

Co-Occurring Conditions among Young Adults who Stutter

Molly Jacobs^{1*} and Patrick Briley²

which conditions take divergent paths and resolve during childhood. Additional insights are possible through utilization of patient reported data, particularly when inferences can be made to the population based on analyses of that data [26]. To our knowledge, few studies have targeted young adults in the 24-to-32-year age range using a nationally representative sample of self-reported data. Gerlach et al. (2018) reported on elevated ADHD and learning disability among PWS in the same dataset as being used for the current project. However, their analysis focused on labor market outcomes among PWS and did not extend beyond the descriptive level for those two variables. This study fills a gap in the existing literature by exploring the incidence of co-existing conditions, self-reported by PWS and people who do not stutter (PWNS). This analysis will add to previous findings, which showed increased incidence of non-speech related conditions primarily via secondary reports, by examining self-reported data of young adults with stuttering. Self-reported data decreases interpretation bias introduced in secondhand reports and incorporates a comprehensive individual perspective that is missing in electronic health records (EHR) [27,28]. Addressing these issues, using self-reported measures, among a sample of young adults precludes the possibility that the presence of coexisting conditions is influenced by secondhand reports.

Method

Study sample

To appropriately address the incidence of stuttering and other conditions in self-reports from young adults, this study utilized data from the National Longitudinal Study of Adolescent to Adult Health (ADD Health)-a nationally-representative, longitudinal panel of the US population containing self-reported information on social, economic, psychological, and physical well-being as well as contextual information on the family, neighborhood, community, school, friendships, peer groups, and romantic relationships. ADD Health followed a sample of 12,105 adolescents in 7th to 12th grade during the 1994-1995 school years (ages 12 to 17) with four in-home interviews occurring at irregular intervals. Wave I was collected in 1994/95 when participants were 12 to 17 years old. Waves II and III were collected in 1996 and 2001/02, respectively. This study utilizes Wave IV which was collected in 2008 when respondents were 24 to 32 years old. While each wave consisted of a slightly different questionnaire with a different focus, Wave IV Section 6: Illness, Medications, and Physical Disabilities included detailed information on participants' medical diagnoses and condition status. For additional information on the ADD Health survey and sampling process, see <http://www.cpc.unc.edu/projects/addhealth/design>.

ADD Health has been used extensively to study a variety of topics related to stuttering and characteristics of PWS. Studies concerning labor market outcomes [29,30], aggressive behavior [31], sleep patterns [32,25], depression and suicidal ideation [24], and esophagus-muscularis tissue variation [33] among PWS used these data to generate robust findings and unique differences between those who do and do not stutter. However, to date, no research has used ADD Health to evaluate differences in the prevalence of asthma, ADD/ADHD, anxiety, depression, and epilepsy.

Identification of stuttering

The survey item regarding stuttering was only included in ADD Health Waves III and IV. In these waves, respondents were asked the question 'Do you have a problem with stuttering or stammering?' To identify individuals with stuttering and to ensure that individuals did

not misidentify themselves as a PWS, individuals in this study were only classified as a PWS if they reported 'yes' to the survey question regarding stuttering in both waves. This classification scheme resulted in 261 PWS (unweighted), which represents 1.8 percent of the sample. Descriptive statistics for key variables of PWS and PWNS are provided in Table 1.

Demographic characteristics

Demographic characteristics include respondents' sex, age, race, and ethnicity. The sample was 47% male and over 25% minority race/ethnicity. Differences were present in the composition of people who do and do not stutter as a function of race. Specifically, Hispanics and African Americans, comprised roughly 14% and 29% of PWS, respectively, compared to comprising roughly 11% and 14% of PWNS, (African American: $\chi^2=18.66$, $p<0.0001$; Hispanic: $\chi^2=4.88$, $p=0.003$), respectively. Stuttering was also more prevalent among males than females who made up 60% of PWS, ($\chi^2=19.44$, $p=0.002$). Average age was 28 (sd=0.12) years with little difference between PWS and PWNS, ($t=0.94$, $p=0.35$).

