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Highlights

- Stuttering is a speech disorder that hampers communication in social situations

- Roughly 22–60% of adults who stutter meet criteria for social anxiety disorder

- No studies have evaluated the rate of anxiety disorders among stuttering children

- Stuttering children demonstrated a significantly higher rate of anxiety disorders

- Of note, 24% of stuttering children met criteria for social anxiety disorder

Abstract

Purpose: Stuttering during adulthood is associated with a heightened rate of anxiety disorders, especially social anxiety disorder. Given the early onset of both anxiety and stuttering, this comorbidity could be present among stuttering children.

Method: Participants were 75 stuttering children 7–12 years and 150 matched non-stuttering control children. Multinomial and binary logistic regression models were used to estimate odds ratios for anxiety disorders, and two-sample t-tests compared scores on measures of anxiety and psycho-social difficulties.

Results: Compared to non-stuttering controls, the stuttering group had six-fold increased odds for social anxiety disorder, seven-fold increased odds for subclinical generalized anxiety disorder, and four-fold increased odds for any anxiety disorder.

Conclusion: These results show that, as is the case during adulthood, stuttering during childhood is associated with a significantly heightened rate of anxiety disorders. Future research is needed to determine the impact of those disorders on speech treatment outcomes.

Keywords: Anxiety disorders; Social anxiety disorder; Diagnosis; Stuttering.

1. Prevalence of anxiety disorders among children who stutter

For some children who stutter, the negative social consequences of stuttering can begin as early as the preschool years, and continue across the lifespan. Non-stuttering preschool children have been found to negatively evaluate stuttering (Ezrati-Vinacour, Platzky, & Yairi, 2001) and may sometimes ignore, interrupt, mock, and walk away from stuttering children (Langevin, Packman, & Onslow, 2009). The communication difficulties and negative consequences of stuttering experienced by some children who stutter typically intensify during the school years, due to the increased importance of communication in social and classroom settings. Stuttering children have been rated as less popular, less likely to be considered leaders, and more likely to be considered bully victims, than their non-stuttering peers (Davis, Howell, & Cooke, 2002). Several studies have also confirmed that stuttering adolescents report a significantly higher rate of bullying than non-stuttering controls (Blood & Blood, 2004, 2007; Blood et al., 2011).

Although negative consequences to stuttering may not occur for all children who stutter, these experiences have the capacity to adversely impact communication competence, self-esteem, social development, and even romantic attractiveness (Blood et al., 2011; Erickson & Block, 2013; Van Borsel, Brepoels, & De Coene, 2011). By adulthood, stuttering is often associated with escalating social and psychological difficulties, including negative listener reactions and stereotypes, educational and occupational disadvantages, lowered quality of life, fear of social harm, avoidance of social situations, and debilitating levels of anxiety (Blumgart, Tran, & Craig, 2010; Craig, Blumgart, & Tran, 2009; Cream, Onslow, Packman, & Llewellyn, 2003).

1.1. Anxiety and stuttering

Anxiety is one of the most frequently observed and extensively studied consequences of stuttering. Associations between stuttering and anxiety are not surprising when considering the importance of speech to daily functioning and social wellbeing. Despite widespread associations between stuttering and anxiety, studies investigating this relationship have not always provided clear and convincing evidence (Iverach, Menzies, O'Brian, Packman, & Onslow, 2011). Reviews of this literature have highlighted several methodological limitations thought to contribute to the ambiguous nature of research findings regarding anxiety in both children and adults who stutter, including small sample sizes and use of general measures of anxiety that do not adequately evaluate the unique social fears associated with stuttering (Iverach et al., 2011, Smith, Iverach, O'Brian, Kefalianos, & Reilly, 2014).

More recently, findings regarding the presence of anxiety among adults who stutter have become less equivocal. This may be underpinned by advances in the assessment of anxiety among adults who stutter, including recruitment of larger samples sizes, application of measures designed specifically to assess symptoms of social anxiety, and use of structured diagnostic assessments to evaluate the clinical presence of anxiety disorders such as social anxiety disorder (Iverach & Rapee, 2014). It is plausible that these advances in the assessment of anxiety among adults who stutter may also be of benefit to children who stutter.

1.2. Social anxiety disorder

Social anxiety disorder is a chronic and debilitating anxiety disorder characterized by intense fear of social or performance-based situations where evaluation by others is possible (American Psychiatric Association, 2013).). Individuals with social anxiety disorder typically report a profound fear of negative evaluation by others, and experience considerable distress

across a wide range of social situations. Social anxiety disorder is one of the most common mental disorders, with a lifetime prevalence of 8–13% (Kessler et al., 2005; Ruscio et al., 2008). Onset typically occurs between 8–15 years of age (Beidel & Turner, 1998; Schneier, Johnson, Hornig, Liebowitz, & Weissman, 1992), when vulnerability to social embarrassment is heightened, and social relationships are growing in significance (Ollendick & Hirshfeld-Becker, 2002). The disorder is typically associated with significant life interference and distress, reduced occupational and educational achievement, lower socioeconomic status, and high rates of comorbidity with other mental disorders such as depression and substance use (Slade et al., 2009; Stein & Keen, 2000).

Structured diagnostic interviews are regarded as the gold standard for evaluating the clinical presence of anxiety disorders such as social anxiety disorder (Gunn et al., 2014). While self-report measures of anxiety typically provide a reliable and time-efficient method for evaluating the presence and severity of anxiety symptoms, they are not capable of diagnosing the clinical presence of anxiety disorders or providing detailed clinical information. Structured diagnostic interviews, on the other hand, provide a comprehensive, detailed, and often lengthy assessment of anxiety symptoms and associated life interference based on the diagnostic criteria set forth by the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; American Psychiatric Association [APA], 2000; DSM-5, American Psychiatric Association, 2013). Structured diagnostic interviews are often supplemented with child and parent report measures of anxiety symptoms in order to yield a comprehensive, multi-method, multi-informant evaluation of diagnostic information and associated symptoms.

1.3. Social anxiety disorder in adolescents and adults who stutter

As noted above, the use of structured diagnostic interviews to determine the clinical presence of anxiety disorders in adults who stutter has yielded convincing evidence of a relationship between stuttering and anxiety (Iverach & Rapee, 2014). In these studies, approximately 22–60% of adults who stutter were found to meet criteria for a diagnosis of social anxiety disorder (Blumgart et al., 2010; Iverach & Rapee, 2014; Menzies et al., 2008; Stein, Baird, & Walker, 1996). For instance, in a large sample of adults seeking speech treatment for stuttering, the 12-month prevalence for social anxiety disorder was 22%, which represented a 34-fold greater likelihood of social anxiety disorder than among a sample of age and gender-matched controls (Iverach, O'Brian, et al., 2009). Similarly, using a screening instrument, Blumgart and colleagues (2010) reported a significantly increased risk for social anxiety disorder among 50 adults who stutter when compared to controls, indicating a spot prevalence of at least 40% for adults who stutter.

More recently, Gunn and colleagues (2014) reported on the use of a structured diagnostic interview to diagnose mental disorders among adolescent seeking treatment for stuttering. Although this study did not use a control group, adolescents who stutter were found to demonstrate a higher rate of anxiety disorders, including social anxiety disorder, than rates for non-stuttering adolescents from the general community.

1.4. Anxiety in children who stutter

As outlined above, there are numerous reasons why children who stutter may experience heightened social anxiety. According to a developmental psychopathology perspective, multiple pathways to the acquisition of social anxiety disorder exist (Kearney, 2005; Kimbrel, 2008; Ollendick & Hirshfeld-Becker, 2002), and typically occur within particular periods or stages of

development, such as childhood or adolescence (Alfano, Beidel, & Turner, 2006; Morris, 2001).

Etiological models in the field of developmental and clinical psychology have highlighted a

range of biological, psychological, and social risk factors implicated in the origins of social

anxiety disorder for non-stuttering individuals, including genetic and physiological

predispositions, temperamental traits (e.g., behavioral inhibition), and environmental influences

such as adverse life events and traumatic social events (Higa-McMillan & Ebesutani, 2011;

Hofmann & Barlow, 2002; Kearney, 2005; Kimbrel, 2008; Morris, 2001; Rapee & Spence,

2004).

　　　　Several of these etiological factors may also apply to children who stutter, particularly

those pertaining to peer relationships and negative social events. For instance, several models

have proposed that socially anxious children may be more likely to encounter negative peer

experiences, such as rejection, exclusion, and teasing (Kearney, 2005; Morris, 2001; Rapee &

Spence, 2004), which may reduce opportunities for peer interaction, limit acquisition of age-

appropriate social skills, and subsequently increase risk for social anxiety disorder (Morris, 2001;

Rapee & Spence, 2004). Although very little is known about the role of risk factors in the

development of social anxiety disorder among children who stutter, it is likely that once the

propensity to appraise social-evaluative situations as threatening has been acquired, specific

cognitive and behavioral processes occur before, during, and after social-evaluative situations,

which increase the likelihood of social fears persisting over time. Understanding these factors

has the potential to contribute valuable knowledge regarding the clinical management of children

who stutter.

