.6</i>
				<i>33.5%</i>								

^a Means for only one sample was available; therefore, the standard deviation cannot be calculated.

Table 4.

*Summary of pre, post, and post-minus-pre POSHA–S subscores (Obesity/Mental Illness, Beliefs, and Self Reactions) and Overall Stuttering Scores (OSSs) for four categories: Very Successful (VS), Successful (S), Marginally Successful (MS), and Unsuccessful (U). Values reflect the mean of all respondents within each category. Also included is the Cohen’s *d* effect size of change from pre test OSS to post test OSS.*

Category	Sample Size	Obesity/Mental illness Pre	Obesity/Mental Illness Post	Obesity/Mental Illness Difference	Beliefs Pre	Beliefs Post	Beliefs Difference	Self Reactions Pre	Self Reactions Post	Self Reactions Difference	OSS Pre	OSS Post	OSS Difference	Cohen’s <i>d</i> Effect Size of Change Pre to Post in OSS
VS	480	-37	-33	+4	38	54	+16	0	16	+16	19	35	+16	0.71
S	109	-28	-29	-1	39	50	+11	7	12	+5	23	31	+8	0.37
MS	92	-24	-20	+4	36	38	+1	12	19	+7	24	28	+4	0.20
U	253	-31	-30	+4	23	24	-1	-4	-3	0	10	10	+1	0.09

Table 5.

Wilks' Lambdas and F tests for 14 steps of stepwise discriminant function analysis to identify predictive intervention properties for respondents in Very Successful (VS), Successful (S), Marginally Successful (MS), and Unsuccessful (U) categories.

Step	Variables Entered	Wilks' Lambda Statistic	df1	df2	df3	F Statistic	df1	df2	Significance
1	Content: Facts/Research (0-100%)	0.619	1	3	883	181.23 ^a	3	883	<0.001
2	1=Humor Involved; 2=No Humor	0.408	2	3	883	166.07 ^a	6	1764	<0.001
3	1=Listening/Observation; 2=Listening/Observation Plus Direct Participation	0.322	3	3	883	141.34 ^b	9	2144	<0.001
4	1=Live; 2=Video; 3=Combination	0.255	4	3	883	130.99 ^b	12	2329	<0.001
5	Content: Other (0-100%)	0.204	5	3	883	125.93 ^b	15	2427	<0.001
6	Duration in Minutes	0.163	6	3	883	123.88 ^b	18	2484	<0.001
7	Content: Therapy (0-100%)	0.102	7	3	883	146.00 ^b	21	2519	<0.001
8	Content: Reactions/Interactions (0-100%)	0.089	8	3	883	138.14 ^b	24	2541	<0.001
9	Content: Definition/Symptoms (0-100%)	0.076	9	3	883	133.83 ^b	27	2556	<0.001
10	Content: DOs DON'Ts (0-100%)	0.056	10	3	883	142.34 ^b	30	2566	<0.001
11	Content: Personal Stories (0-100%)	0.047	11	3	883	142.06 ^b	33	2573	<0.001
12	Content: Associated Emotions	0.040	12	3	883	142.03 ^b	36	2577	<0.001
13	1=Individual; 2=Group; 3=Both	0.035	13	3	883	138.87 ^b	39	2580	<0.001
14	1=Stutterer or Stuttering Relative Involved; 2=No	0.024	14	3	883	154.02 ^b	42	2582	<0.001

^a Exact F statistic

^b Approximate F statistic

Notes:

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- (a) At each step, the variable that minimizes the overall Wilks' Lambda is entered.
- (b) Minimum partial F to enter is 3.84.
- (c) Maximum partial F to remove is 2.71.
- (d) F level, tolerance, or VIN are insufficient for further computation.
- (e) “If the assumptions under which it was derived are met, the transformation of lambda into an F statistic will yield a value that has an exact F distribution any time there are three or fewer groups, and for the first and second variables entered when there are four or more groups” (IBM Support, 2019). The current analysis used 14 variables so that the first two F values are exact and the remainder are approximate. The reason for this is that when there are four or more groups, the mathematics become very complex and mathematicians have been unable to perfectly describe the sampling distribution of the F statistic for Wilks' Lambda (Pham-Gia, 2008) and other statistics, such as Pillai's trace, in some multivariate cases. As a result, various algorithms are applied by statistics programs to reconcile the slightly different results from these tests in terms of an “approximate” F statistic.

