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Characteristics of adults who stutter by treatment approach: Speech, psychological, or combined treatment

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Characteristics of adults who stutter by treatment approach: Speech, psychological, or combined treatment

Several treatment approaches are available for adults who stutter, including speech treatment, psychological treatment for anxiety, and a combination of both. It is useful to determine whether any differences exist between adults who stutter enrolled in different types of treatment. Therefore, the purpose of this study was to compare demographic, speech, and psychological characteristics of adults who stutter enrolled in speech, psychological, and combined treatment programs. Participants were 288 adults who stutter (18–80 years) enrolled in one of three different treatment programs: Speech Treatment for stuttering ($n=134$), Cognitive Behaviour Therapy (CBT) for anxiety ($n=70$), or Speech Treatment plus or minus CBT treatment ($n=84$). Participants completed a range of demographic, speech, and psychological measures prior to the commencement of treatment. Based on our conservative Bonferroni-adjusted alpha (0.004), the three treatment groups appeared similar across the majority of demographic, speech, and psychological variables. However, a significantly higher proportion of participants in the CBT group were in a romantic relationship than the other treatment groups. The Speech Treatment group also demonstrated significantly higher self-rated stuttering severity than the CBT group, even though there were no significant difference between groups for clinician-rated percentage of syllables stuttered. Although the majority of characteristics of adults who stutter did not vary by treatment type, the present findings suggest that adults who stutter enrolled in speech treatment perceived their stuttering as more severe, which may have prompted treatment seeking. Further research is needed regarding the supportive influence of romantic status.

Keywords: Stuttering; Anxiety; Assessment; Treatment.

Introduction

Stuttering is a speech disorder that involves involuntary disruptions to speech, which interfere with effective communication. It has a genetic basis (1), and is thought to be caused by deficits in neural processing and brain timing networks underpinning speech production (2). Stuttering is a prevalent speech disorder, with a lifetime incidence of approximately 4–5%, and 1% point prevalence (3). Onset typically occurs in the preschool years when children start combining words into short sentences (4). Although three-quarters of children who develop stuttering will recover naturally, the chance of natural recovery 9–18 months post onset is less than 10% (5). When natural recovery does not occur, stuttering typically persists across the lifespan and is associated with a range of negative consequences.

Stuttering and social anxiety

The negative experiences associated with stuttering are thought to increase risk for the development of anxiety, and can commence as early as the preschool years and continue throughout childhood and adolescence. These negative experiences can include bullying, teasing, negative peer reactions, social isolation and rejection, and being seen as less popular than non-stuttering peers (6–10). In adulthood, stuttering is associated with negative listener reactions, negative stereotypes, occupational disadvantages, reduced quality of life, and impaired social and emotional functioning (11–16). As a result of these experiences, many adults who stutter develop anxiety in social and speaking situations, with at least one-quarter of adults who stutter meeting criteria for social anxiety disorder (17, 18).

Social anxiety disorder is a chronic and disabling anxiety disorder that involves intense fear of negative evaluation in social situations (19). Onset typically occurs in late childhood or adolescence, at a time when social and peer relationships are growing in importance (20). The

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3 disorder is prevalent, affecting 8–13% of the general population (21–23). It is associated with
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5 significant functional impairment and a range of negative consequences, including lower
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7 education, unemployment, reduced socioeconomic status, low self-esteem, poor quality of life,
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9 and a reduced likelihood of being engaged in a relationship (24).
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12 *Treatment approaches for stuttering and social anxiety*

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15 Speech restructuring is a treatment for stuttering with the strongest research evidence for
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17 adults who stutter. It involves adopting a new speech pattern to control stuttering while sounding
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19 as natural as possible. Although speech restructuring is supported by randomised controlled trial
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21 evidence (25, 26), it has been recognised that the ability to maintain the benefits of speech
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23 restructuring may only be achieved by around one-third of adults who stutter (27, 28). Recent
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25 research provided an explanation for this problem by finding significantly poorer outcomes
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27 following speech restructuring for the one-third of adults who stutter with an anxiety-related
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29 disorder (28). This finding suggests that the failure to maintain speech gains following treatment
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31 may in part be explained by the presence of anxiety-related disorders.
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37 Given the prevalence and impact of social anxiety disorder on the maintenance of speech
38
39 treatment gains, and considering that treatments designed to reduce stuttering may have limited
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41 impact on stuttering-related anxiety, several anxiolytic treatment packages have been developed
42
43 to address the unique fears and anxieties experienced by people who stutter (29, 30). Cognitive-
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45 behaviour therapy (CBT), in particular, is one of the most efficacious and extensively researched
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47 treatments for social anxiety disorder in the general community (31). Several studies have
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49 confirmed the efficacy of both face-to-face and online CBT programs in treating social anxiety
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51 for adults who stutter, reporting significant improvements in social anxiety, avoidance, and
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53 overall functioning (30, 32–39).
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Despite the efficacy of CBT in reducing anxiety symptoms and eliminating social anxiety disorder diagnoses for adults who stutter, CBT programs for anxiety do not typically lead to improvements in stuttering (30, 39). That is, reductions in anxiety may occur without reductions in stuttering. Hence, several researchers and clinicians have recommended the incorporation of CBT approaches into standard speech pathology (29, 40), including the development of CBT treatment guidelines and worksheets for speech pathologists to use during treatment for stuttering (40). These CBT strategies can be applied in speech pathology clinics with collaborative support from clinical psychologists as required. Furthermore, face-to-face and online CBT treatment programs are also available for adults who stutter either as standalone treatments or in addition to speech therapy (36).

27 ***Purpose of the present study***

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Several treatment approaches are available for adults who stutter, including speech treatment for stuttering and psychological treatment for anxiety. In order to tailor treatments to the unique needs of adults who stutter enrolled in different treatment programs, it is useful to understand whether the characteristic of these groups differ prior to commencement of treatment. If differences are found between groups, this may suggest the need to tailor different treatment programs more specifically to the unique needs of each group. Therefore, the purpose of the present study is to compare demographic, speech, and psychological characteristics of adults enrolled to commence Speech Treatment for stuttering, CBT treatment for anxiety, or Speech Treatment with and without the addition of CBT treatment for anxiety. It is hypothesized that adults seeking CBT treatment will report significantly more psychological difficulties than adults seeking CBT treatment for anxiety or Speech Treatment.

Method

Participants

Adults who stutter were drawn from treatment waiting lists across seven university-affiliated stuttering treatment clinics across Australia and New Zealand (Australian Stuttering Research Centre, The University of Sydney; School of Human Communication Sciences, La Trobe University, Melbourne; Discipline of Speech Pathology, The University of Sydney; Department of Linguistics, Macquarie University, Sydney; School of Humanities and Social Science, University of Newcastle, Australia; Royal Prince Alfred Hospital, Sydney; Stuttering Treatment and Research Trust, Auckland, New Zealand). Eligibility criteria for inclusion in the study included: (1) age 18 years and above, (2) developmental stuttering present before 12 years of age, (3) seeking speech therapy for stuttering and/or CBT for anxiety with stuttering, (4) no previous therapy in the six months prior to commencement in the present study, and (5) presence of stuttering confirmed by participant and speech pathologist during assessment. The study was approved by the relevant Human Research Ethics Committees. Informed consent was obtained from all participants.