Income

Respondents provided an estimate of their personal, pre-tax earnings which included wages or salaries, including tips, bonuses, and overtime pay, and income from self-employment. Average earnings were \$35,766.34 (sd=\$45,526.51) per year for PWNS. PWS earned significantly less with annual earnings reported at \$29,182.14 (sd=\$65,168.91) ($t=15.47$, $p<0.0001$). In the regression model, income was included in logarithmic form to account for potential socioeconomic differences.

Parental characteristics

Nearly all parents of PWNS (96%) were married compared to only 90% of parents of PWS-a statistically significant difference ($\chi^2=9.6$, $p=0.002$). Education is represented by a set of discrete values ranging from one to nine. These values represent the number of years of post-secondary education. On average, parents of PWNS (5.6, sd=0.10) had greater educational attainment than parents of PWS (4.7, sd=0.26), a statistically significant difference ($\chi^2=20.8$, $p=0.013$).

Co-Occurring conditions

Section 6 of the Wave IV asks respondents whether a doctor, nurse, or other health care provider has ever diagnosed him/her with a condition, which included the following five conditions: asthma, ADD/ADHD, anxiety, depression, and epilepsy. Conditions in this section were selected since they were self-reported, maintained a uniform questioning framework, and presented clear criteria for diagnosis.

Analysis

All analyses were performed using SAS 9.4 (Cary, NC) proc survey logistic. The ADD Health study design used a clustered sample in which the clusters were sampled with unequal probability. While reducing the cost of data collection, this design complicates the statistical analysis because the observations are no longer independent and identically distributed. To analyze the data correctly requires the use of special survey software packages specifically designed to handle observations that are not independent and identically distributed.

The proc survey logistic procedure estimated the logistic regression model taking the survey design and data collection methods into account. In addition to survey procedures that accounted for

sampling variation, estimates were also weighted. The ADD Health sampling weights were designed to turn the sample of adolescents interviewed into the representative population we intended to study. Unless appropriate adjustments are made for sample selection and participation, estimates from analyses using the ADD Health data can be biased when any factor used as a basis for selection as a participant in the study also influences the outcome of interest. To obtain unbiased estimates, it is important to account for the sampling design by using analytical methods designed to handle clustered data collected from respondents with unequal probability of selection.

By using these sampling weights and model specifications that account for regional stratification and the clustering of adolescents within schools, analysis produced unbiased estimates of population parameters and standard errors. Regression analysis tested for differences in the incidence of co-occurring conditions in PWS and PWNS, controlling for age, race, sex, parental attributes, and income. Five logistic regressions (one for each condition) were run using the same empirical specification to evaluate each condition individually.

The regression modeled a binomial outcome coded as 0 or 1 to indicate whether each respondent reported the condition of interest. The model was used to obtain the odds ratio which indicates the relative likelihood of the dependent variables, adjusting for the independent variables.

Results

PWS had a higher proportion of asthma (15.7% vs. 14.3%), ADD/ADHD (10% vs. 4.5%), anxiety (16.1% vs 11.2%), depression (25.3% vs. 14.6%), and epilepsy (2.3% vs. 1.2%) compared to PWNS (Table 1). However, differences in the portion of the populations with these conditions were only statistically significant for ADD/ADHD ($\chi^2=2.5$,

Table 1:

	N	Mean	Std Dev			
Age		28.30001				
logIncome		10.16558				
Parent Education	8997	5.517258				
	N	Percent				
Male		0.467087				
Stutter		0.018332				
Hispanic						
African American						
Parent Married		0.959855				
Asthma						
Depression						
Anxiety						
Epilepsy	180					
	N	Mean	Std Dev	N	Mean	Std Dev
Age		28.30024	0.118645		28.6287	
logIncome	8547		0.024855		9.862164	0.133098
Parent Education	8271	5.574082				
	N	Percent		N	Percent	
Mal		0.45818			0.598926	
Hispanic		0.106683			0.143098	
African American					0.283934	
Parent Married	8302	0.963178			0.898188	
Asthma		14.28				
Depression	2098	14.58				
Anxiety						
Epilepsy						
ADD/ADHD						