　　　　Despite this, studies investigating the presence of anxiety in children who stutter have

yielded equivocal findings (Smith et al., 2014). In particular, a small number of studies have

reported significantly higher anxiety symptoms in stuttering children or adolescents when compared to controls (Blood & Blood, 2007; Blood, Blood, Tellis, & Gabel, 2001; Davis, Shisca, & Howell, 2007; Mulcahy, Hennessey, Beilby, & Byrnes, 2008), yet several other studies have failed to find such an effect (Andrews & Harris, 1964; Craig & Hancock, 1996; Craig et al., 1996; Hancock et al., 1998; Messenger, Packman, Onslow, Menzies, & O'Brian, 2015; Ortega & Ambrose, 2011; van der Merwe, Robb, Lewis, & Ormond, 2011). In a review of findings to date, Smith and colleagues (2014) concluded that the onset and status of anxiety in children who stutter is unclear. The inconclusive and inconsistent nature of past research findings was attributed to several methodological limitations, including small sample sizes, the grouping together of stuttering children and adolescents, and lack of sensitivity of anxiety measures to adequately evaluate speech-related anxiety (e.g., state/trait anxiety measures; Smith et al., 2014). The conclusions drawn by Smith and colleagues (2014) are similar to previous evaluations of the literature regarding adults who stutter prior to the use of structured diagnostic interviews (Iverach et al., 2011; Menzies, Onslow, & Packman, 1999).

1.4. Purpose of the present study

Despite growing evidence of a heightened rate of social anxiety disorder among adolescents and adults who stutter when using structured diagnostic interviews, no previous studies have comprehensively evaluated the presence of anxiety disorders among a large sample of stuttering children using a structured diagnostic interview. Given the early onset of anxiety disorders in non-stuttering populations and the negative social consequences of stuttering from an early age, it is imperative to determine the rate of anxiety disorders among stuttering children. If stuttering children experience a heightened rate of anxiety disorders, the provision of assessment and treatment practices to deal with this anxiety is critical. Therefore, the purpose of

the present study was to investigate the relationship between stuttering and anxiety in a sample of stuttering children, with the following aims: (1) determine the rate of anxiety disorders among stuttering children, in comparison to non-stuttering control children from the general community; (2) evaluate symptoms of anxiety, mood, emotional and behavioral problems, and experiences of bullying, for stuttering children and non-stuttering controls, based on child and parent report.

2. Method

2.1. Participants

Participants were children who stutter, and non-stuttering control children. Eligibility criteria for inclusion in the study were: (1) 7–12 years of age, and (2) functional written and spoken English. In addition, children who stutter were included in the study when the presence of stuttering was confirmed by a speech-language pathologist. Non-stuttering control children were included when there was no evidence of stuttering based on parent report.

2.1.1. Confirmation of Stuttering

In order to confirm a diagnosis of stuttering for children in the stuttering group, parents provided one of the following: (1) consent for the researchers to contact the child's speech-language pathologist to obtain written confirmation that a diagnosis of stuttering had been made within the previous 12 months, OR (2) a 10-minute recording of the child speaking at home, which was evaluated by a speech-language pathologist, OR (3) consent for their child to complete a 10-minute phone call with a speech-language pathologist. A diagnosis of stuttering was made when unambiguous stuttering was present either within the clinic, within a 10-minute speech recording, or over the telephone, with no minimum criteria for percentage of syllables stuttered. Unambiguous stuttering was defined using Bloodstein's perceptual, pragmatic

definition (Bloodstein & Bernstein Ratner, 2008). If the parent was unable to provide details to confirm their child's stuttering, the child was unable to participate in the study.

2.1.2. Stuttering Group

Participants were 75 stuttering children from around Australia, including 63 boys (84.0%) and 12 girls (16.0%), ranging in age from 7–12 years (mean = 8.7 years, SD = 1.50). Participants were drawn from private and public speech pathology clinics (n = 59, 78.7%), and from the general community by means of advertisements in major newspapers, television news, social media, school newsletters, and through word-of-mouth (n = 16, 21.3%).

Mean age of stuttering onset was 3.6 years (SD = 1.7, range = 1–8 years). In the majority of cases, stuttering onset reportedly occurred gradually over several weeks or months (72.0%, n = 54) rather than suddenly over a few days (28.0%, n = 21), and a reported family history of stuttering was present (56.0%, n = 42). Eighty percent of stuttering children were currently seeing a speech-language pathologist for stuttering treatment (n = 60), and the majority had sought previous treatment for stuttering (78.7%, n = 59). Stuttering severity, as rated by each child and parent together, was rated as mild (31%, n = 23), moderate (52%, n = 39), or severe (17%, n = 13). Based on parent-child report, mean typical stuttering severity was 3.2 (SD = 1.4, range = 0–7) and mean worst stuttering severity was 4.6 (SD = 1.8, range = 0–9), rated on the scale from 0 ("*No stuttering*") to 9 ("*Extremely severe stuttering*"). Based on parent-child report, mean speech satisfaction was 5.8 (SD = 2.2, range = 1–9), rated on the scale ranging from 1 ("*Extremely unhappy/unsatisfied*") to 9 ("*Extremely happy/satisfied*").

3.1.3. Control Group

Non-stuttering control children were drawn from the Australian general community through university advertisements (36.0%, n = 54), word-of-mouth (42.0%, n = 63), or

advertisements placed in newspapers, magazines, school newsletters, or social media (22.0%, $n =$ 33). Two controls were matched by gender to each child in the stuttering group, resulting in a sample of 150 children, including 126 boys (84.0%) and 24 girls (16.0%), ranging in age from 7–12 years (mean = 8.9 years; SD = 1.30).

3.1.3. Demographic characteristics

Child, parent, and family-related demographic variables for stuttering children and non-stuttering controls are reported in Tables 1 and 2. Parents of non-stuttering children reported a significantly higher level of education than parents of stuttering children; Primary caregiver: t (128.5) = -3.19, p = 0.002; Secondary caregiver: t (127.7) = -3.00, p = 0.004; with equal variances not assumed based on Levene's test for equality of variances. No other significant differences in demographic variables were found between groups. As shown in Table 1, less than 10% of participants reported the presence of past or current speech-language disorders, or current psychiatric disorders. However, no children in the control group reported the past or current presence of stuttering. Approximately one-third of stuttering and control participants had sought referral, assessment or treatment for mental health in the past. These participants were retained in the analysis in order to maintain a sample representative of the wider population of school-age children.

<u>Insert Tables 1 and 2</u>

2.1.2. Ethical approval

The study was approved by Macquarie University's Human Research Ethics Committee, and the Human Research Ethics Committees overseeing relevant sites, including The University of Sydney, South Western Sydney Local Health District, and New South Wales Department of

Education. Informed consent was obtained from all parents of stuttering children and parents of non-stuttering controls.

2.2. Measures and Online Anxiety Diagnostic Assessment

Parents and children completed an online survey which included: (1) demographic questions for the parent, (2) stuttering-related questions for children and parents from the stuttering group only, (3) an online child anxiety diagnostic assessment (Youth Online Diagnostic Assessment, YODA; Lyneham et al., 2015) completed by parents, (4) child report symptom measures of anxiety, mood, behavioral and emotional problems, and experiences of bullying, and (5) parent report symptom measures of child anxiety, and behavioral and emotional problems.

2.2.1. Stuttering Questionnaire

Parents of children in the stuttering group were asked to provide detailed information about their child's stuttering, including onset, severity, past/current speech treatment, and family history. Children in the stuttering group were asked to work together with their primary caregiver to decide upon their: (1) typical and worst stuttering severity across eight speaking situations, rated on a scale ranging from 0 ("*no stuttering*") to 9 ("*extremely severe stuttering*"); (2) current speech satisfaction, rated on a scale ranging from 1 ("*extremely unhappy/unsatisfied*") to 9 ("*extremely happy/satisfied*").