Participants were recruited over a 10-year period (2006–2016), and were drawn from a range of studies involving speech treatment for stuttering and/or CBT for anxiety in stuttering (17, 26, 28, 33, 41–47). When adults who stutter enquired about treatment, they were provided with information about the options available at the time. Although all treatment options were not always available at the same time, possible treatment options included: (1) speech treatment for stuttering (face-to-face or online), (2) CBT for anxiety with stuttering (face-to-face or online), and (3) speech treatment for stuttering plus or minus CBT for anxiety (face-to-face). When a particular treatment option was not available, adults who stutter were able to enrol in a different

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3 type of treatment. Therefore, treatment choice was based on the treatment options available at the
4
5 time, and each participant's primary concerns and symptoms.
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8 Participants were 288 adults who stutter, including 230 males (79.9%) and 58 females
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10 (22.6% / 20.1). Participants ranged in age from 18–80 years (mean = 33.6 years, $SD = 13.3$),
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12 with a similar age distribution for males and females (males: mean = 33.6 years, $SD = 0.9$;
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14 females: mean = 33.4 years, $SD = 1.8$). The majority of participants were married or in a
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16 relationship (53.2%, $n = 153$), a considerable proportion were single (39.6%, $n = 114$), and the
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18 remainder were separated, divorced, widowed, or unspecified (7.2%, $n = 21$). More than half the
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20 participants had completed an undergraduate or postgraduate university degree (53.1%, $n=153$),
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22 and 15.3% had attained a college diploma or certificate ($n = 44$). Around one-third of
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24 participants were currently studying (36.5%, $n = 105$). Most participants were employed on a
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26 full-time, part-time, or casual basis (72.0%, $n = 207$). Nearly half the participants spoke English
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28 only (49.3%, $n=142$), 43.8% were bilingual ($n=126$), and 6.9% were unspecified ($n=20$). A
29
30 family history of stuttering was present for 183 participants (63.5%), and 235 had received
31
32 previous treatment for stuttering (81.6%).
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38 **Measures**

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40 The following speech and psychological measures were completed during each
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42 participant's initial assessment for treatment:
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45 **Speech Measures**

46 *Percentage of syllables stuttered (%SS)*

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48 Percentage of syllables stuttered (%SS) is a measure of the proportion of syllables in a
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50 speech sample that contain unambiguous stuttering (48). Prior to the commencement of
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52 treatment, participants completed two 10-minute speech samples. These speech samples were
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3 made from unscheduled beyond-clinic phone calls to participants by unfamiliar research
4 assistants. Participants completed a routine and a challenging phone call on two separate
5 occasions, both of which were audio-recorded with consent. During routine phone conversations,
6 the participant chose the topic, and the listener gave three positive acknowledgments. During
7 challenging conversations, the listener chose the topic from a list of eight topics, and engaged in
8 each of the following four behaviours twice: (1) interrupting the participant, (2) disagreeing with
9 something the participant said, (3) talking over the participant, and (4) requesting clarification of
10 an idea. In the present study, %SS was based on the mean of the two 10-minute phone calls (one
11 routine, one challenging). In the present study, %SS was based on the mean of the two 10-minute
12 phone calls (one routine, one challenging), and was rated by blinded, independent raters.

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Reliability was established in the original studies from which the data for the present study was drawn.

Self-reported stuttering severity

Participants were asked to rate their typical and worst stuttering severity across eight speaking situations: (1) talking with a family member, (2) talking with a best friend, (3) talking with a group of friends, (4) talking with a boss or teacher, (5) giving their name and address, (6) giving a class presentation, (7) talking on the phone, and (8) buying food or drink. Typical and worst stuttering severity for each situation was rated on a scale ranging from 1 = *no stuttering* to 9 = *extremely severe stuttering*. This scale is a valid and reliable method for evaluating stuttering severity (49, 50).

Avoidance of Speaking Situations

Participants were asked to rate how often they avoided the eight speaking situations above using a three-point scale ranging from 0 = *never avoid*, 1 = *sometimes avoid*, and 2 = *usually*

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avoid. Scores for each situation were summed to calculate a total avoidance score, ranging from 0 = *no avoidance* to 16 = *high avoidance*.

Speech Satisfaction Scale

Participants were asked to rate their current speech satisfaction on a scale ranging from 1 = *extremely happy/satisfied* to 9 = *extremely unhappy/unsatisfied*.

Psychological measures

Computerized version of the Composite International Diagnostic Interview (CIDI-Auto-2.1) (51)

The CIDI-Auto-2.1 is a standardized computer interview designed to comprehensively evaluate and diagnose mental disorders according to the diagnostic criteria of the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) (52). The interview is self-administered by the respondent using a computer, and is designed to mimic a clinical interview with a psychologist. The interview takes approximately 70 min to complete. Responses are computer-scored and all diagnoses are programmed according to DSM-IV criteria, thereby eliminating interviewer bias (53, 54). The CIDI-Auto-2.1 has shown good reliability and validity for research purposes (51, 53), and returns similar prevalence rates for the anxiety disorders to those attained through psychiatric interviews with clinicians (55). The interview has been previously used to evaluate the presence of mental disorders among a large sample of adults seeking speech treatment for stuttering (17, 28). In the present study, it was used to evaluate the 12-month presence of DSM-IV social anxiety disorder.

Adult Self-Report (ASR) (56)

The ASR evaluates psychological functioning in adults, and includes 123 items to assess behavioural, emotional, and social problems experienced within the past six months. Items are rated on a 3-point scale ranging from 0=*Not true*, 1=*Somewhat or sometimes true*, to 2=*Very true*

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3 *or often true.* Item responses are used to calculate scores for eight Syndrome Scales, which can
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5 be classified into two broad categories: (1) Internalizing (sum of Anxious/Depressed,
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7 Withdrawn/Depressed, and Somatic Complaints scales), and (2) Externalizing (sum of the Rule-
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9 Breaking Behaviour and Aggressive Behaviour scales). A Total Problems score can be
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11 calculated by summing scores for the Internalizing and Externalizing scales, plus the Sleep
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13 Problems, Social Problems and Attention Problems Syndrome Scales. The Total Problems Score
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15 ranges from 0–210, with high scores indicating numerous problems. Scores can be classified as
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17 ‘normal’, ‘borderline’, or ‘clinical’, with separate norms available by age. The ASR is widely
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19 used and has strong psychometric properties (56).

20 21 22 *Overall Assessment of the Speaker’s Experience of Stuttering (OASES) (57)*

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27 The OASES is a self-report measure designed to evaluate quality of life and the overall
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29 impact of stuttering for adults. In the present study, a draft version of the OASES was used with
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31 permission from the OASES authors before the new version of the OASES-A had been
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33 published. The OASES consists of four sections: (1) General Information, (2) Your Reactions to
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35 Stuttering, (3) Communication in Daily Situations, and (4) Quality of Life. Items are rated on a
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37 5-point scale, with higher scores indicating greater negative impact of stuttering. Impact scores
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39 for each section and the Total Impact Score range from 20–100, and are rated as *Mild* (20.0–
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41 29.9), *Mild–Moderate* (30.0–44.9), *Moderate* (45.0–59.9), *Moderate–Severe* (60.0–74.9), and
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46 *Severe* (75.0–100.0).

