7-12-2023

Attention-Deficit Hyperactivity Disorder: Improving Outcomes Through Early Identification

Tina Lusk
University of Missouri-St. Louis, tms6c2@umsystem.edu

Attention-Deficit Hyperactivity Disorder: Improving Outcomes Through Early Identification

Tina Lusk

B.S., Nursing, Research College of Nursing, 2004

B.S., Human Environmental Sciences, Food Science and Human Nutrition, University of Missouri-Columbia, 2000

A Dissertation Submitted to The Graduate School at the University of Missouri-St. Louis
in partial fulfillment of the requirements for the degree
Doctor of Nursing Practice
with an emphasis as Psychiatric Mental Health Nurse Practitioner

August 2023

Advisory Committee

Anne L. Thatcher, DNP, MSW, APRN, PMHNP-BC, LMSW

Chairperson

Brittania Phillips, DNP, APRN, PMHNP-BC

Lisa Wiersema, LCPC

Abstract

***Problem*:** Failure to identify and treat attention-deficit hyperactivity disorder (ADHD) is associated with academic underachievement, social difficulties, negative physical and mental health effects. Evidence suggests approximately 3% of a broad-based population sample and roughly 13% of an at-risk population are undiagnosed despite significant symptomology (Downey & Zun, 2018; Madsen et al., 2018; Okumura et al., 2019). The United States (U.S.) has no structured screening system for ADHD. Consequently, children receive no referral for diagnosis or treatment to mitigate its effects.

***Methods*:** The Institute for Healthcare Improvement (IHI) Model for Evidence-Based Practice using the Plan Do Study Act (PDSA) cycle guided this quality improvement (QI) initiative. The design was an observational, prospective cohort with a qualitative arm. A convenience sample of children aged 6- to 12-years receiving care from one Midwest counseling and therapy practice psychotherapist was utilized. Quantitative data was collected using the Vanderbilt ADHD Diagnostic Parent Rating Scale (VADPRS) over eight weeks at psychotherapy appointments.

***Results*:** Six eligible participants ($N = 6$) participated in the study. Subjects were predominantly female (83%, $n = 5$) compared to male (17%, *n = 1).* One positive screen (16.7%, $n = 1$) resulted. Positive characteristics included female gender, inattentive ADHD, and anxiety/depression. Screening for ADHD using the VADPRS ($M = 0.17$, $SD = 0.408$), $t(5) = 0.496$, $p = 0.320$ is not significantly different from CDC prevalence rates in Illinois ($M = 0.084$).

***Practice Implications*:** Results were clinically significant. APRN guided, agency-wide implementation of VADPRS may reduce myriad consequences of unrecognized, untreated ADHD.

Attention Deficit Hyperactivity Disorder: Improving Outcomes Through Early Identification

Attention Deficit Hyperactivity Disorder (ADHD) is a neurodevelopmental disorder once regarded only as a childhood condition. However, ADHD is not a singular or stagnant malady, but a disorder evolving over the lifespan of those affected with periods of remission and recurrence (Sibley et al., 2021). For children with ADHD, symptoms persist across the lifespan and do not extinguish as they sometimes do with allergies. Rather, children learn coping strategies, allowing them to mask symptoms of ADHD as they enter adolescence and adulthood. While some coping strategies may be functional and improve how people with ADHD live in the world, others may hinder as those individuals hide aspects of themselves due to discomfort or shame (Beaton et al., 2022). The national nonprofit organization Children and Adults with Attention Deficit Hyperactivity Disorder (CHADD) estimates symptoms notably persist into adulthood for more than 75% of children with ADHD (2022).