2.2.2. Youth Online Diagnostic Assessment (YODA; Lyneham et al., 2015; McLellan et al., 2016)

The YODA was developed at the Centre for Emotional Health, Macquarie University, to assess and diagnose anxiety disorders in children and adolescents (5–17 years), according to the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV; American Psychiatric Association, 2000). The assessment evaluates the presence of the main anxiety

disorders (separation anxiety disorder, social anxiety disorder, generalized anxiety disorder, obsessive-compulsive disorder), and common specific phobias that reflect the five DSM-IV subtypes (animals, insects, heights, storms, water, the dark, blood/injections/injury, enclosed spaces, transport, doctors, vomiting, loud noises, and costumed characters). Posttraumatic stress disorder and panic/agoraphobia are not included in the assessment due to an insufficient number of children under 12 years of age presenting with these disorders.

The YODA is completed by the child's parent using a computer with internet access. Screening questions lead each diagnostic category, with negative responses to screening initiating an automated skip of the remaining questions for that disorder. Therefore, if the child does not meet screening criteria for a particular diagnostic category, the full assessment for that category is not administered. In addition, the number of items administered across the full assessment will vary depending on responses to questions with automated skip rules. The assessment includes three main types of questions: (1) rating the frequency of specific symptoms characteristic of a given disorder; (2) rating the extent of impact and interference attributed to the characteristic symptoms; and (3) brief open-ended written responses describing specific examples of the child's problem and its interference. Computer programming allows for the assessment to be personalized, with the child's name and appropriate pronouns used throughout (e.g., "*Currently, does [child's preferred name] get distressed when [he/she] needs to separate from particular family members or home?*"). Parent completion times typically range from 7–10 minutes for non-clinical cases, and 20–90 minutes for clinical cases.

2.2.2.1. Symptom, duration, and interference questions

Each diagnostic section contains screening questions and questions about symptoms, duration, and interference. Screening questions include closed questions with yes/no responses

(e.g., "*Currently, does [child's name] avoid or get distressed in social situations such as meeting new people, joining in group activities or performing in front of others?*"). Symptom questions for separation anxiety disorder, social phobia, and generalized anxiety disorder (e.g., "*Currently, which of the following situations would [child's name] avoid (if possible) or find very distressing?*"), are rated as follows: Never a problem/worry, About the same as other children the child's age, A little more than other children the child's age, A lot more than other children the child's age. Symptom questions for obsessive-compulsive disorder (unwanted repetitive thoughts, behaviors) are rated as follows: Don't know, Not at all, A little, A lot.

Duration questions request information about how long symptoms have been present. Duration for separation anxiety disorder and social phobia is rated on a scale ranging from: Less than 1 month, 1–3 months, 3–6 months, More than 6 months. Duration for generalized anxiety disorder, obsessive-compulsive disorder, and the specific phobias, is rated as follows: Less than 3 months, 3–6 months, More than 6 months. Interference questions request information about how anxiety symptoms may be interfering with functioning: "*Fears and worries can interfere with a child's life. For example a particular fear or worry may stop a child from doing things that are important or enjoyable, may cause interruptions to daily activities, may make a child really upset or distressed, or may upset or make life difficult for family, friends or teachers. Please write examples of how [child name]'s distress and avoidance of social/performance situations has interfered in [his/her] life during a recent, typical week?*" Interference questions are rated as follows: Not at all, A little, Some, Quite a bit, A lot.

At the end of the assessment, the parent is shown the following question: "*Listed below are the areas that you have identified as being difficult for your child. Which of these areas is currently the most problematic?*" Based on symptom severity and interference scores relating to

DSM diagnostic criteria, the YODA algorithm assigns the following diagnostic decision per disorder: 0 = No disorder, 1 = Clinical/meets diagnostic criteria.

2.2.2.2. Scoring and evaluation

A clinical psychologist, trained in the diagnostic criteria and experienced in the assessment and treatment of child anxiety, subsequently reviews and evaluates the open-ended descriptive responses for each participant and the computer-scored diagnostic decision to determine the final result for each diagnostic category. Using clinical judgment based on DSM criteria, the clinical psychologist is able to subsume diagnoses where reported difficulties overlap substantially, and override responses to closed questions in cases where written responses to open-ended questions clearly contradict the closed question response. This is particularly important in cases where a parent provides low symptom severity and/or interference scores, yet provides a written description outlining significant symptom severity and interference.

The clinical psychologist is also able to diagnose Anxiety Disorder Not Otherwise Specified (ADNOS) where specific diagnostic criteria are not met but symptoms are clinically distressing and/or interfering, and benchmark interference ratings against standard exemplars. Based on this evaluation, the clinical psychologist assigns each diagnosis a rating of 0 = No disorder, 1 = Subclinical, 2 = Clinical/meets diagnostic criteria. The subclinical category refers to cases where some, but not all, diagnostic criteria are met. Overall, the clinical psychologist uses the same clinical judgment that is applied when conducting face-to-face diagnostic assessments with parents. Therefore, the only difference between the YODA and face-to-face diagnostic assessments is that clinical questions and parent responses for the YODA are delivered in writing via computer.

For the purposes of the present study, the clinical psychologist was blinded to group membership. That is, it was not known whether the child was from the stuttering or control group.

2.2.2.3. Diagnosis of social anxiety disorder

Although the clinical psychologist was blinded to group membership, roughly one-quarter of parents provided written responses during the YODA which stated that their child stuttered ($n = 26$, 34.7%). In light of growing evidence of clinically significant levels of social anxiety among adults who stutter, the recently released DSM-5 now specifies that a diagnosis of social anxiety can be made in cases where another condition—such as stuttering—is present, provided that the fear or anxiety is out of proportion with what would normally be felt (APA, 2013). That is, the individual's estimate of threat, and their anxiety in response to this perceived threat, is considered to significantly exceed any evidence of actual threat. Therefore, for the purposes of the present study, the DSM-IV social anxiety disorder criterion was amended to allow a diagnosis of social anxiety disorder in cases where the child's fear or anxiety was out of proportion with what would normally be expected. This approach to the DSM-IV diagnosis of social anxiety disorder in stuttering has been used in past research with adults who stutter (e.g., Stein et al., 1996), and requires the expert clinical judgment of a psychologist.

2.2.2.4. Validity and Reliability

The YODA was developed by clinical psychologists and researchers from the Centre for Emotional Health, Macquarie University, based closely on DSM diagnostic criteria and on existing structured diagnostic interviews. The YODA has been administered to hundreds of parents of anxious and non-anxious children as part of research trials and treatment programs being conducted through the Centre, and validity data are currently being prepared for

publication (McLellan et al., 2016). Given that the YODA is based on computer algorithms designed to evaluate DSM diagnostic criteria, with evaluation by a clinical psychologist, it is highly likely to reflect DSM diagnoses, thus confirming face validity. When conducting structured diagnostic interviews, research has shown that obtaining parent-report only is an acceptable approach, with child-report making no discernible difference to final diagnoses (Lyneham, Abbott, & Rapee, 2007).

Inter-rater reliability. Following the clinical psychologist's review and assignment of final diagnoses for all participants, a second (senior) clinical psychologist reviewed 20% of the online assessments for the stuttering ($n = 15$) and control groups ($n = 30$) in order to determine inter-rater reliability. Perfect agreement between the first and second clinician was found for separation anxiety disorder and generalized anxiety disorder (Kappa = 1.00, $p < .001$), and almost perfect agreement was found for social anxiety disorder (Kappa = 0.846, $p < .001$). Of the 45 participants evaluated by both clinicians, none were diagnosed with obsessive compulsive disorder or ADNOS, thus Kappa was not calculated. In addition, Kappa was not calculated for the specific phobias due to an insufficient number of clinical diagnoses. In particular, only 1–2 diagnoses were made for each of the following phobias: insects, dark, animals, loud noises, and heights; and no participants were diagnosed with specific phobias relating to storms, water, enclosed spaces, doctors, vomit, costumed characters, and transport.

2.2.3. Spence Children's Anxiety Scale, Child and Parent Report (SCAS-C, Nauta et al., 2004; SCAS-P, Spence, 1998)

The 44-item SCAS evaluates the severity of anxiety symptoms in children, and is completed by both the child (SCAS-C) and the child's primary caregiver (SCAS-P). The scale assesses six domains of anxiety in line with DSM-IV anxiety disorder dimensions, including

generalized anxiety, panic/agoraphobia, social phobia, separation anxiety, obsessive-compulsive

disorder and physical injury fears. The SCAS comprises 38 anxiety symptom items, and six

positive 'filler items' to reduce negative response bias, which are completed using a four-point

scale ranging from 0 ("*never*") to 3 ("*always*"). Sub-scale scores are computed by summing

items for the six anxiety domains, and the 38 anxiety symptom items are summed to yield a

maximum possible total score of 114. The SCAS is used widely in child anxiety research and has

excellent psychometric properties (Nauta et al., 2004; Spence, Barrett, & Turner, 2003).