47 48 49 *Unhelpful Thoughts and Beliefs About Stuttering (UTBAS) (38, 45)*

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51 The UTBAS scales provide a comprehensive measure of the unhelpful cognitions
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53 associated with social anxiety and stuttering. Respondents are asked to read each of the 66 items
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55 and to indicate (a) “How frequently I have these thoughts” (UTBAS-1), (b) “How much I believe
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these thoughts” (UTBAS-2), and (c) “How anxious these thoughts make me feel” (UTBAS-3). A 5-point rating scale is used to indicate a response for each item (1 = *never or not at all*, 2 = *rarely or a little*, 3 = *sometimes or somewhat*, 4 = *often or a lot*, 5 = *always or totally*). Item responses for the three UTBAS scales are summed to produce a score ranging from 66 to 330 for each scale. Item responses for all three scales can be summed to yield an UTBAS total score ranging from 198 to 990, with higher scores indicates a higher frequency of unhelpful thoughts and beliefs about stuttering and greater anxiety associated with these thoughts. Evidence has established the validity and utility of the UTBAS scales in evaluating the negative cognitions associated with social anxiety and stuttering and has confirmed the capacity of the scales to discriminate between adults who stutter with and without a diagnosis of social anxiety disorder (38, 45).

Data analysis

Demographic, speech, and psychological variables were compared for adults who stutter enrolled to commence: (1) speech treatment for stuttering, (2) CBT for anxiety with stuttering, and (3) speech treatment for stuttering plus or minus CBT for anxiety. For continuous dependent variables, comparisons were based on one-way between-groups analyses of variance (ANOVA) with planned comparisons. The Speech Treatment group was used as the reference group for these comparisons. Eta-squared was reported as the effect size statistic to indicate the magnitude of differences between groups, where 0.01 = small effect, 0.06 = medium effect, and 0.14 = large effect. Post-hoc comparisons were conducted using the Tukey HSD test.

For categorical dependent variables, comparisons were based on chi-squared tests for independence, with Yates’ Continuity Correction for variables with only two categories. For chi-squared tests with only two variable categories (2 x 2), the phi coefficient was reported as the

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3 effect size statistic to indicate the magnitude of differences between groups, where 0.10 = small
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5 effect, 0.30 = moderate effect, and 0.50 = large effect. For chi-squared tests with more than two
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7 variable categories (e.g., 3 x 2), Cramer's V was reported as the effect size statistic to indicate
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9 the magnitude of differences between groups, where 0.07 = small effect, 0.21 = moderate effect,
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11 and 0.35 = large effect. In cases where chi-square tests showed a significant difference between
12
13 the three groups, post-hoc comparisons were conducted.
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17 A Bonferroni adjusted alpha of 0.004 was used to account for the 14 planned comparisons
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19 between groups for demographic variables (five comparisons), speech variables (five
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21 comparisons), and psychological variables (four comparisons) ($0.05 / 14 = 0.004$).
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24 Results

25 *Participants and treatment groups*

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27 Participants were 288 adults who stutter, including 230 males (79.9%) and 58 females
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29 (22.6%/20.1). Participants were enrolled to commence one of the following treatment programs:
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31 Speech Treatment for stuttering ($n = 134, 46.5%$), CBT for anxiety ($n = 70, 24.3%$), or Speech
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33 Treatment plus or minus CBT for anxiety ($n = 84, 29.2%$).
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38 *Demographic variables*

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40 As shown in Table 1, a chi-squared test for independence showed a significant association
41
42 between relationship status and treatment group, $\chi^2 (2, n = 267) = 13.791, p = 0.001, Cramer's V$
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44 $= 0.227$. A post-hoc chi-square test comparing the CBT group with the Speech Treatment and
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46 Speech +/- CBT groups combined also showed a significant association between relationship
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48 status and treatment group, $\chi^2 (1, n = 267) = 11.747, p = 0.001, phi = 0.219$. This indicates that
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50 the proportion of participants who were in a relationship was significantly higher for the CBT
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52 group (22.1% single, 72.1% in a relationship) when compared to the combined Speech
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3 Treatment and Speech +/- CBT groups (Speech group: 47.4% single, 44.4% in a relationship;
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5 Speech +/- CBT group: 42.9% single, 53.6% in a relationship).
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8 Chi-squared tests for independence did not reveal any other significant differences between
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10 groups for categorical demographic variables including gender, relationship status, employment
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12 status, household income, and languages spoken. The one-way between-groups ANOVA for age
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14 by treatment group violated the assumption of homogeneity of variances, based on Levene's test
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16 for equality of variances ($p = 0.003$). Therefore, comparisons were based on Welch's robust test
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18 of equality of means with equal variances not assumed, Welch = 6.445 (2, 144.9), $p = 0.002$.
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20 This comparison was not significant ($p = 0.004$).
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24 [INSERT TABLE 1 ABOUT HERE]
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27 *Speech variables*

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29 Table 2 compares speech variables for the three treatment groups. A one-way between-
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31 groups ANOVA showed a significant difference in self-reported stuttering severity for the three
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33 treatment groups, $F(2, 278) = 5.647$, $p = 0.004$. Post-hoc comparisons using the Tukey HSD test
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35 indicated that the mean self-rated stuttering severity score for the Speech Treatment group (Mean
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37 = 4.4, $SD = 1.6$) was significantly different from the CBT group (Mean = 3.7, $SD = 1.6$), $p =$
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39 0.004. Mean self-reported stuttering severity for the Speech +/- CBT group (Mean = 4.0, $SD =$
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41 1.4) did not differ significantly from the other two treatment groups. There were no other
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43 significant differences between groups for the remaining speech variables, including %SS,
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45 speech dissatisfaction, avoidance of speaking situations, and previous stuttering treatment.
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Psychological variables

Overall, 29.8% of participants met criteria for a diagnosis of social anxiety disorder ($n = 82$), including 23.8% of participants in the Speech Treatment group ($n = 31$), 39.1% of participants in the CBT group ($n = 27$), and 31.6% of participants in the Speech +/- CBT group ($n = 24$). A chi-squared test for independence showed that there was no significant difference in the rate of social anxiety disorder for the three treatment groups, $X^2(2, n = 275) = 5.187, p = 0.075$, *Cramer's V* = 0.137. As shown in Table 3, one-way between-groups ANOVAs showed no significant differences between groups for any psychological variables, including total problems, overall negative impact of stuttering, and unhelpful cognitions associated with stuttering.

[INSERT TABLE 2 ABOUT HERE]

Discussion

To our knowledge, this was the first study to compare characteristics of adults who stutter enrolled in speech and/or psychological treatment programs. In the last two decades, research regarding the clinical management of adults who stutter has shifted from pure speech treatment to the incorporation of psychological assessment and treatment practices to improve quality of life (29, 30). Therefore, understanding differences between adults enrolled in speech and/or psychological treatment programs provides valuable information about adults who stutter. In the present study, no significant differences were found between treatment groups across the majority of demographic, speech, and psychological variables. Our hypothesis that adults who stutter in the CBT group would demonstrate significantly more psychological difficulties than the other two groups was not supported. However, two interesting findings emerged regarding perceived stuttering severity and relationship status.

Relationship status

First, there was a significant difference between groups for relationship status. Post-hoc comparisons revealed that a significantly higher proportion of participants in the CBT group were in a romantic relationship than participants in the Speech Treatment and Speech +/- CBT groups. Although this was an unexpected finding, it is of interest when considering the protective influence of social and family support on emotional functioning and psychosocial stress (58–61). This is particularly relevant for adults who stutter, with research evidence confirming the presence of more negative affect among adults who stutter with poor social support (58), and improved self-image in the presence of social support (62). Further research is required to understand the anxiety-buffering properties of romantic relationships for adults who stutter.