According to the Child and Adolescent Health Measurement Initiative (CAHMI) 2019-2020 (n.d.), the prevalence of ADHD in children aged 3- to 17-years is 9.7%. The Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-5), defines ADHD as “a persistent pattern of inattention and/or hyperactivity-impulsivity that interferes with functioning or development” (American Psychological Association [APA], 2013). The DSM-5 delineates three subtypes of ADHD, including inattentive,

hyperactive/impulsive, and combined. In the combined presentation, an individual must meet diagnostic threshold for both inattentive and hyperactive/impulsive subtypes. In order to meet ADHD criteria through age 16-years, at least six symptoms must manifest for at least six months within a singular subtype; for individuals aged 17-years and older, at least five symptoms must manifest (APA, 2013). Inattentive symptoms include such behaviors as failing to pay close attention to details, failure to finish tasks due to easy distractibility, and frequent loss of items needed for task completion (APA, 2013). Hyperactive/impulsive symptoms include such behaviors as inability to remain still for extended periods, restlessness, and inability to wait for one's turn (APA, 2013). These symptoms impact a wide array of important childhood tasks including learning in school and forming relationships. As these important tasks are disrupted, a wide array of difficulties may ensue, particularly if unrecognized and untreated.

ADHD is one of the most prevalent mental health disorders and the most prevalent neurodevelopmental disorder in children (Bitsko et al., 2022). There is a perception ADHD is over-diagnosed, in large part due to increased societal understanding of ADHD and subsequent increased numbers of children identified with the disorder (Kazda et al., 2021). Though misdiagnosis of ADHD may occur due to alterations in criteria, lax diagnostic practices, pharmaceutical influence, and enhanced availability of treatment, societal perception contributes to continued underdiagnosis (Kazda et al., 2019). The reality of underdiagnosed ADHD is less understood, often leaving those children and adults with ADHD who are undiagnosed without needed resources.

ADHD is underdiagnosed in children ages 6- to 12-years who meet diagnostic criteria for ADHD. The degree to which ADHD is underdiagnosed is unclear, although

recent research provides valuable information about the phenomenon. Of children presenting to the Emergency Department who were not previously diagnosed with ADHD, 13% screened positive for ADHD (Downey & Zun, 2018). In one broad-based cohort study, 4% of children screened positive for ADHD without previous diagnosis (Madsen et al., 2018). Of those children who screened positive for ADHD, 67% were subsequently diagnosed with ADHD, which represents 2.7% of the Danish cohort (Madsen et al., 2018). In Tokyo, a similar cohort study revealed 3.1% of participants had persistent ADHD symptoms, 83.5% of whom were absent a prior diagnosis (Okumura et al., 2019).

Despite the persistence of ADHD throughout the life cycle, only 5.2% of adults are diagnosed with ADHD (Fayaad et al., 2017). Undiagnosed adults with ADHD are more likely to have comorbid mental health disorders, as well as myriad other troubling symptoms. Richter and colleagues recommend offering young adult psychiatric patients ADHD assessment (Richter et al., 2020).

Diagnosis of ADHD is the task of primary care providers and mental health professionals. However, teachers and parents are integral in providing key information for diagnosis. The large increase in children diagnosed with ADHD resulted in medical professionals asking teachers to scale back suggesting ADHD (Te Meerman et al., 2017). This call to inaction may result in teachers under-communicating symptoms and symptom implication to parents who may be unaware of their child's symptoms in the context of the school environment.

The Vanderbilt ADHD Rating Scale (VARS) is a valid and reliable assessment tool developed by the National Institute for Children's Health Quality (NICHQ) and endorsed

by the American Academy of Pediatrics to aid in the diagnosis of ADHD (Bard et al., 2013; Wolraich et al., 2013). VARS is used by mental health professionals along with other psychological assessments to diagnose children aged 6- to 12-years for ADHD. When administered, a parent version and teacher version are both administered and scored to accompany additional psychological testing for the diagnosis of ADHD. While parents and teachers currently complete these forms for children aged 6- to 12-years, current research is being conducted to evaluate a modified Vanderbilt Screening for adolescents and young adults aged 13- to 21-years (Boston Children's Hospital, 2022).