2.2.4. Strengths and Difficulties Questionnaire, Parent Report (SDQ; Goodman, 1997, 2001)

The SDQ is a brief behavioral screening questionnaire designed to evaluate emotional

and behavioral problems in children. Parents complete the SDQ by indicating how applicable 25

attributes are to their child, using a three-point scale ranging from 1 ("*not true*") to 3 ("*certainly*

true"). Items load onto five scales: emotional symptoms, conduct problems,

hyperactivity/inattention, peer relationship problems, and pro-social behavior. A Total

Difficulties score is derived from the sum of all scales except the pro-social behavior scale, and

ranges from 0–40. The Internalizing score is derived from the sum of the emotional and peer

problems scales, and evaluates problems directed towards/within the self (i.e., internalized

negative emotions); the Externalizing score is derived from the sum of the conduct problems and

hyperactivity/inattention scales, and evaluates problems directed towards the external

environment (i.e., conflicts with others) (Goodman, Lamping, & Ploubidis, 2010). Internalizing

and Externalizing scores range from 0–20 respectively. The SDQ is used extensively in child

mental health research, and has good psychometric properties (Hawes & Dadds, 2004).

2.2.5. Short Mood and Feelings Questionnaire, Child Report (SMFQ; Angold et al., 1995)

The SMFQ is a brief screening instrument designed to evaluate depressive symptomatology in children. It consists of 13 items referring to cognitive and affective symptoms that the child may have experienced in the past two weeks. Items are rated on a 3-point scale ranging from 0 ("*Not True*") to 2 ("*True*"), and summed to yield a Total score ranging from 0–26. The SMFQ is widely used in child mental health research and has good psychometric properties (Rhew et al., 2010).

2.2.6. Personal Experiences Checklist, Child Report (PECK) (Hunt, Peters, & Rapee, 2012)

The PECK evaluates personal experiences of being bullied in children and young people. The PECK comprises 32 items that cover a broad range of bullying behaviors. Items are rated on a five-point scale ranging from 0 ("*never*") to 4 ("*every day*"), and load onto four scales: relational-verbal bullying, cyber bullying, physical bullying, and bullying based on culture. A total score is computed by summing responses to all 32 items, with higher scores indicating a greater frequency of being bullied. Preliminary findings have confirmed the psychometric properties of the PECK (Hunt et al., 2012).

2.2.7. Rationale for selected measures

The YODA is a structured diagnostic interview designed to evaluate the presence of anxiety disorders in children, based on parent report. The YODA was chosen as the primary (categorical) outcome measure in the present study to evaluate possible differences in the rate of anxiety disorders for children who stutter and non-stuttering controls. In clinical psychology, it is common for structured diagnostic assessments to be supplemented with a range of multi-informant symptom measures. This allows for a more comprehensive evaluation of diagnostic information and associated symptoms based on both child and parent report. It also provides a

means for comparing or confirming diagnostic information with symptom-related reports.

Therefore, additional parent and child report measures were chosen as secondary (continuous)

outcome measures to evaluate symptoms of anxiety (SCAS), mood (SMFQ), emotional and

behavioral problems (SDQ), and experiences of bullying (PECK).

2.3. Procedure

Parents of stuttering children and non-stuttering controls contacted the researchers by

phone or email to register interest in the study. Parents were screened by phone to determine

their child's eligibility to participate. When children met all eligibility criteria for inclusion in the

study, the child's parent was emailed a personalized web link to access the online survey.

Participating families received weekly email reminders to prompt completion of the survey

within a 4-week period. All parents who were sent the web link completed the online survey

within the specified time frame, except for one parent from the stuttering group who completed

all child/parent report measures and 90% of the YODA and then could not be contacted. Data

from this parent-child pair was deemed acceptable for inclusion in the present study given that

all child/parent report measures and nearly all questions for the YODA had been completed.

The study took approximately 60–90 minutes to complete, and could be completed in

stages if necessary. Parents were instructed to remain present while their child completed the

child report measures, and to offer help if required without influencing the child's responses.

Upon completion of the study, families in the stuttering group were posted a $75 grocery

voucher, and families in the control group were posted a $50 grocery voucher. Families in the

stuttering group received a larger incentive due to the additional screening requirements prior to

participation (i.e., confirmation of stuttering), and the additional stuttering-related questions

included in the online survey. In order to reimburse speech-language pathologists for the time

required to confirm the presence of stuttering of participating children, they were posted a $20 grocery voucher when they provided written confirmation of stuttering for a child participating in the study. To ensure that the $20 grocery voucher did not provide any incentive to confirm the presence of stuttering, speech-language pathologist were advised that they would receive the gift voucher regardless of whether the child in question was stuttering or not.

2.4. Data analysis

Multinomial and binary logistic regression models were used to estimate odds ratios, 95% confidence intervals and p-values for the primary outcome. The primary outcome was the prevalence of anxiety disorders for stuttering children and controls when adjusting for gender, with sufficient numbers to obtain valid estimates. These analyses included subclinical and clinical diagnoses for: (1) the main anxiety disorders (separation anxiety disorder, social anxiety disorder, generalized anxiety disorder, obsessive-compulsive disorder, ADNOS); (2) any anxiety disorder, and (3) any specific phobia (animals, insects, heights, storms, water, the dark, blood/injections/injury, enclosed spaces, transport, doctors, vomiting, loud noise, and costumed characters). Multinomial logistic regression models were used for analyses of three categorical outcomes: clinical, sub-clinical, and non-clinical (no diagnosis).

Although the original aim of the study was to recruit 100 children who stutter and 100 non-stuttering controls, recruitment of children who stutter was slower than recruitment of non-stuttering controls. Therefore, a power calculation was conducted to determine the number of stuttering and non-stuttering children that would be required to provide sufficient power to detect differences between groups. Based on the recruitment of 75 stuttering children and 150 controls, there was 80% power to detect 2.75 increased odds of having an anxiety disorder with a 5% level of significance. A Bonferroni adjusted alpha of .007 was used to account for the seven total

planned comparisons between groups (separation anxiety disorder, social anxiety disorder, generalized anxiety disorder, obsessive-compulsive disorder, ADNOS, any anxiety disorder, any specific phobia).

For the secondary outcomes, 2-sample *t*-tests were used to compare continuous scores on child and parent report measures (SCAS, SDQ, SMFQ, and PECK) for the stuttering and control groups. A Bonferroni adjusted alpha of .003 was used to account for the 15 planned comparisons between groups (SCAS subscale and total scores; SDQ internalizing, externalizing, and total scores; SMFQ total score; and PECK subscale and total scores).

3. Results

3.1. Anxiety disorders

Table 3 reports the prevalence of anxiety disorders for 75 stuttering children and 150 non-stuttering controls, including both clinical and subclinical diagnoses. Subclinical diagnoses refer to cases where some, but not all, diagnostic criteria for a specific disorder were met. Gender was entered as a covariate in all regression models. Given that the age range for participants in this study was relatively narrow (i.e., 7–12 years), and no significant difference in age was found between groups, age was not included as a covariate in these models. Further, in light of finding that parents of control children reported higher parental education than parents of stuttering children, two binary regression models were conducted to determine whether parental education predicted the presence of any clinical or subclinical anxiety disorder. Parental education was not a significant predictor in either of these models, which by definition confirms that it is not a confounding variable in the relationship between stuttering and anxiety disorders. Therefore, it was not included as a covariate in any additional models.

As shown in Table 3, prevalence of any anxiety disorder for stuttering children was significantly higher than the rate for non-stuttering controls, demonstrating four-fold increased odds. Specifically, prevalence of social anxiety disorder was significantly higher for stuttering children when compared to non-stuttering controls, indicating six-fold increased odds. Prevalence of clinical social anxiety disorder was also significantly higher for girls than boys, indicating six-fold increased odds, OR = 6.319, CI = 1.71 – 23.36, p = 0.006.

Prevalence rates for all other clinical anxiety disorders, including separation anxiety disorder, generalized anxiety disorder, obsessive compulsive disorder, and ADNOS, were not found to be significantly higher in the stuttering group, when compared with prevalence rates for non-stuttering controls. However, prevalence of subclinical generalized anxiety disorder was significantly higher for stuttering children than non-stuttering controls, demonstrating seven-fold odds. Prevalence rates for all other subclinical anxiety disorders were not found to be significantly higher in the stuttering group when compared to non-stuttering controls. Based on significance at p ≤ 0.007, gender was not a significant predictor of the prevalence of any clinical or subclinical anxiety disorder category.