Perceived stuttering severity

The second significant finding for the present study pertains to self-rated stuttering severity. Specifically, self-rated stuttering severity was significantly higher for the Speech Treatment group than the CBT group. However, no significant difference was found between groups for %SS. Together, these findings indicate that participants in the Speech Treatment group perceived their stuttering as significantly more severe than participants in the CBT group, but this was not confirmed by clinician-rated stuttering severity, %SS or increased speech dissatisfaction. It is possible that higher perceived stuttering severity for participants in the Speech group may have been a driving factor in seeking speech treatment for stuttering, regardless of actual stuttering severity as rated by a clinician. Subtle differences between adults seeking speech treatment versus CBT treatment may tie in with the concept of ‘fluency versus freedom’ (63), whereby some adults who stutter seek ‘fluency’, while others prefer ‘freedom’ from managing stuttering in favour of attitudinal change (63).

Limitations

Several limitations pertain to the present study. Foremost among these, the three treatment approaches reported in this study were not always concurrently available during the 10-year data collection period. As a result, some participants may have enrolled in a treatment program that was not their first preference. Having said that, it must be acknowledged that participants still indicated a preference for the treatment program they enrolled in, as opposed to opting out of treatment altogether. Therefore, findings from the present study still provide new knowledge about the characteristics of adults who stutter seeking different types of treatment. Another limitation of the present study relates to the cross-sectional nature of findings. Characteristics of adults who stutter were only evaluated at a single time-point prior to the commencement of treatment. This may not necessarily have captured an accurate account of speech and psychological characteristics, with future research needed to determine the outcome of treatment for participants with different characteristics.

Conclusion

Understanding the demographic, speech, and psychological characteristics of adults who seek different types of treatment may inform the clinical management of this population. This is particularly relevant when considering that many adults who stutter pursue a range of treatment options (30, 62). In the last two decades, psychological assessment and treatment practices are more frequently incorporated into standard speech therapy, or offered as an adjunct (29, 30). In the present study, the majority of participant characteristics did not differ by treatment approach. However, adults who stutter, enrolled in Speech Treatment perceived their stuttering as more severe, and this may have prompted the need for treatment. Furthermore, a significantly higher proportion of adults in the CBT group were in a relationship, with this finding highlighting the

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3 importance of social support for adults who stutter. More research is needed to determine the
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5 influence of romantic relationships on treatment choice. Ultimately, these findings suggest that
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7 the motivation for choosing a particular treatment type may be influenced by several
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9 demographic and speech factors.
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For Peer Review Only

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15 **Disclosure of Interest**
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17 The authors report no conflicts of interest.
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Adults who stutter by treatment approach

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3 **Characteristics of adults who stutter by treatment approach: Speech, psychological, or**
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5 **combined treatment**
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Characteristics of adults who stutter by treatment approach: Speech, psychological, or combined treatment

Several treatment approaches are available for adults who stutter, including speech treatment, psychological treatment for anxiety, and a combination of both. It is useful to determine whether any differences exist between adults who stutter enrolled in different types of treatment. Therefore, the purpose of this study was to compare demographic, speech, and psychological characteristics of adults who stutter enrolled in speech, psychological, and combined treatment programs. Participants were 288 adults who stutter (18–80 years) enrolled in one of three different treatment programs: Speech Treatment for stuttering ($n=134$), Cognitive Behaviour Therapy (CBT) for anxiety ($n=70$), or Speech Treatment plus or minus CBT treatment ($n=84$). Participants completed a range of demographic, speech, and psychological measures prior to the commencement of treatment. Based on our conservative Bonferroni-adjusted alpha (0.004), the three treatment groups appeared similar across the majority of demographic, speech, and psychological variables. However, a significantly higher proportion of participants in the CBT group were in a romantic relationship than the other treatment groups. The Speech Treatment group also demonstrated significantly higher self-rated stuttering severity than the CBT group, even though there were no significant difference between groups for clinician-rated percentage of syllables stuttered. Although the majority of characteristics of adults who stutter did not vary by treatment type, the present findings suggest that adults who stutter enrolled in speech treatment perceived their stuttering as more severe, which may have prompted treatment seeking. Further research is needed regarding the supportive influence of romantic status.

Keywords: Stuttering; Anxiety; Assessment; Treatment.

Introduction

Stuttering is a speech disorder that involves involuntary disruptions to speech, which interfere with effective communication. It has a genetic basis (1), and is thought to be caused by deficits in neural processing and brain timing networks underpinning speech production (2). Stuttering is a prevalent speech disorder, with a lifetime incidence of approximately 4–5%, and 1% point prevalence (3). Onset typically occurs in the preschool years when children start combining words into short sentences (4). Although three-quarters of children who develop stuttering will recover naturally, the chance of natural recovery 9–18 months post onset is less than 10% (5). When natural recovery does not occur, stuttering typically persists across the lifespan and is associated with a range of negative consequences.

Stuttering and social anxiety

The negative experiences associated with stuttering are thought to increase risk for the development of anxiety, and can commence as early as the preschool years and continue throughout childhood and adolescence. These negative experiences can include bullying, teasing, negative peer reactions, social isolation and rejection, and being seen as less popular than non-stuttering peers (6–10). In adulthood, stuttering is associated with negative listener reactions, negative stereotypes, occupational disadvantages, reduced quality of life, and impaired social and emotional functioning (11–16). As a result of these experiences, many adults who stutter develop anxiety in social and speaking situations, with at least one-quarter of adults who stutter meeting criteria for social anxiety disorder (17, 18).

Social anxiety disorder is a chronic and disabling anxiety disorder that involves intense fear of negative evaluation in social situations (19). Onset typically occurs in late childhood or adolescence, at a time when social and peer relationships are growing in importance (20). The

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3 disorder is prevalent, affecting 8–13% of the general population (21–23). It is associated with
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5 significant functional impairment and a range of negative consequences, including lower
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7 education, unemployment, reduced socioeconomic status, low self-esteem, poor quality of life,
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9 and a reduced likelihood of being engaged in a relationship (24).
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12 *Treatment approaches for stuttering and social anxiety*

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15 Speech restructuring is a treatment for stuttering with the strongest research evidence for
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17 adults who stutter. It involves adopting a new speech pattern to control stuttering while sounding
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19 as natural as possible. Although speech restructuring is supported by randomised controlled trial
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21 evidence (25, 26), it has been recognised that the ability to maintain the benefits of speech
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23 restructuring may only be achieved by around one-third of adults who stutter (27, 28). Recent
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25 research provided an explanation for this problem by finding significantly poorer outcomes
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27 following speech restructuring for the one-third of adults who stutter with an anxiety-related
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29 disorder (28). This finding suggests that the failure to maintain speech gains following treatment
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31 may in part be explained by the presence of anxiety-related disorders.
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37 Given the prevalence and impact of social anxiety disorder on the maintenance of speech
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39 treatment gains, and considering that treatments designed to reduce stuttering may have limited
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41 impact on stuttering-related anxiety, several anxiolytic treatment packages have been developed
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43 to address the unique fears and anxieties experienced by people who stutter (29, 30). Cognitive-
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45 behaviour therapy (CBT), in particular, is one of the most efficacious and extensively researched
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47 treatments for social anxiety disorder in the general community (31). Several studies have
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49 confirmed the efficacy of both face-to-face and online CBT programs in treating social anxiety
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51 for adults who stutter, reporting significant improvements in social anxiety, avoidance, and
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53 overall functioning (30, 32–39).
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Despite the efficacy of CBT in reducing anxiety symptoms and eliminating social anxiety disorder diagnoses for adults who stutter, CBT programs for anxiety do not typically lead to improvements in stuttering (30, 39). That is, reductions in anxiety may occur without reductions in stuttering. Hence, several researchers and clinicians have recommended the incorporation of CBT approaches into standard speech pathology (29, 40), including the development of CBT treatment guidelines and worksheets for speech pathologists to use during treatment for stuttering (40). These CBT strategies can be applied in speech pathology clinics with collaborative support from clinical psychologists as required. Furthermore, face-to-face and online CBT treatment programs are also available for adults who stutter either as standalone treatments or in addition to speech therapy (36).