Table 6.

Mean values for intervention properties of respondents in Very Successful (VS), Successful (S), Marginally Successful (MS), and Unsuccessful (U) categories, followed by three functions identified by stepwise discriminant function analysis.

Intervention Properties	Mean Values in Each Category				Structure Matrix Function		
	VS	S	MS	U	1	2	3
Function 1: "High Interest and Involvement"							
1=Humor Involved; 2=No Humor	1.50	1.25	2.00	2.00	.310 ^a	0.038	-0.261
Content: Personal Stories (0-100%)	23.0%	34.5%	10.8%	13.2%	-.221 ^a	0.002	0.071
1=Listening/ Observation; 2=Listening/ Observation Plus Direct Participation	1.36	1.25	1.61	1.45	.085 ^a	0.044	0.006
Function 2: "Personal Connection"							
Content: Facts/Research (0-100%)	7.2%	3.7%	1.7%	9.5%	0.086	-.466 ^a	-0.28
Content: Associated Emotions (0-100%)	18.2%	20.6%	30.4%	18.4%	0.055	.199 ^a	0.068
Function 3: "Other Factors"							
Content: DOs DON'Ts (0-100%)	6.1%	9.3%	5.7%	10.9%	0.014	-0.022	-.356 ^a
1=Live; 2=Video; 3=Combination	1.97	1.50	2.26	1.55	0.049	0.041	.311 ^a
Content: Therapy (0-100%)	19.8%	5.6%	31.2%	12.9%	0.111	0.053	.289 ^a
1=Stutterer or Stuttering Relative Involved; 2=No	1.43	2.00	1.61	1.66	-0.07	0.16	-.267 ^a
1=Individual; 2=Group; 3=Both	1.88	2.25	2.29	2.21	0.044	0.178	-.253 ^a
Content: Other (0-100%)	2.6%	0.0%	0.0%	0.0%	-0.039	-0.136	.252 ^a
Content: Reactions/Interactions (0-100%)	12.1%	14.5%	10.0%	16.3%	-0.001	-0.053	-.236 ^a
Content: Definition/Symptoms (0-100%)	6.3%	8.0%	9.4%	9.5%	0.08	0.099	-.229 ^a
Duration in Minutes	563	705	815	36	-0.066	0.121	.227 ^a

^a Largest absolute correlation between each variable and any discriminant function.

Notes:

- (a) Pooled within-groups correlations between discriminating variables and standardized canonical discriminant functions.
- (b) Variables ordered by absolute size of correlation within function.

Table 7.

Mean values for 24 individual demographic characteristics of respondents in Very Successful (VS), Successful (S), Marginally Successful (MS), and Unsuccessful (U) categories from the stepwise discriminant function analysis followed by significant Wilks' Lambda values and then by the percentage of predicted respondents in each category within the model. Included are 19 demographic variables for which Wilks' Lambdas were not significant and hence were not predictive of any category.