Insert Table 3

3.2. Child and parent report symptom measures

Table 4 presents mean scores on the SCAS (child and parent report) for stuttering children and non-stuttering controls, using comparisons based on 2-sample t-tests. All mean SCAS scores fell within normal limits. However, SCAS Total scores (child and parent report) were significantly higher for stuttering children than non-stuttering controls, with moderate effect sizes. In particular, mean scores for the Social Phobia, and Separation Anxiety subscales (child and parent report) and the Generalized Anxiety subscale scores (parent report) were

significantly higher for stuttering children than non-stuttering controls, with moderate effect

sizes. Table 4 shows that no significant differences in mean scores were found between groups

for the Physical Injury Fears subscale (child and parent report), Panic Attack/Agoraphobia

subscale (child and parent report), Obsessive-Compulsive subscale (child and parent report), and

Generalized Anxiety (child report).

When using a multi-informant approach to the evaluation of psychological symptoms in

children, it is very common for discrepancies to exist between child and parent report (De Los

Reyes & Kazdin, 2005). In the present study, mean SCAS scores for parents were found to be

significantly lower than mean scores for children across all subscales and the Total score ($p <$

0.001 for all t-test comparisons). Despite these discrepancies, however, significantly higher

SCAS scores were still found for the stuttering group when compared to controls, based on both

child and parent report.

<div align="center">Insert Table 4</div>

Table 5 presents mean scores for the SMFQ and PECK (child report) and the SDQ

(parent report) for stuttering children and non-stuttering controls, using comparisons based on 2-

sample t-tests. All mean scores on the SDQ, SMFQ, and PECK fell within normal limits.

However, the mean SDQ Total Difficulties score and Internalizing and Externalizing scores

(parent report) were significantly higher for stuttering children than non-stuttering controls, with

moderate effect sizes. Post-hoc comparisons were conducted on the SDQ Externalizing and

Internalizing scores to determine which sub-scales were contributing to these findings. The SDQ

Hyperactivity/Inattention subscale score (from the Externalizing score) and the SDQ Emotional

Problems subscale score (from the Internalizing score) were both significantly higher for

stuttering children than non-stuttering controls, with moderate effect sizes. No significant

differences were found between groups for the SDQ Conduct Problems subscale score (from the Externalizing score) or the SDQ Peer Problems subscale score (from the Internalizing score).

Mean scores for the SMFQ Total score, PECK Relational-Verbal Bullying and Physical Bullying scores and the PECK Total score (child report) were not found to differ significantly between groups. However, the mean PECK Culture Bullying score was significantly higher for stuttering children than non-stuttering controls, with a moderate effect size. Given that the PECK Culture Bullying score evaluates the frequency of bullying based on culture, and does not appear to be directly relevant to the experience of stuttering, post-hoc comparisons were conducted to determine the individual items contributing to this significant finding. Mean scores for items 5 (“*other kids make fun of my language*”) and 25 (“*other kids tease me about my voice*”) were significantly higher for stuttering children than matched controls, with moderate-large effect sizes. A post-hoc linear regression model was used to determine the relationship between bullying and social anxiety. With the PECK Culture Bullying score, age, and gender entered as predictors, this model accounted for 16% of the variance in SCAS Social Phobia scores (child report), $F(3,220) = 13.79$, $p < 0.001$, with higher PECK Culture Bullying scores and female gender predicting higher SCAS Social Phobia scores, $p < 0.001$ and $p = 0.036$. Age was not a significant predictor in this model.

<div align="center">Insert Table 5</div>

4. Discussion

In a recent review of research evidence relating to the presence of anxiety in young people who stutter, Smith and colleagues (2014) concluded that,

> “*The prevalence of anxiety in young people who stutter, and the timing of anxiety onset in stuttering could not be determined. This was due to methodological limitations in the*

reviewed research such as small participant numbers, and the use of measures that lack

sensitivity to identify anxiety in the targeted population" (p.22)

No previous studies have comprehensively evaluated the presence of anxiety disorders among children who stutter using a structured diagnostic interview. Therefore, the purpose of the present study was to determine the rate of anxiety disorders among a large sample of children who stutter in comparison with a matched sample of non-stuttering controls, using a structured diagnostic interview supplemented with a range of related symptom measures. This approach to the evaluation of anxiety was aimed at overcoming some of the limitations of past research in order to more clearly understand the relationship between anxiety and childhood stuttering.

Based on findings from the structured diagnostic interview, the rate of any anxiety disorder among stuttering children (32%) was significantly higher than non-stuttering controls (11%), demonstrating four-fold increased odds. This result indicates the potential for stuttering children to experience debilitating anxiety, and corresponds with previous evidence of a significantly higher rate of any anxiety disorder among adults seeking treatment for stuttering (27%) in comparison to matched controls (5%), demonstrating seven-fold increased odds (Iverach, O'Brian, et al., 2009). The higher prevalence of anxiety disorders among stuttering children was primarily a function of the prevalence of social anxiety disorder. Children in the stuttering group showed six-fold increased odds of social anxiety disorder (24%) than non-stuttering controls (5%). The prevalence of social anxiety disorder for stuttering children in the present study is substantially higher than prevalence rates reported in large mental health surveys of the general population (Kessler, Chiu, Demler, & Walters, 2004; Rapee, Schniering, & Hudson, 2009). It also corresponds with previous evidence of an inflated rate of social anxiety

disorder (21–26%) among adults seeking treatment for stuttering (Iverach, O'Brian, et al., 2009), and confirms that social anxiety disorder may be present among school-age children who stutter.

Stuttering children in the present study did not report a significantly higher rate of any other clinical anxiety disorder, when compared to non-stuttering controls. However, a significantly higher rate of subclinical generalized anxiety disorder (GAD) was found for stuttering children (13%), when compared to non-stuttering controls (2%), demonstrating seven-fold increased odds. A subclinical diagnosis of GAD indicates the presence of considerable anxiety and worry, where the number or severity of symptoms, or the level of associated distress or life interference, do not meet the diagnostic threshold for a clinical diagnosis. Subclinical GAD may still be associated with distress and functional impairment, and may require monitoring or early intervention to reduce the likelihood that symptoms and impairment will escalate over time (Angold, Costello, Farmer, Burns, & Erkanli, 1999; Costello, Angold, & Keeler, 1999; Costello & Shugart, 1992). This is especially relevant when considering that mild anxious symptomatology in childhood may increase risk for the development of later psychopathology (Spence & Dadds, 1996). It is also possible that the heightened rate of subclinical GAD found for stuttering children in the present study is simply a by-product or derivative of the social fears subsumed under the diagnosis of social anxiety disorder. Nevertheless, this finding corresponds with previous evidence of a significantly higher rate of GAD in adults seeking treatment for stuttering (9%), when compared to matched controls (2%), demonstrating four-fold increased odds (Iverach, O'Brian, et al., 2009).

Stuttering children demonstrated significantly higher child and parent reported symptoms of anxiety, when compared to non-stuttering controls. Consistent with the diagnostic data, children and their parents reported higher mean scores on the social phobia subscale of the

SCAS, and parents reported higher mean scores on the generalized anxiety subscale of the

SCAS. Surprisingly, stuttering children and their parents also reported higher scores on the

separation anxiety subscale. One possible explanation for this finding is that some of the SCAS

items relating to separation anxiety may have tapped into the social fears of stuttering children

that increase reliance on parental figures for protection from social harm at this younger age

(e.g., "*I have trouble going to school in the mornings because I feel nervous or afraid*").

In clinical psychology, discrepancies often exist across different informants (e.g., parents

and children; De Los Reyes & Kazdin, 2005). Given that these discrepancies may impact

assessment and classification, a multi-informant approach is typically recommended across

diagnostic assessments and symptom measures in order to provide a comprehensive picture of

emotional and behavioral functioning in children. In the present study, the stuttering group

demonstrated significantly higher scores on the generalized anxiety subscale, but this was based

on parent report only, with differences in child report scores by group only approaching

significance ($p = 0.018$) based on our strict Bonferroni adjustment. Additional analyses revealed

that mean parent report SCAS scores were significantly lower than mean child report SCAS

scores for the stuttering and control groups together. This corresponds with evidence that

informant agreement is typically in the low-to-moderate range when evaluating symptoms of

anxiety in children (De Los Reyes & Kazdin, 2005). Despite these discrepancies, however,

significantly higher SCAS scores were still found for the stuttering group when compared to

controls, based on both child and parent report.

Children in the stuttering group also demonstrated significantly greater psycho-social

difficulties than non-stuttering controls with higher scores on several child and parent report

measures. First, stuttering children were characterized by significantly more emotional and

behavioral difficulties than non-stuttering controls, as shown by significantly higher SDQ

internalizing and externalizing scores respectively. Elevated behavioral problems in the

stuttering group specifically reflected higher levels of hyperactivity and inattention. This

corresponds with previous evidence that stuttering in childhood may be associated with ADHD

symptoms and temperamental traits of inattention and hyperactivity (Alm, 2014; Donaher &

Richels, 2012). Elevated internalizing problems in the stuttering group reflected emotional

difficulties associated with symptoms of anxiety (e.g., "*Nervous or clingy in new situations,*

easily loses confidence", "*Many fears, easily scared*", "*Many worries or often seems worried*").