27 ***Purpose of the present study***

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Several treatment approaches are available for adults who stutter, including speech treatment for stuttering and psychological treatment for anxiety. In order to tailor treatments to the unique needs of adults who stutter enrolled in different treatment programs, it is useful to understand whether the characteristic of these groups differ prior to commencement of treatment. If differences are found between groups, this may suggest the need to tailor different treatment programs more specifically to the unique needs of each group. Therefore, the purpose of the present study is to compare demographic, speech, and psychological characteristics of adults enrolled to commence Speech Treatment for stuttering, CBT treatment for anxiety, or Speech Treatment with and without the addition of CBT treatment for anxiety. It is hypothesized that adults seeking CBT treatment will report significantly more psychological difficulties than adults seeking CBT treatment for anxiety or Speech Treatment.

Method

Participants

Adults who stutter were drawn from treatment waiting lists across seven university-affiliated stuttering treatment clinics across Australia and New Zealand (Australian Stuttering Research Centre, The University of Sydney; School of Human Communication Sciences, La Trobe University, Melbourne; Discipline of Speech Pathology, The University of Sydney; Department of Linguistics, Macquarie University, Sydney; School of Humanities and Social Science, University of Newcastle, Australia; Royal Prince Alfred Hospital, Sydney; Stuttering Treatment and Research Trust, Auckland, New Zealand). Eligibility criteria for inclusion in the study included: (1) age 18 years and above, (2) developmental stuttering present before 12 years of age, (3) seeking speech therapy for stuttering and/or CBT for anxiety with stuttering, (4) no previous therapy in the six months prior to commencement in the present study, and (5) presence of stuttering confirmed by participant and speech pathologist during assessment. The study was approved by the relevant Human Research Ethics Committees. Informed consent was obtained from all participants.

Participants were recruited over a 10-year period (2006–2016), and were drawn from a range of studies involving speech treatment for stuttering and/or CBT for anxiety in stuttering (17, 26, 28, 33, 41–47). When adults who stutter enquired about treatment, they were provided with information about the options available at the time. Although all treatment options were not always available at the same time, possible treatment options included: (1) speech treatment for stuttering (face-to-face or online), (2) CBT for anxiety with stuttering (face-to-face or online), and (3) speech treatment for stuttering plus or minus CBT for anxiety (face-to-face). When a particular treatment option was not available, adults who stutter were able to enrol in a different

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3 type of treatment. Therefore, treatment choice was based on the treatment options available at the
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5 time, and each participant's primary concerns and symptoms.
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8 Participants were 288 adults who stutter, including 230 males (79.9%) and 58 females
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10 (22.6% / 20.1). Participants ranged in age from 18–80 years (mean = 33.6 years, $SD = 13.3$),
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12 with a similar age distribution for males and females (males: mean = 33.6 years, $SD = 0.9$;
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14 females: mean = 33.4 years, $SD = 1.8$). The majority of participants were married or in a
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16 relationship (53.2%, $n = 153$), a considerable proportion were single (39.6%, $n = 114$), and the
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18 remainder were separated, divorced, widowed, or unspecified (7.2%, $n = 21$). More than half the
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20 participants had completed an undergraduate or postgraduate university degree (53.1%, $n=153$),
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22 and 15.3% had attained a college diploma or certificate ($n = 44$). Around one-third of
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24 participants were currently studying (36.5%, $n = 105$). Most participants were employed on a
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26 full-time, part-time, or casual basis (72.0%, $n = 207$). Nearly half the participants spoke English
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28 only (49.3%, $n=142$), 43.8% were bilingual ($n=126$), and 6.9% were unspecified ($n=20$). A
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30 family history of stuttering was present for 183 participants (63.5%), and 235 had received
31
32 previous treatment for stuttering (81.6%).
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38 **Measures**

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40 The following speech and psychological measures were completed during each
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42 participant's initial assessment for treatment:
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45 **Speech Measures**

46 *Percentage of syllables stuttered (%SS)*

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48 Percentage of syllables stuttered (%SS) is a measure of the proportion of syllables in a
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50 speech sample that contain unambiguous stuttering (48). Prior to the commencement of
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52 treatment, participants completed two 10-minute speech samples. These speech samples were
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made from unscheduled beyond-clinic phone calls to participants by unfamiliar research assistants. Participants completed a routine and a challenging phone call on two separate occasions, both of which were audio-recorded with consent. During routine phone conversations, the participant chose the topic, and the listener gave three positive acknowledgments. During challenging conversations, the listener chose the topic from a list of eight topics, and engaged in each of the following four behaviours twice: (1) interrupting the participant, (2) disagreeing with something the participant said, (3) talking over the participant, and (4) requesting clarification of an idea. In the present study, %SS was based on the mean of the two 10-minute phone calls (one routine, one challenging). In the present study, %SS was based on the mean of the two 10-minute phone calls (one routine, one challenging), and was rated by blinded, independent raters.

Reliability was established in the original studies from which the data for the present study was drawn.

Self-reported stuttering severity

Participants were asked to rate their typical and worst stuttering severity across eight speaking situations: (1) talking with a family member, (2) talking with a best friend, (3) talking with a group of friends, (4) talking with a boss or teacher, (5) giving their name and address, (6) giving a class presentation, (7) talking on the phone, and (8) buying food or drink. Typical and worst stuttering severity for each situation was rated on a scale ranging from 1 = *no stuttering* to 9 = *extremely severe stuttering*. This scale is a valid and reliable method for evaluating stuttering severity (49, 50).

Avoidance of Speaking Situations

Participants were asked to rate how often they avoided the eight speaking situations above using a three-point scale ranging from 0 = *never avoid*, 1 = *sometimes avoid*, and 2 = *usually*

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3 *avoid*. Scores for each situation were summed to calculate a total avoidance score, ranging from
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5 0 = *no avoidance* to 16 = *high avoidance*.

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8 *Speech Satisfaction Scale*

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10 Participants were asked to rate their current speech satisfaction on a scale ranging from 1 =
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12 *extremely happy/satisfied* to 9 = *extremely unhappy/unsatisfied*.