Demographic Variable	Means ^a				Wilks' Lambda ^b	Percentage of Prediction			
	VS	S	MS	U		VS	S	MS	U
Age (yr)	24.61	17.64	19.74	25.18	.926***	100%	0%	0%	0%
Education (yr)	14.47	10.82	12.08	12.57	.876***	100%	0%	0%	0%
Relative Income (-100 to +100)	+7	-20	-3	+12	.953***	100%	0%	0%	0%
1=Male; 2=Female	1.82	1.69	1.74	1.51	.922***	83%	0%	0%	49%
Ever Married: Yes; 2=No	1.59	1.88	1.80	1.92	.893***	100%	0%	0%	0%
Parent; 1=Yes; 2=No	1.78	2.00	1.91	1.93	.953***	100%	0%	0%	0%
Student: 1=Yes; 2=No	1.11	1.00	1.00	1.25	.927***	89%	0%	0%	25%
Working: 1=Yes; 2=No	1.67	2.00	1.90	1.75	.932***	100%	0%	0%	0%
Not Working: 1=Yes; 2=No	1.95	2.00	2.00	2.00	.974***	100%	0%	0%	0%
Self-Identification as Intelligent: 1=Yes; 2=No	1.52	1.56	1.70	1.63	.987**	100%	0%	0%	0%
Nobody Known Mentally Ill: 1=Yes; 2=No	1.76	1.89	1.70	1.50	.934***	100%	0%	0%	0%
Physical Health (-100 to +100)	+51	+66	+63	+52	.980**	100%	0%	0%	0%
Mental Health (-100 to +100)	+57	+69	+70	+46	.964***	100%	0%	0%	0%
Ability to Learn (-100 to +100)	+67	+77	+71	+52	.954***	100%	0%	0%	2%
Priority to Spend Time Alone (-100 to +100)	+44	+48	+33	+49	.963***	94%	0%	0%	14%
Priority to Help Less Fortunate (-100 to +100)	+43	+79	+53	+48	.963***	100%	0%	0%	0%
Priority to Have Exciting & Potentially Dangerous Experiences (-100 to +100)	-30	0	-13	0	.940***	85%	0%	0%	34%
Priority to Practice My Religion (-100 to +100)	+20	+48	+44	+33	.977**	100%	0%	0%	0%
Priority to Do My Job/Duty (-100 to +100)	+74	+94	+75	+56	.931***	94%	0%	0%	19%
Priority to Get Things Done (-100 to +100)	+76	+100	+74	+61	.931***	94%	0%	0%	16%
Priority to Solve Big Problems (-100 to +100)	+61	+83	+75	+75	.952***	100%	0%	0%	0%
Impression Left Handed (-100 to +100)	+24	+43	+38	+38	.971***	100%	0%	0%	0%
Amount Known Intelligence (-100 to +100)	+29	+36	+30	+46	.983**	100%	0%	0%	0%

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Amount Known Left Handed (-100 to +100)	-5	+10	+7	+18	.976**	100%	0%	0%	0%
No Prediction									
Retired: 1=Yes; 2=No	2.00	2.00	2.00	2.00	—	—	—	—	—
Self-Identification as Multilingual: 1=Yes; 2=No	1.56	1.41	1.43	1.45	—	—	—	—	—
Self-Identification as Left Handed: 1=Yes; 2=No	1.93	1.91	1.92	1.89	—	—	—	—	—
Self-Identification as Obese: 1=Yes; 2=No	1.99	1.92	1.96	1.92	—	—	—	—	—
Self-Identification as Mentally Ill: 1=Yes; 2=No	1.98	1.97	1.99	1.98	—	—	—	—	—
Self-Identification as Stuttering: 1=Yes; 2=No	1.98	2.00	1.99	1.99	—	—	—	—	—
Nobody Known as Intelligent: 1=Yes; 2=No	2.00	1.98	1.99	1.99	—	—	—	—	—
Nobody Known as Left Handed: 1=Yes; 2=No	1.99	1.97	1.99	1.98	—	—	—	—	—
Nobody Known as Obese: 1=Yes; 2=No	1.91	1.90	1.99	1.94	—	—	—	—	—
Nobody Known as Stuttering: 1=Yes; 2=No	1.76	1.80	1.66	1.75	—	—	—	—	—
Ability to Speak (-100 to +100)	64	65	75	70	—	—	—	—	—
Priority to Be Safe and Secure (-100 to +100)	76	76	93	83	—	—	—	—	—
Priority to Free to Do What I Want (-100 to +100)	71	63	80	64	—	—	—	—	—
Priority to Attend Social Events (-100 to +100)	22	27	44	17	—	—	—	—	—
Priority to Imagine New Things (-100 to +100)	41	30	41	25	—	—	—	—	—
Priority to Earn Money (-100 to +100)	66	58	77	60	—	—	—	—	—
Overall Impression Intelligence (-100 to +100)	64	68	70	60	—	—	—	—	—
Want to Be Intelligent (-100 to +100)	87	73	84	84	—	—	—	—	—
Want to Be Left Handed (-100 to +100)	4	5	7	3	—	—	—	—	—

^a Means are not equal to those of the total samples in Table 2.