This is not surprising given our findings of increased social anxiety disorder and subclinical

generalized anxiety disorder in the stuttering group when compared to controls.

However, group differences in depressive symptomatology were not significant based on

our more conservative alpha, adjusted for multiple planned comparisons. Although a high rate of

comorbidity is typically found between anxiety and depression (Kessler et al., 2004), psycho-

social difficulties in the present sample of stuttering children appear to specifically reflect

anxiety and behavioral concerns. The lack of significant difference in depression may reflect the

young mean age of this sample (8.7 years), given the considerably later average onset for major

depressive disorder of around 15 years (Hankin et al., 1998).

An interesting finding was uncovered about bullying and teasing. Although children who

stutter did not report significantly more bullying or teasing across the majority of domains, they

reported significantly higher scores on the Culture Bullying scale of the Personal Experiences

Checklist, when compared to non-stuttering controls. Due to the apparent unlikeliness of this

finding, post-hoc analyses were conducted, revealing significantly higher scores for children who

stutter on the following two items: "*other kids make fun of my language*" (item 5) and "*other*

kids tease me about my voice" (item 25). Given the lack of cultural and language differences between stuttering children and non-stuttering controls (see Table 2), this result suggests that stuttering children completed these items in relation to their experiences of being teased about their stuttering. Of all the comparisons conducted for the present study, the significant difference between groups for Item 5 of the PECK ("*other kids make fun of my language*") had the largest effect size, indicating that stuttering children may regularly experience teasing in relation to their stuttering. They may not, however, experience teasing or bullying in domains outside the realm of speaking. Post-hoc analyses revealed that higher Culture Bullying scores predicted higher child-reported social phobia symptoms. This highlights the potential for experiences of bullying to increase social anxiety for children who stutter. It is also plausible that the presence of social anxiety in children who stutter may increase the likelihood of peer victimization. For instance, higher rates of victimization have been found for non-stuttering children with social anxiety when compared to children without internalizing difficulties (for a review of the relationship between anxiety and peer victimization, see Griffin & Gross, 2004).

Overall, child and parent responses on the symptom measures indicate that children who stutter in the present study were characterized by significantly higher social anxiety, total anxiety, and internalizing and externalizing problems, than matched controls. These findings confirm that social anxiety is the primary concern for children who stutter in this sample. That is, when compared to matched controls, a significantly higher rate of social anxiety disorder was found for children who stutter (based on diagnostic assessment), and this was corroborated by significantly higher social anxiety scores (based on parent and child report symptom measures). Research with adults who stutter has also shown that social anxiety is the primary disorder reported when conducting diagnostic assessments (Blumgart et al., 2010; Iverach, Jones et al.,

2009; Menzies et al., 2008; Stein et al., 1996). Hence, findings from the present study emphasize the potential for social anxiety to be the primary concern for children who stutter, with other forms of anxiety (e.g., separation anxiety, generalized anxiety) being of secondary concern for a smaller subset of children.

However, it is important to note that scores for stuttering children on all symptom measures fell within normal limits, corresponding with previous research (Blood, Blood, Maloney, Meyer, & Qualls, 2007; Craig et al., 1996; Smith et al., 2014). This suggests the importance of supplementing symptom measures with a diagnostic assessment in order to comprehensively evaluate the unique social fears and experiences of stuttering children, including the severity and impact of this anxiety. The present findings confirm the consistency of results across symptom-based measures and the diagnostic assessment; that is, higher levels of social anxiety were found for stuttering children according to both child and parent report, and this was further corroborated by a significantly increased rate of social anxiety disorder as reported by parents on the diagnostic assessment. This highlights the importance of administering several multi-informant measures and assessments. Computer-administered diagnostic assessments, in particular, are becoming increasingly common in clinical and research settings (Newman, Consoli, & Taylor, 1997), and allow for efficient assessment of patients including those in remote and rural settings.

Several caveats pertain to the present findings. First, anxiety disorder diagnoses were made using a structured diagnostic interview that has been administered to hundreds of parents of anxious and non-anxious children, but which is yet to be validated (validity data are being prepared for publication). Nevertheless, the interview is based on DSM-IV and DSM-5 criteria, and diagnoses are based on computer algorithms and evaluation by a senior clinical psychologist,

with good inter-rater reliability established. Further research is required to determine the sensitivity and specificity of the YODA in accurately diagnosing anxiety disorders for those who stutter. Second, the present study used a sample that was not stratified according to the general population, with eligibility criteria based on general demographic characteristics such as age, gender, and stuttering status. Additional research is required to determine whether supplementary variables, such as language skills and articulation, may have any influence on the relationship between anxiety and stuttering. Third, reliability of a stuttering diagnosis was not confirmed by a second speech-language pathologist. Fourth, the elevated hyperactivity and inattention symptoms reported by parents could not be corroborated diagnostically because the YODA only assesses for the presence or absence of anxiety disorders in youth. Even so, this is the only study to investigate the presence of anxiety disorders among a large sample of stuttering children in comparison with matched controls, thereby providing a significant and valuable advance on previous research. Future research assessing behavioral difficulties diagnostically is warranted.

Finally, it is important to note that the majority of stuttering children in the present study (80%) were currently seeing a speech-language pathologist for stuttering treatment. As previously stated in research with adolescents and adults seeking treatment for stuttering (Gunn et al., 2014; Iverach, O'Brian, et al., 2009), it is possible that children receiving speech treatment for stuttering may demonstrate higher rates of anxiety disorders than stuttering children from the general community. Likewise, stuttering children with an anxiety disorder may be more likely to seek stuttering treatment. Although our findings may not be generalizable to all stuttering children, the high rate of psychosocial symptomatology and diagnostic levels of anxiety disorders reported in our study extends research with adolescents and adults who stutter to indicate that anxiety may reach clinical levels in childhood.

However, it must be acknowledged that not all children, adolescents, and adults who stutter demonstrate excessive levels of anxiety. In cases where anxiety and stuttering are concomitant disorders, it is possible that this anxiety may occur in specific speaking situations. Although socially anxious individuals who do not stutter often fear or expect negative evaluation in social situations even when such experiences have not occurred in an obvious or continuing manner, individuals who stutter may experience ongoing and chronic negative evaluation throughout life. Hence, they may encounter social threats that are real, and these experiences may compound social fears over time. Therefore, determining whether anxiety is "out of proportion" for children who stutter is complex, and further clinical research is needed to determine the accuracy of anxiety disorder diagnoses.

4.1. Conclusion

Overall, the present findings extend previous research by presenting evidence of a heightened rate of social anxiety disorders among children who stutter than non-stuttering controls, based on administration of a structured diagnostic interview. These findings establish the value of assessing and treating anxiety in stuttering children who meet criteria for the diagnosis of an anxiety disorder. In such cases, specific strategies to directly address anxiety should be in incorporated into, or conducted in addition to, standard speech treatment. Although speech treatments for stuttering may incorporate strategies to address speech-related anxiety in stuttering patients, psychological treatments such as Cognitive Behaviour Therapy are designed specifically to address emotional, cognitive and behavioural factors contributing to the development, persistence, or exacerbation of psychological conditions such as social anxiety disorder. In addition, speech-language pathologists often have large and busy caseloads, and limited psychological training, which restricts their capacity to efficaciously treat social anxiety

in stuttering patients. Psychological intervention is particularly relevant given that the presence of anxiety-related disorders among stuttering adults has been associated with a significant rate of relapse following speech treatment for stuttering (Iverach, Jones, et al., 2009).

Future research is needed to determine the impact of anxiety disorders among stuttering children on speech and psychological outcomes, and to further investigate the relationship between stuttering and behavioral problems in childhood. In addition, the inclusion of age as a variable in future regression models may help to determine whether anxiety becomes more apparent for children who stutter with accumulated negative speaking experiences. Social anxiety disorder, in particular, is a chronic and disabling condition associated with significant life impairment. Left untreated, it is likely that stuttering children with social anxiety disorder may develop the same chronic social, emotional, occupational, and educational impairments reported by stuttering adults. This is particularly relevant when considering that many of the features of social anxiety—poor social skills, lack of eye contact, social avoidance—are known to contribute to the maintenance of social fears by reducing opportunities to practice social skills and limiting positive social encounters (Clark & Wells, 1995; Iverach & Rapee, 2014; Rapee & Heimberg, 1997). Hence, treatment programs designed to address the unique social fears associated with stuttering may improve the long-term outcomes for stuttering children. In addition, given that multiple pathways to the acquisition of social anxiety disorder exist in non-stuttering populations (e.g., genetics, temperament, childrearing, negative life events, adverse social experiences; see Rapee & Spence, 2004), future research is also needed to determine the unique interplay of factors that may influence development of social anxiety disorder among stuttering children.