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15 ***Psychological measures***

16
17 *Computerized version of the Composite International Diagnostic Interview (CIDI-Auto-2.1) (51)*

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19 The CIDI-Auto-2.1 is a standardized computer interview designed to comprehensively
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21 evaluate and diagnose mental disorders according to the diagnostic criteria of the Diagnostic and
22
23 Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) (52). The interview is self-
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25 administered by the respondent using a computer, and is designed to mimic a clinical interview
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27 with a psychologist. The interview takes approximately 70 min to complete. Responses are
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29 computer-scored and all diagnoses are programmed according to DSM-IV criteria, thereby
30
31 eliminating interviewer bias (53, 54). The CIDI-Auto-2.1 has shown good reliability and validity
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33 for research purposes (51, 53), and returns similar prevalence rates for the anxiety disorders to
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35 those attained through psychiatric interviews with clinicians (55). The interview has been
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37 previously used to evaluate the presence of mental disorders among a large sample of adults
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39 seeking speech treatment for stuttering (17, 28). In the present study, it was used to evaluate the
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41 12-month presence of DSM-IV social anxiety disorder.

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44 *Adult Self-Report (ASR) (56)*

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46 The ASR evaluates psychological functioning in adults, and includes 123 items to assess
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48 behavioural, emotional, and social problems experienced within the past six months. Items are
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50 rated on a 3-point scale ranging from 0=*Not true*, 1=*Somewhat or sometimes true*, to 2=*Very true*
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3 *or often true*. Item responses are used to calculate scores for eight Syndrome Scales, which can
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5 be classified into two broad categories: (1) Internalizing (sum of Anxious/Depressed,
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7 Withdrawn/Depressed, and Somatic Complaints scales), and (2) Externalizing (sum of the Rule-
8
9 Breaking Behaviour and Aggressive Behaviour scales). A Total Problems score can be
10
11 calculated by summing scores for the Internalizing and Externalizing scales, plus the Sleep
12
13 Problems, Social Problems and Attention Problems Syndrome Scales. The Total Problems Score
14
15 ranges from 0–210, with high scores indicating numerous problems. Scores can be classified as
16
17 ‘normal’, ‘borderline’, or ‘clinical’, with separate norms available by age. The ASR is widely
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19 used and has strong psychometric properties (56).

20 21 22 *Overall Assessment of the Speaker’s Experience of Stuttering (OASES) (57)*

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27 The OASES is a self-report measure designed to evaluate quality of life and the overall
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29 impact of stuttering for adults. In the present study, a draft version of the OASES was used with
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31 permission from the OASES authors before the new version of the OASES-A had been
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33 published. The OASES consists of four sections: (1) General Information, (2) Your Reactions to
34
35 Stuttering, (3) Communication in Daily Situations, and (4) Quality of Life. Items are rated on a
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37 5-point scale, with higher scores indicating greater negative impact of stuttering. Impact scores
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39 for each section and the Total Impact Score range from 20–100, and are rated as *Mild* (20.0–
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41 29.9), *Mild–Moderate* (30.0–44.9), *Moderate* (45.0–59.9), *Moderate–Severe* (60.0–74.9), and
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46 *Severe* (75.0–100.0).

47 48 *Unhelpful Thoughts and Beliefs About Stuttering (UTBAS) (38, 45)*

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51 The UTBAS scales provide a comprehensive measure of the unhelpful cognitions
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53 associated with social anxiety and stuttering. Respondents are asked to read each of the 66 items
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55 and to indicate (a) “How frequently I have these thoughts” (UTBAS-1), (b) “How much I believe
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3 these thoughts” (UTBAS-2), and (c) “How anxious these thoughts make me feel” (UTBAS-3). A
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5 5-point rating scale is used to indicate a response for each item (1 = *never or not at all*, 2 =
6
7 *rarely or a little*, 3 = *sometimes or somewhat*, 4 = *often or a lot*, 5 = *always or totally*). Item
8
9 responses for the three UTBAS scales are summed to produce a score ranging from 66 to 330 for
10
11 each scale. Item responses for all three scales can be summed to yield an UTBAS total score
12
13 ranging from 198 to 990, with higher scores indicates a higher frequency of unhelpful thoughts
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15 and beliefs about stuttering and greater anxiety associated with these thoughts. Evidence has
16
17 established the validity and utility of the UTBAS scales in evaluating the negative cognitions
18
19 associated with social anxiety and stuttering and has confirmed the capacity of the scales to
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21 discriminate between adults who stutter with and without a diagnosis of social anxiety disorder
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23 (38, 45).
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29 ***Data analysis***

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31 Demographic, speech, and psychological variables were compared for adults who stutter
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33 enrolled to commence: (1) speech treatment for stuttering, (2) CBT for anxiety with stuttering,
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35 and (3) speech treatment for stuttering plus or minus CBT for anxiety. For continuous dependent
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37 variables, comparisons were based on one-way between-groups analyses of variance (ANOVA)
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39 with planned comparisons. The Speech Treatment group was used as the reference group for
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41 these comparisons. Eta-squared was reported as the effect size statistic to indicate the magnitude
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43 of differences between groups, where 0.01 = small effect, 0.06 = medium effect, and 0.14 = large
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45 effect. Post-hoc comparisons were conducted using the Tukey HSD test.
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51 For categorical dependent variables, comparisons were based on chi-squared tests for
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53 independence, with Yates’ Continuity Correction for variables with only two categories. For chi-
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55 squared tests with only two variable categories (2 x 2), the phi coefficient was reported as the
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effect size statistic to indicate the magnitude of differences between groups, where 0.10 = small effect, 0.30 = moderate effect, and 0.50 = large effect. For chi-squared tests with more than two variable categories (e.g., 3 x 2), Cramer's V was reported as the effect size statistic to indicate the magnitude of differences between groups, where 0.07 = small effect, 0.21 = moderate effect, and 0.35 = large effect. In cases where chi-square tests showed a significant difference between the three groups, post-hoc comparisons were conducted.

A Bonferroni adjusted alpha of 0.004 was used to account for the 14 planned comparisons between groups for demographic variables (five comparisons), speech variables (five comparisons), and psychological variables (four comparisons) ($0.05 / 14 = 0.004$).

Results

Participants and treatment groups

Participants were 288 adults who stutter, including 230 males (79.9%) and 58 females (22.6%/20.1). Participants were enrolled to commence one of the following treatment programs: Speech Treatment for stuttering ($n = 134, 46.5%$), CBT for anxiety ($n = 70, 24.3%$), or Speech Treatment plus or minus CBT for anxiety ($n = 84, 29.2%$).