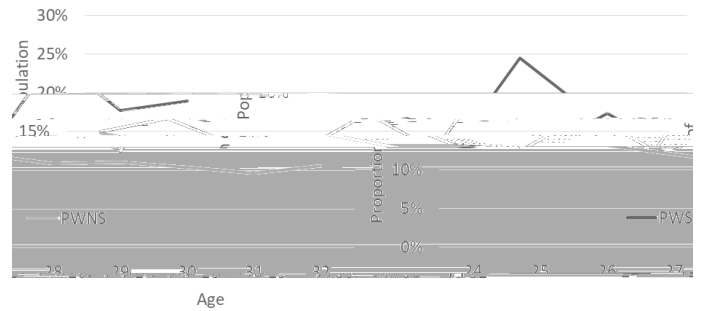


Figure 1:

Table 2: Chi-square test of differential between young adults who do and do not

	Chi-Square	p-Value
ADD/ADHD		

$p<0.001$), anxiety ($\chi^2=6.1$, $p=0.01$), and depression ($\chi^2=23.3$, $p<0.001$) (Table 2). The disparity in anxiety incidence between PWS and PWNS is depicted in Figure 1.

Logistic regression results modeled the probability of reporting the condition accounting for demographic and parental differences (Table 3). In the results from these regression models, a positive coefficient represented a higher log-odds ratio of the given characteristic for the respective parameter. For ease of interpretation, odds ratios were provided which quantify the relative probability of the condition given the independent characteristic. Income was significant for asthma, ADD/ADHD, anxiety, depression, and epilepsy. While there were some small differences in the racial/ethnic probability of these conditions, most demographic and parental characteristics were insignificant.

Stuttering had a statistically significant association with asthma (OR=2.1, CI= 1.04-4.27), ADD/ADHD (OR=2.3, CI=0.94-5.77), anxiety (OR=1.7, CI=0.90-3.34), and depression (OR=2.2, CI=1.19-3.9) at the 95% level. Odds ratios represented the likelihood of PWS having been diagnosed with a given condition relative to PWNS. Ratios less than one indicated that PWS had a lower probability of having the condition. Odds ratios in Table 3 indicated that PWS had a higher likelihood of having asthma, ADD/ADHD, anxiety, and depression compared to PWNS.

Discussion

This study examined the incidence of five self-reported conditions among PWS and PWNS. Findings suggest that PWS have increased odds of experiencing asthma, ADD/ADHD, anxiety, and depression. Previous analyses have examined similar conditions among CWS; however, this study extends those findings by examining co-occurrences that were self-reported by those in young adulthood.

Conditions with a significantly different representation between people who do and do not stutter

Asthma

Previous studies have helped to uncover a relationship between the

Citation:

system, which is also involved in ADHD [43]. Additionally, stuttering and ADHD share characteristics of occurring more frequently in males and being exacerbated by stress [20]. Of interest are questions related to the neurobiological similarities and differences in all combinations of male and female children, including those who do and do not stutter and those with and without ADHD. Future studies addressing these questions might provide critical pathophysiological evidence, contributing to etiological research.

Clinically, identification of co-occurring ADHD in PWS prompts additional considerations for SLPs since over two-thirds of individuals with ADHD suffer from at least one co-existing condition and up to half of children with ADHD also suffer from a learning disorder [44]. For example, in the presence of a suspected learning disorder rooted in reading disability, it should be determined if deficits in reading outcomes are a result of a true delay or if stuttering behaviors are mirroring disabilities in decoding (Blood et al., 2003). That is, are breaks in speech resulting from reduced reading fluency or in stuttering induced breaks in the forward flow of speech. Determination of the presence of ADHD may also result in divergent clinical approaches. For example, deficits in reading ability may prompt usage of sentence formulation tasks over reading passages as stimuli used in therapy when learning/practicing behavioral techniques. If the determination is that the reader's behaviors are resulting from stuttering and not reading disability, then a clinical approach may be to use passages with increased linguistic complexity as the PWS' work towards implement motoric adaptations while taxing the system with complex stimuli. The complex interactions of symptoms described above are not limited to stuttering and reading disability and the association between stuttering and the common coexisting conditions of ADHD should be considered in this context. Clinical awareness of high rates of co-occurring ADHD among PWS is imperative given that differences in attributes of ADHD call for varying clinical approaches [20], and the presence of ADHD symptoms may necessitate longer durations of intervention when reduction of observable behaviors of stuttering is included as an outcome measure [19]. Ultimately, any behavioral adaptation (e.g., cancellations, prolonged speech, preparatory sets, etc.) [45] can be negatively influenced by ADHD, where distractibility or lack of attention creates a barrier to learning and implementation of these behavioral changes. While ADD/ADHD among PWS is biological in nature, the higher incidence of anxiety among young AWS in the present sample is more likely a result of stuttering instead of being a true co-occurring disorder [46].