Continuing Education Questions

1. Compared to non-stuttering controls, school-age stuttering children had:

    a. Six-fold increased odds of meeting criteria for generalized anxiety disorder

    b. Increased odds of meeting subclinical criteria for social anxiety disorder

    c. Six-fold increased odds of meeting criteria for any anxiety disorder

    d. Increased odds of meeting criteria for separation anxiety disorder

    e. Six-fold increased odds of meeting criteria for social anxiety disorder

2. The online diagnostic assessment used in this study was:

    a. Completed by parents to determine the presence of anxiety disorders in each child

    b. Completed by children to determine the presence of anxiety disorders in each child

    c. Completed by parent and child together to determine the presence of anxiety disorders in the child

    d. Completed as a full mental health assessment of the child including an anxiety disorders assessment

   e.   Completed by parents to determine psychosocial distress

3.   Anxiety disorder diagnoses were based on:

   a.   Computer-scored diagnostic decisions programmed in line with the diagnostic criteria of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV)

   b.   Diagnostic decisions made by a clinical psychologist trained in the diagnostic criteria of the DSM-IV based on answers to open-ended questions and the computer-scored diagnostic decision

   c.   A cumulative score of anxiety severity across all parent and child report measures of anxiety

   d.   Diagnostic decisions made by two clinical psychologist trained in DSM-IV criteria to ensure reliability

   e.   Diagnostic decisions made by a clinical psychologist trained in the diagnostic criteria of the DSM-IV based parent report of distress

4.   A diagnosis of Anxiety Disorder Not Otherwise Specified (ADNOS) was made when:

   a.   Specific diagnostic criteria were met but symptoms were not clinically distressing

   b.   Specific diagnostic criteria were met but symptoms were not clinically interfering

   c.   Specific diagnostic criteria were not met but symptoms were clinically distressing and/or interfering

   d.   Specific diagnostic criteria were not met but symptoms were clinically distressing

    e.   Specific diagnostic criteria were not met but symptoms were clinically interfering

5.   Stuttering children reported significantly higher scores on the Culture Bullying Scale of the Personal Experiences Checklist when compared to controls because:

    a.   There were cultural and language differences between the stuttering and control groups

    b.   Significantly more stuttering children spoke a second language at home

    c.   Significantly more control children spoke a second language at home

    d.   Children who stutter were significantly more likely to endorse items indicating that they had been teased by peers about their language or their voice

    e.   Children who stutter were significantly more likely to endorse items indicating that they had been teased by peers about their culture

Continuing Education

Answers

1 e

2 a

3 b

4 c

5 d

Educational Objectives

The reader will be able to: (a) describe factors that may contribute to the development of anxiety in stuttering children, (b) explain how anxiety disorders were assessed and diagnosed, (c) discuss rates of anxiety disorders for stuttering children in comparison with non-stuttering controls, (d) outline similarities between diagnostic outcomes and parent/child-reported anxiety.

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Biographical Sketch

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Dr Heidi Lyneham is a clinical psychologist and Director of the Centre for Emotional Health Clinic, Macquarie University. Her research focuses on improving assessment and treatment methods for emotional problems experienced by children and adolescents, and improving access to services for families from rural areas.

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Associate Professor Ross Menzies is a clinical psychologist with an interest in the origins and management of anxiety. He has developed cognitive behaviour therapy packages for the treatment of obsessive compulsive disorders and published theories of the origins of phobias. He is currently the director of the Anxiety Clinic at The University of Sydney.

Professor Ron Rapee is Distinguished Professor and founding member of the Centre for Emotional Health, Macquarie University. In 2015 he was awarded an Australian Research Council Laureate Fellowship for research into the development of emotional functioning during adolescence. His work spans 25 years and he has published extensively on understanding and managing emotional difficulties across the lifespan.

Tables

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Table 1: Child-related demographic variables for children in the stuttering and control groups

Child-related variables		Stuttering group (N = 75) n (%)	Control group (N = 150) n (%)
Gender	Male	63 (84.0%)	126 (84.0%)
	Female	12 (16.0%)	24 (16.0%)
Siblings	No	7 (9.3%)	10 (6.7%)
	Yes	68 (90.7%	140 (93.3%)
Speech-language disorders[a] (not including stuttering)	No	68 (90.7%)	147 (98.0%)
	Yes (current)	5 (6.7%)	1 (0.7%)
	Yes (past)	2 (2.7%)	2 (1.3%)
Ever sought mental health assessment/referral/treatment	No	54 (72.0%)	114 (76.0%)
	Yes	21 (28.0%)	36 (24.0%)
Current psychiatric disorders	No	72 (96.0%)	141 (94.0%)
	ADHD/ADD	0 (0.0%)	5 (3.3%)
	Autism/Asperger's	2 (2.7%)	4 (2.7%)
	Autism+ADHD	1 (1.3%)	0 (0.0%)
Medication[b] (last 3 months)	None	32 (42.7%)	66 (44.0%)
	Prescription/ Over-the-counter	40 (53.3%)	78 (52.0%)
	Psychiatric	3 (4.0%)	6 (4.0%)

[a] Speech-language disorders for stuttering children included: current receptive/expressive speech/language delay (n = 3), current verbal information processing disorder (n = 1), current mild lisp (n = 1), and past speech delay (n = 2).

Speech language disorders for non-stuttering controls included: current receptive/expression language delay (n = 1), past articulation disorder (n = 1), and past speech delay (n = 1).

[b] Prescription medications (e.g., asthma, antibiotics, steroids, allergies); over-the counter medications (e.g., vitamins, pain, cough/cold antihistamines, ear drops, eczema); psychiatric medication (e.g., Concerta, Dexamphetamine, Ritalin, Sertraline, Respiridone).

Table 2: Primary caregiver[a] and family-related variables for children in the stuttering and control groups

Primary caregiver and family-related variables		Stuttering group (N = 75) n (%)	Control group (N = 150) n (%)
Gender	Male	6 (8.0%)	7 (4.7%)
	Female	69 (92.0%)	143 (95.3%)
Marital status	Married/defacto	71 (94.7%)	142 (94.7%)
	Separated/divorced/other	4 (5.3%)	8 (5.3%)
Highest level of education	High school or equivalent	12 (16.0%)	12 (8.0%)
	Apprenticeship/certificate/ diploma	24 (32.0%)	21 (14.0%)
	Under-graduate university	19 (25.3%)	51 (34.0%)
	Post-graduate university	20 (26.7%)	66 (44.0%)
Employment	Full-time	10 (13.3%)	30 (20.0%)
	Part-time/Contract	50 (66.7%)	73 (48.7%)
	At home by choice	11 (14.7%)	38 (25.3%)
	Other	4 (5.3%)	9 (6.0%)
Gross annual household income[b]	$0—$51,999	4 (5.3%)	9 (6.0%)
	$52,000—$83,199	16 (21.3%)	14 (9.3%)
	$83,200—$124,799	26 (34.7%)	53 (35.3%)
	$124,800—$207,999	18 (24.0%)	42 (28.0%)

	$208,000—$416,000+	11 (14.7%)	32 (21.3%)
Cultural Background[c]	Australian/Oceanian/ North-West European	56 (74.7%)	118 (78.7%)
	Other	19 (25.3%)	32 (21.3%)
Main language spoken at home	English	72 (96.0%)	143 (95.3%)
	Other	3 (4.0%)	7 (4.7%)

[a] Each child's primary caregiver completed questionnaires/measures relating to the child.

[b] Gross annual income reported in Australian dollars (2013-2015).

[c] Oceanian (e.g., Australian, Aboriginal, Torres Strait Islander, New Zealander, Solomon Islander, Papua New Guinean, Samoan, Tongan); North-West European (e.g., British, Irish, Austrian, Dutch, French, Swiss, Belgian, Danish, Swedish); Other (e.g., Southern and Eastern European, North African and Middle Eastern, South-East Asian, North-East Asian, Southern and Central Asian, People of the Americas, Sub-Saharan African).