^b *** indicates $p < .001$; ** indicates $p < .01$; NS indicates $p > .05$.

Note: Nineteen other variables were entered into the model but did not generate statistically significant Wilks' Lambdas and hence are not shown in the table.

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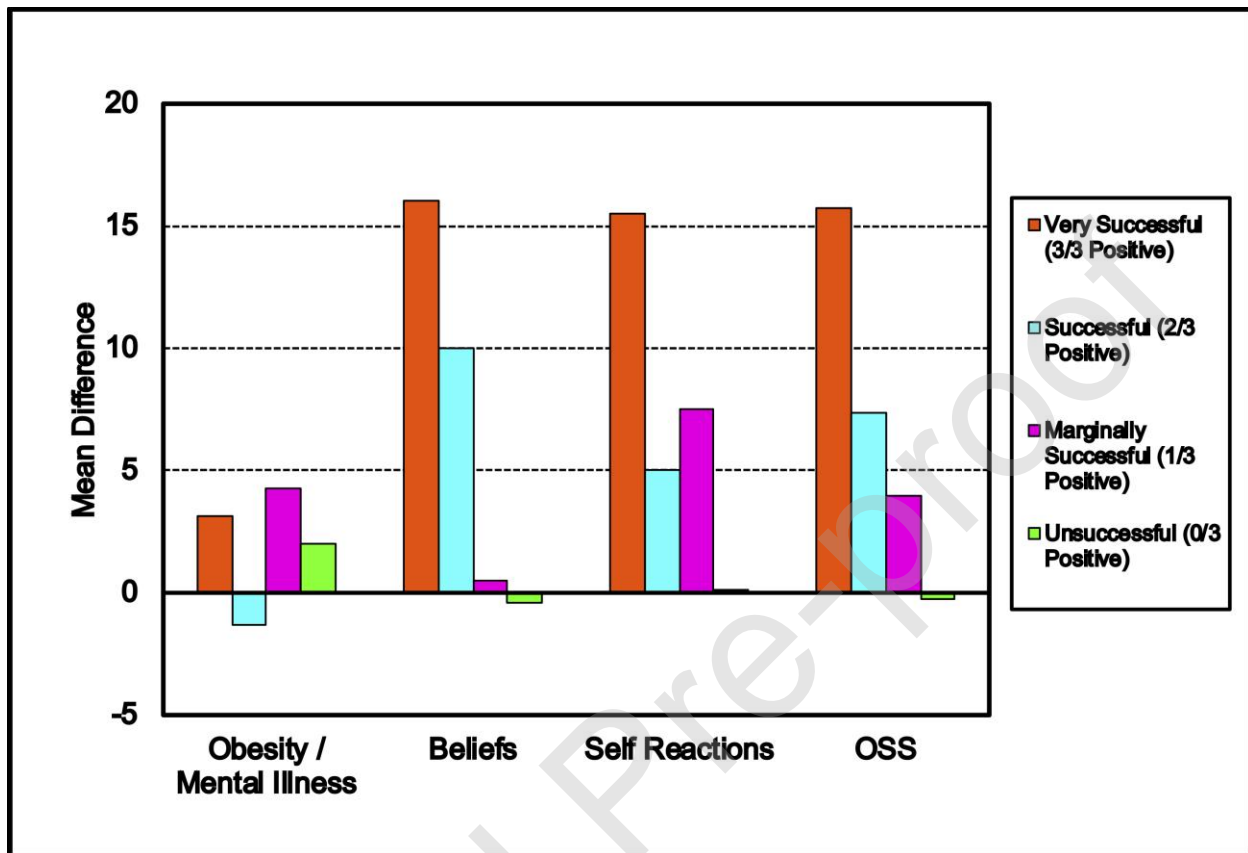


Figure 1.

Mean differences values for *POSHA-S* subscores (Obesity/Mental Illness, Beliefs, and Self Reactions) and the Overall Stuttering Score (OSS) for four success categories (Very Successful, Successful, Marginally Successful, and Unsuccessful).