Demographic variables

As shown in Table 1, a chi-squared test for independence showed a significant association between relationship status and treatment group, $\chi^2 (2, n = 267) = 13.791, p = 0.001, Cramer's V = 0.227$. A post-hoc chi-square test comparing the CBT group with the Speech Treatment and Speech +/- CBT groups combined also showed a significant association between relationship status and treatment group, $\chi^2 (1, n = 267) = 11.747, p = 0.001, phi = 0.219$. This indicates that the proportion of participants who were in a relationship was significantly higher for the CBT group (22.1% single, 72.1% in a relationship) when compared to the combined Speech

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3 Treatment and Speech +/- CBT groups (Speech group: 47.4% single, 44.4% in a relationship;
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5 Speech+/-CBT group: 42.9% single, 53.6% in a relationship).
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8 Chi-squared tests for independence did not reveal any other significant differences between
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10 groups for categorical demographic variables including gender, relationship status, employment
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12 status, household income, and languages spoken. The one-way between-groups ANOVA for age
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14 by treatment group violated the assumption of homogeneity of variances, based on Levene's test
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16 for equality of variances ($p = 0.003$). Therefore, comparisons were based on Welch's robust test
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18 of equality of means with equal variances not assumed, Welch = 6.445 (2, 144.9), $p = 0.002$.
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20 This comparison was not significant ($p = 0.004$).
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24 [INSERT TABLE 1 ABOUT HERE]
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27 *Speech variables*

28
29 Table 2 compares speech variables for the three treatment groups. A one-way between-
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31 groups ANOVA showed a significant difference in self-reported stuttering severity for the three
32
33 treatment groups, $F(2, 278) = 5.647$, $p = 0.004$. Post-hoc comparisons using the Tukey HSD test
34
35 indicated that the mean self-rated stuttering severity score for the Speech Treatment group (Mean
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37 = 4.4, $SD = 1.6$) was significantly different from the CBT group (Mean = 3.7, $SD = 1.6$), $p =$
38
39 0.004. Mean self-reported stuttering severity for the Speech +/- CBT group (Mean = 4.0, $SD =$
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41 1.4) did not differ significantly from the other two treatment groups. There were no other
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43 significant differences between groups for the remaining speech variables, including %SS,
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45 speech dissatisfaction, avoidance of speaking situations, and previous stuttering treatment.
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50 [INSERT TABLE 2 ABOUT HERE]
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Psychological variables

Overall, 29.8% of participants met criteria for a diagnosis of social anxiety disorder ($n = 82$), including 23.8% of participants in the Speech Treatment group ($n = 31$), 39.1% of participants in the CBT group ($n = 27$), and 31.6% of participants in the Speech +/- CBT group ($n = 24$). A chi-squared test for independence showed that there was no significant difference in the rate of social anxiety disorder for the three treatment groups, $X^2(2, n = 275) = 5.187, p = 0.075$, *Cramer's V* = 0.137. As shown in Table 3, one-way between-groups ANOVAs showed no significant differences between groups for any psychological variables, including total problems, overall negative impact of stuttering, and unhelpful cognitions associated with stuttering.

[INSERT TABLE 2 ABOUT HERE]

Discussion

To our knowledge, this was the first study to compare characteristics of adults who stutter enrolled in speech and/or psychological treatment programs. In the last two decades, research regarding the clinical management of adults who stutter has shifted from pure speech treatment to the incorporation of psychological assessment and treatment practices to improve quality of life (29, 30). Therefore, understanding differences between adults enrolled in speech and/or psychological treatment programs provides valuable information about adults who stutter. In the present study, no significant differences were found between treatment groups across the majority of demographic, speech, and psychological variables. Our hypothesis that adults who stutter in the CBT group would demonstrate significantly more psychological difficulties than the other two groups was not supported. However, two interesting findings emerged regarding perceived stuttering severity and relationship status.

Relationship status

First, there was a significant difference between groups for relationship status. Post-hoc comparisons revealed that a significantly higher proportion of participants in the CBT group were in a romantic relationship than participants in the Speech Treatment and Speech +/- CBT groups. Although this was an unexpected finding, it is of interest when considering the protective influence of social and family support on emotional functioning and psychosocial stress (58–61). This is particularly relevant for adults who stutter, with research evidence confirming the presence of more negative affect among adults who stutter with poor social support (58), and improved self-image in the presence of social support (62). Further research is required to understand the anxiety-buffering properties of romantic relationships for adults who stutter.

Perceived stuttering severity

The second significant finding for the present study pertains to self-rated stuttering severity. Specifically, self-rated stuttering severity was significantly higher for the Speech Treatment group than the CBT group. However, no significant difference was found between groups for %SS. Together, these findings indicate that participants in the Speech Treatment group perceived their stuttering as significantly more severe than participants in the CBT group, but this was not confirmed by clinician-rated stuttering severity, %SS or increased speech dissatisfaction. It is possible that higher perceived stuttering severity for participants in the Speech group may have been a driving factor in seeking speech treatment for stuttering, regardless of actual stuttering severity as rated by a clinician. Subtle differences between adults seeking speech treatment versus CBT treatment may tie in with the concept of ‘fluency versus freedom’ (63), whereby some adults who stutter seek ‘fluency’, while others prefer ‘freedom’ from managing stuttering in favour of attitudinal change (63).

Limitations

Several limitations pertain to the present study. Foremost among these, the three treatment approaches reported in this study were not always concurrently available during the 10-year data collection period. As a result, some participants may have enrolled in a treatment program that was not their first preference. Having said that, it must be acknowledged that participants still indicated a preference for the treatment program they enrolled in, as opposed to opting out of treatment altogether. Therefore, findings from the present study still provide new knowledge about the characteristics of adults who stutter seeking different types of treatment. Another limitation of the present study relates to the cross-sectional nature of findings. Characteristics of adults who stutter were only evaluated at a single time-point prior to the commencement of treatment. This may not necessarily have captured an accurate account of speech and psychological characteristics, with future research needed to determine the outcome of treatment for participants with different characteristics.

Conclusion

Understanding the demographic, speech, and psychological characteristics of adults who seek different types of treatment may inform the clinical management of this population. This is particularly relevant when considering that many adults who stutter pursue a range of treatment options (30, 62). In the last two decades, psychological assessment and treatment practices are more frequently incorporated into standard speech therapy, or offered as an adjunct (29, 30). In the present study, the majority of participant characteristics did not differ by treatment approach. However, adults who stutter, enrolled in Speech Treatment perceived their stuttering as more severe, and this may have prompted the need for treatment. Furthermore, a significantly higher proportion of adults in the CBT group were in a relationship, with this finding highlighting the

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3 importance of social support for adults who stutter. More research is needed to determine the
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5 influence of romantic relationships on treatment choice. Ultimately, these findings suggest that
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7 the motivation for choosing a particular treatment type may be influenced by several
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9 demographic and speech factors.
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Disclosure of Interest

The authors report no conflicts of interest.

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Table 1: Demographic variables for adults who stutter by treatment type

	1. Speech treatment (<i>N</i> = 134)	2. CBT treatment (<i>N</i> = 70)	3. Speech +/- CBT (<i>N</i> = 84)	Total (<i>N</i> = 288)	Groups compared	<i>p</i> -value
Gender % (<i>n</i>)						
Male	79.9 (107)	75.7 (53)	83.3 (70)	79.9 (230)	1, 2, 3	$\chi^2 (2, n = 288) = 1.378, p = 0.502$
Female	20.1 (27)	24.3 (17)	16.7 (14)	20.1 (58)		<i>Cramer's V</i> = 0.069
Age in years						
Mean (<i>SD</i>)	31.4 (11.0)	38.8 (15.3)	32.6 (13.9)	33.5 (13.3)	1, 2, 3	* $t (264.7) = -2.802, 7 = 0.005$ <i>Eta</i> ² = 0.05
Relationship Status ^a % (<i>n</i>)						
Single	47.4 (63)	22.1 (15)	42.9 (36)	40.0 (114)	1, 2, 3	$\chi^2 (2, n = 267) = 13.791, p = 0.001$
In a relationship	44.4 (59)	72.1 (49)	53.6 (45)	53.7 (153)		<i>Cramer's V</i> = 0.227

Other	8.3 (11)	5.9 (4)	3.6 (3)	6.3 (18)	2 and 1, 3	$X^2 (1, n = 267) = 11.747, p = 0.001$ $\Phi = 0.219$
Employment ^b % (n)						
Employed	72.8 (91)	78.6 (55)	75.0 (63)	74.9 (209)	1, 2, 3	$X^2 (4, n = 279) = 1.444, p = 0.837$
Unemployed	12.0 (15)	8.6 (6)	8.3 (7)	10.0 (28)		<i>Cramer's V</i> = 0.051
Other	15.2 (19)	12.9 (9)	16.7 (14)	15.1 (42)		
Household income ^c % (n)						
<\$80,000	64.2 (70)	48.6 (34)	55.0 (44)	57.1 (148)	1, 2, 3	$X^2 (2, n = 259) = 4.479, p = 0.106$
>\$80,000	35.8 (39)	51.4 (36)	45.0 (36)	42.9 (111)		<i>Cramer's V</i> = 0.132

Note: Findings in bold represent significance at $p \leq 0.004$. Comparisons were based on chi-squared tests for independence for categorical variables, and one-way between-groups analysis of variance for continuous variables.