Table 3: Prevalence of anxiety disorders for children in the stuttering and control groups

Anxiety Disorder	Diagnostic Category	Stuttering Group (N = 75) % (n)	Control Group (N = 150) % (n)	Odds Ratio (95% CI)	*p*-value
Social Anxiety Disorder	Clinical	24.0 (18[a])	4.67 (7)	6.51 (2.57—16.51)	**<.001**
	Subclinical	4.0 (3)	4.67 (7)	1.11 (.27—4.60)	.883
Separation Anxiety Disorder	Clinical	6.67 (5)	4.0 (6)	1.78 (.51—6.19)	.363
	Subclinical	2.67 (2)	1.33 (2)	2.11 (.29—15.30)	.462
Generalized Anxiety Disorder	Clinical	8.0 (6)	8.0 (12)	1.16 (.41—3.25)	.783
	Subclinical	13.33 (10)	2.0 (3)	7.68 (2.04—29.00)	**.003**
Obsessive Compulsive Disorder	Clinical	0.0 (0)	1.33 (2)	*	*
	Subclinical	0.0 (0)	0.0 (0)	*	*
ADNOS	Clinical	4.0 (3)	0.0 (0)	*	*
	Subclinical	0.0 (0)	0.0 (0)	*	*

Any Anxiety Disorder[b]	Clinical	32.0 (24)	10.67 (16)	3.95 (1.94—8.06)	**<.001**
	Subclinical[c]	13.33 (10)	8.0 (12)	1.79 (.73—4.41)	.204
Any Specific Phobia[d]	Clinical	18.67 (14)	10.67 (16)	1.92 (.88—4.18)	.100
	Subclinical[c]	8.00 (6)	7.33 (11)	1.10 (.39—3.14)	.857

Note: Findings in bold represent significance at $p \leq .007$; ADNOS = Anxiety Disorder Not Otherwise Specified.

[*] Odds ratios were not estimated for Obsessive Compulsive Disorder and ADNOS due to an insufficient number of cases within each diagnostic category.

[a] Of the 18 stuttering children who met criteria for clinical social anxiety disorder, 10 parents acknowledged that their child stuttered within the written component of the YODA. Therefore, the clinical psychologist who evaluated YODA responses was not blinded to group membership for these 10 children. In all cases, the clinical psychologist used clinical judgment to diagnose social anxiety disorder as per guidelines outlined in section 2.2.2.3.

[b] Any Anxiety Disorder includes Social Anxiety Disorder, Separation Anxiety Disorder, Generalized Anxiety Disorder, Obsessive Compulsive Disorder, and ADNOS.

[c] Subclinical cases included participants who met subclinical criteria for one or more anxiety disorder; subclinical cases who also met clinical criteria for one or more anxiety disorder were excluded from this analysis.

[d] Specific phobia was diagnosed in cases of persistent, excessive and unreasonable fear of at least one of the following categories: animals, insects, heights, storms, water, the dark, blood/injections/injury, enclosed spaces, doctors, vomiting, loud noises, costumed characters (e.g., clowns), transport (e.g., airplanes).

Table 4: Mean scores on the SCAS (parent and child report) for children in the stuttering and control groups

	Parent/Child Report	Stuttering group (N = 75)		Control group (N = 150)		*p*-value	Effect size[b] (95% CI)
		Mean (SD)	Range[a]	Mean (SD)	Range[a]		
Panic attack / agoraphobia	Parent	1.36 (2.20)	0—11	0.78 (1.72)	0—13	.048*	.31 (.06—.55)
	Child	2.72 (3.52)	0—15	2.05 (2.92)	0—21	.160*	.22 (-.19—.62)
Separation anxiety	Parent	4.23 (3.37)	0—15	2.85 (3.12)	0—18	**.003**	.43 (.02—.85)
	Child	5.55 (3.71)	0—14	3.60 (2.84)	0—18	**<.001***	.62 (.21—1.03)
Physical injury fears	Parent	3.13 (2.60)	0—12	2.49 (2.36)	0—12	.065	.26 (-.05—.58)
	Child	3.84 (2.83)	0—11	2.99 (2.36)	0—9	.019	.34 (.01—0.67)
Social phobia	Parent	4.44 (3.16)	0—13	2.80 (2.70)	0—15	**<.001**	.58 (.20—.95)
	Child	5.19 (3.58)	0—15	3.40 (2.97)	0—16	**<.001***	.56 (.15—.98)
Obsessive compulsive	Parent	1.56 (2.43)	0—16	1.05 (1.77)	0—12	.072	.25 (-.01—.52)
	Child	3.67 (2.90)	0—12	3.53 (2.87)	0—13	.744	.05 (-.33—.42)
Generalized anxiety	Parent	3.57 (2.74)	0—13	2.37 (2.33)	0—16	**.001**	.49 (.17—.81)

	Child	5.77 (3.08)	1—13	4.87 (2.68)	0—16	.018	.32 (-.05—.69)
Total Score	Parent	18.29 (12.72)	0—74	12.33 (11.24)	0—69	**<.001**	.51 (-1.02—2.04)
	Child	26.73 (14.92)	3—71	20.40 (12.95)	0—91	**.001**	.47 (-1.31—2.24)

Note: Findings in bold represent significance at $p \leq .003$.

[*] Equal variances not assumed, based on Levene's test for equality of variances.

[a] Possible scores range from 0—15 (Physical Injury Fears), 0—18 (Separation Anxiety, Social Anxiety, Obsessive Compulsive, Generalized Anxiety Disorder), 0—27 (Panic Attack/Agoraphobia), and 0—114 (Total Difficulties).

[b] Cohen's d is reported as the effect size statistic to indicate the magnitude of differences between groups, where .2 = small effect, .5 = moderate effect, and .8 = large effect.

Table 5: Mean scores on the SMFQ and PECK (child report) and the SDQ (parent report) for children in the stuttering and

control groups

	Stuttering group (N = 75)		Control group (N = 150)[a]		*p*-value	Effect size[b] (95% CI)
	Mean (SD)	Range[a]	Mean (SD)	Range[a]		
SDQ Total Difficulties	10.05 (6.00)	0—26	6.53 (5.47)	0—30	**<.001**	.63 (-.11—1.36)
SDQ Internalizing	4.08 (3.67)	0—18	2.43 (3.02)	0—18	**.001***	.51 (.09—.93)
SDQ Externalizing	5.97 (4.07)	0—19	4.10 (3.22)	0—15	**.001***	.53 (.07—0.99)
SDQ Conduct Problems	1.52 (1.68)	0—9	1.16 (1.51)	0—9	.105	.23 (.03—.44)
SDQ Hyperactivity/Inattention	4.45 (2.92)	0—10	2.94 (2.25)	0—10	**<.001***	.61 (.28—.93)
SDQ Emotional Symptoms	2.32 (2.24)	0—10	1.27 (1.91)	0—10	**.001***	.52 (.26—.78)
SDQ Peer Problems	1.76 (2.05)	0—8	1.16 (1.58)	0—9	.028	.34 (.12—.57)
SMFQ Total	4.96 (4.13)	0—20	3.61 (3.94)	0—24	.018	.34 (-.18—.86)
PECK Relational-Verbal Bullying[c]	4.92 (5.05)	0—18	4.34 (7.06)	0—43	.528	.09 (-.75—.93)
PECK Physical Bullying[c]	2.16 (2.94)	0—11	2.43 (4.18)	0—25	.618	-.07 (-.57—.43)

PECK Culture Bullying[c]	1.60 (2.09)	0—10	.45 (1.22)	0—10	**<.001**[*]	.73 (.53—.94)
PECK Total[c]	8.89 (8.96)	0—32	7.36 (11.87)	0—73	.326	.14 (-1.30—1.57)
PECK Item 5 (Culture Bullying Scale): "*Other kids make fun of my language*"[c]	.73 (1.00)	0—4	.15 (.47)	0—3	**<.001**[*]	.84 (.75—.93)
PECK Item 25 (Culture Bullying Scale): "*Other kids tease me about my voice*"[c]	.65 (.94)	0—3	.18 (.57)	0—4	**<.001**[*]	.66 (.57—.75)

Note: Findings in bold represent significance at $p \leq .003$.

[*] Equal variances not assumed, based on Levene's test for equality of variances.

[a] Possible scores range from 0—26 (SMFQ Total score), 0—40 (SDQ Total Difficulties), 0—20 (SDQ Internalizing and Externalizing), 0 – 10 (SDQ Conduct Problems, Hyperactivity/Inattention, Emotional Symptoms, and Peer Problems scales), 0—44 (PECK Relational-Verbal Bullying), 0—32 (PECK Cyber Bullying), 0—36 (PECK Physical Bullying), 0—16 (PECK Culture Bullying), 0—128 (PECK Total score).

[b] Cohen's d is reported as the effect size statistic to indicate the magnitude of differences between groups, where .2 = small effect, .5 = moderate effect, and .8 = large effect.

[c] Data are reported for 149 non-stuttering controls for the PECK, due to 37.5% missing data for one control participant. This participant completed item 5 of the PECK and was therefore included in the analysis for this single item.