Anxiety/panic disorders and depression

Findings of increased anxiety among those in the current sample were consistent with other studies indicating that anxiety is more prevalent among all ages of PWS [46-50]. Previous findings merged with current results suggest that PWS are at risk of developing anxiety early in life and potentially having it persist into adulthood. The anxiety experienced by both children and young AWS is likely generated from both internal and external contributors and relates to both the reaction they receive from others and the feelings they experience when communicating [51,52]. Anxiety may be undue and a result of false perceptions of how others would perceive or respond stuttering. Additionally, anticipation of stuttering can lead to anxiety [2, 49,53]. In both children and adults who stutter, anxiety can be a precursor to avoidance behaviors [54,55].

Importantly, anxiety in PWS is not dependent on severity of stuttering's observable behaviors [48]. Furthermore, evidence that anxiety exists in childhood and adulthood among PWS indicates that

these common disabilities often go unnoticed or untreated, increasing the likelihood that these issues worsen in severity, impede social development, negatively impact labor market outcomes, and interfere with social function [56-58]. The current findings concerning adults echo findings from studies showing issues of social and emotional well-being among CWS [59]. Therefore, early identification and treatment of anxiety among PWS is critical. While unhealthy thoughts, feelings, and/or reactions to stuttering may, at times, not receive equal consideration to more overt symptomatology, these unobservable behaviors could potentially be detrimental to long-term social, emotional, and behavioral well-being. Fear of social situations and negative peer evaluation contribute to social anxieties [60,61], and comprehensive treatment during the developmental years could reduce these negative impacts in young adults, thus improving long term quality of life for PWS. Treating SLPs should consider the full range of impact of stuttering on the individual [62], and healthcare providers treating young PWS should carefully screen for and address all pertinent issues to prevent persistence and/or exacerbation as PWS age. This type of comprehensive treatment goes beyond traditional behavioral therapies and aids in addressing the full impact of stuttering [63]. Once a client has learned to modify speech patterns to work through moments of stuttering, an approach to directly work towards reducing anxiety is exposure therapy [64]. Another critical aspect of treatment in CWS or young AWS who still live with their parents is parental involvement [65], and this is especially important for PWS who are susceptible to feelings of anxiety in social situations.

While commonly co-occurring, anxiety and depression represent two separate constructs [66]. Anxiety includes negative cognitive, behavioral, and physiological reactions in response to a threat [67]. Depression involves a range of symptomatology that impacts feelings, thoughts; lasts at least two weeks; and results in a change in prior functioning [68]. Stein et al. (2001) reported that social anxiety disorder early in life is a predictor of depression later in life [69]. While data cannot be used to determine causality of reported depression in the current sample, it is not difficult to imagine a scenario where the anxieties induced by the ubiquitous nature of stuttering (not necessarily on a path to adulthood) includes a market Anxiety While anxiety am thr

Citation:

Citation:

- experimental trial. *J Commun Disord* 80:81-91.
- Fluency Disord 34:187-200.
- Caughter S, Crofts V (2018) Nurturing a resilient mindset in school-aged
- Arroll B, Kendrick T (2018) Definition of Anxiety. *Primary Care Mental*
- 68.
- Stein MB, Fuetsch M, Müller N, Höfer M, Lieb R, et al. (2001) Social anxiety adolescents and young adults. *Arch Gen Psychiatry* 58:251-256.
- for adults who stutter: Psychosocial adjustment and speech fluency. *J Fluency Disord* 37:289-299.
- Craig A (1998) Relapse following treatment for stuttering: A critical review and
- Menzies RG, O'Brian S, Onslow M, Packman A, St Clare T, et al. (2008) An
2008. *Pediatrics* 127:1034-1042.
- Proctor A, Yairi E, Duf MC, Zhang J (2008) Prevalence of stuttering in African American preschoolers. *J Speech Lang Hear Res* 64:839-853.
- Briley PM, Ellis C (2020) The influence of ethnicity and residence on presence