*Violated the assumption of homogeneity of variances, based on Levene's test for equality of variances ($p = 0.003$). Therefore, comparisons were based on Welch's robust test of equality of means with equal variances not assumed [Welch = 6.445 (2, 144.9), $p = 0.002$].

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7^a Relationship status was missing for one participant from the Speech Treatment group and two participants from the CBT group. The ‘Other’
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9 category included: divorced, separated, widowed, or other; and was excluded from analysis due to insufficient cell counts.

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11^b Employment status was missing for nine participants from the Speech Treatment group. The category of ‘Other’ included: caregiver/domestic
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13 duties, student, or retired.

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15^c Household income is based on Australian dollars (2006–2016). Household income was missing for 25 participants from the Speech Treatment
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18 group and four participants from the Speech +/- CBT group
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Table 2: Speech variables for adults who stutter by treatment type

	<i>N</i>	1. Speech treatment (<i>N</i> = 134)	2. CBT treatment (<i>N</i> = 70)	3. Speech +/- CBT (<i>N</i> = 84)	Total (<i>N</i> = 288)	Groups compared	<i>p</i> -value
Previous treatment for stuttering ^a % (<i>n</i>)							
Yes	288	79.1 (106)	90.0 (63)	78.6 (66)	81.6 (235)	1, 2, 3	$X^2 (2, n = 284) = 3.493, p = 0.174$
No		18.7 (25)	10.0 (7)	20.2 (17)	17.0 (49)		<i>Cramer's V</i> = 0.111
Don't know		2.2 (3)	0.0 (0)	1.2 (1)	1.4 (4)		
Speech dissatisfaction ^b							
Mean (<i>SD</i>)	284	6.1 (1.9)	5.4 (1.7)	5.7 (1.7)	5.8 (1.8)	1, 2, 3	$F (2, 281) = 3.167, p = 0.044$ $\text{Eta}^2 = 0.02$

Avoidance of speaking situations ^c Mean (SD)	284	7.6 (4.1)	7.1 (3.5)	7.1 (3.4)	7.3 (3.6)	1, 2, 3	$F(2, 281) = 0.598, p = 0.551$ Eta ² = 0.004
Self-reported stuttering severity ^d Mean (SD)	281	4.4 (1.6)	3.7 (1.6)	4.0 (1.4)	4.1 (1.5)	1, 2, 3	$F(2, 278) = 5.647, p = 0.004$ Eta² = 0.04
						1 and 2	$p = 0.004$
	<i>N</i>	Speech treatment (<i>N</i> = 60)	CBT treatment (<i>N</i> = 20)	Speech +/- CBT (<i>N</i> = 31)	Total (<i>N</i> = 111)		
Percentage of syllables stuttered ^e Mean (SD)	111	8.6 (6.4)	6.1 (3.9)	5.1 (4.9)	7.1 (5.8)		* $F(2, 108) = 4.309, p = 0.016$ Eta ² = 0.07

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7 *Note:* Findings in bold represent significance at $p \leq 0.004$. Comparisons are based on chi-squared tests for independence for categorical
8 variables, and one-way between-groups analyses of variance for continuous variables.

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11 *Violated the assumption of homogeneity of variances, based on Levene's test for equality of variances ($p = 0.014$). Therefore,
12 comparisons were based on Welch's robust test of equality of means with equal variances not assumed [Welch = 4.664 (2, 153.9), $p =$
13 0.011].
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18 ^a The 'Don't Know' category for was not included in the chi-square analysis due to an insufficient cell count.
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Table 3: Psychological variables for adults who stutter by treatment type

	<i>N</i>	1. Speech treatment (<i>N</i> = 134)	2. CBT treatment (<i>N</i> = 70)	3. Speech +/- CBT (<i>N</i> = 84)	Total (<i>N</i> = 288)	<i>p</i> -value
Social Anxiety Disorder % (<i>n</i>)	82	23.8 (31)	39.1 (27)	31.6 (24)	29.8 (82)	$\chi^2 (2, n = 275) = 5.187, p = 0.075,$ <i>Cramer's V</i> = 0.137
ASR Total Problems ^a	280	51.0 (29.8)	51.5 (28.3)	49.9 (30.4)	50.5 (29.6)	$F (2, 277) = 0.179, p = 0.836$ $\text{Eta}^2 = 0.001$
OASES Total Impact ^b	222	61.7 (12.1) <i>Mod–Severe</i>	60.0 (12.4) <i>Mod–Severe</i>	56.1 (11.4) <i>Moderate</i>	60.7 (12.2) <i>Mod–Severe</i>	$F (2, 219) = 1.909, p = 0.151$ $\text{Eta}^2 = 0.02$
UTBAS Total ^c	286	482.0 (167.8) <i>Psych refer</i>	505.5 (170.5) <i>Psych refer</i>	480.0 (146.9) <i>Psych refer</i>	487.1 (162.4) <i>Psych refer</i>	$F (2, 283) = 0.601, p = 0.549$ $\text{Eta}^2 = 0.004$

Note: Findings in bold represent significance at $p \leq 0.004$. Comparisons are based on chi-squared tests for independence for categorical variables, and one-way between-groups analyses of variance for continuous variables.

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7^a Comparison of the rate of social anxiety disorder diagnoses by group was based on the chi-squared test for independence. Cramer's V is
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9 reported as the effect size statistic to indicate the magnitude of differences between groups, where 0.07 = small effect, 0.21 = moderate
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11 effect, and 0.35 = large effect.

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13^b The ASR Total Problems score evaluates emotional and behavioural problems. Possible scores range between 0–240, with higher scores
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15 indicating a greater number of problems. Scores were missing for six participants from the Speech Treatment group and two participants from
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17 the CBT group. Mean ASR scores for all three groups fell within the normal range.

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19^c OASES Total Impact scores range from Mild (20.0–29.9), Mild–Moderate (30.0–44.9), Moderate (45.0–59.9), Moderate–Severe (60–74.9),
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21 Severe (75.0–100.0). OASES scores were missing for 66 participants from the Speech +/- CBT group.

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24^d UTBAS Total scores range from 198–990. Based on decile ranges reported by Iverach and colleagues (2016), UTBAS Total scores of 421 and above
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26 indicate that referral for a psychological assessment is recommended. UTBAS scores were missing for two participants from the 'Speech treatment'
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28 group.