The purpose of this quality improvement project was to implement the use of VADPRS to all children to identify underdiagnosed children aged 6- to 12-years at risk for ADHD at a Midwest counseling and therapy practice where it was not previously used with all children over an eight-week period. The IHI Model for Evidence-Based Practice using the PDSA cycle guided this project's implementation. The aim of this project was to implement VADPRS screening to 75% of eligible children within eight weeks and 100% of positive screenings result in guidance by a child psychologist or primary care physician with educational information given to parents. The primary outcome measure is the number of ADHD positive screenings, while secondary outcome measures include VARS scores, associated gender, and zip codes, and the number of children whose parents seek treatment for their child. Study questions include:

In children aged 6- to 12-years old receiving services at a Midwest counseling and therapy practice:

1. What is the change, if any, in the rate of positive Vanderbilt ADHD Diagnostic Parent Rating Scale screenings identifying likely ADHD diagnosis when universal screening is implemented?
2. Is gender and zip code predictive of positive Vanderbilt ADHD Diagnostic Parent Rating Scale screening results when universal screening is implemented?
3. If identified, what is the rate of ADHD treatment seeking after use of the Vanderbilt ADHD Diagnostic Parent Rating Scale screening tool for universal screening?
4. What themes emerge from psychotherapist qualitative feedback?

Literature Review

A search using the Cochrane, PsychInfo, CINAHL, Medline, and PubMed databases was conducted. Key search terms included *"undiagnosed ADHD"*, "*ADHD", "attention deficit hyperactivity disorder"*, "*qualitative", "adult"*, "*child*"*, "*negative outcomes*", "*negative impacts"*, "*negative effects*", "*negative consequences*" with Boolean operators AND and OR, which generated 534 articles. Inclusion criteria included peer reviewed journal articles published in English between 2017 and 2022; exclusion criteria include other neurodevelopmental disorders and published before 2017. However, landmark studies discovered by ancestry were retained. After application of inclusion and exclusion criteria, 33 articles were selected. Twenty-five articles were selected using the ancestry method, resulting in 58 articles being retained for this review.

Diagnosing Disparity

Children who screen positive for ADHD symptoms and are undiagnosed are more likely to be of low socioeconomic status (SES) and to live in a specific geographic

region, Southern Denmark (Madsen et al., 2018). Additionally, they are 80% more likely to be female (Madsen et al., 2018). In Missouri in 2021, 12.5% of males aged 3-17 years were diagnosed with ADHD, whereas only 6.4% of females were diagnosed (CAHMI, n.d.). In Illinois in 2021, 10.5% of males aged 3-17 were diagnosed with ADHD, whereas only 3.2% of females were diagnosed (CAHMI, n.d.). Genetic evidence of ADHD is more likely to be diagnosed as anxiety or depression in women, but not in men (Martin et al., 2018). Additionally, a disproportionate amount of ADHD research focuses on males (Mowlem et al., 2019). While prevailing discourse once reported boys were twice as likely to have ADHD than girls, evidence suggests boys with ADHD are more likely to be identified and diagnosed. Young females with ADHD are less likely to be identified and much less likely to be referred and treated (Russell et al., 2019).

Academic Underachievement

Undiagnosed and untreated ADHD leads to lower academic proficiency in children as young as four years of age (May et al., 2021). Underachievement in school is 16.7 times higher for children identified at risk for ADHD. Academic underachievement in adults and children is most closely related to inattentive type ADHD (Henning et al., 2022; Tan et al., 2022). The ADHD symptom of inattention is more likely to manifest in girls than boys (Slobodin & Davidovitch, 2019). However, medical treatment for ADHD can mitigate the school performance gap between students with and without ADHD (Keilow et al., 2018; Arnold et al., 2020). In fact, multi-modal treatment results in the greatest reduction of the performance gap (Arnold et al., 2020). Multi-modal treatment is the use of a combination of intervention classes for treatment. Multi-modal treatment of

ADHD most commonly refers to the use of both medication treatment and non-pharmacologic treatment, such as psychoeducation and behavior therapy.

Social Deficiencies

Untreated ADHD also results in difficulty in social relationships with reduced quality of life, more isolation, fewer friendships, and emotional dysregulation resulting in consequences such as bullying from peers (Fogleman et al., 2018; Lopez-Villalobos et al., 2019; Manfro et al., 2017). Children with impaired facial emotional recognition both with ADHD and with ADHD characteristics are significantly more likely to have social and emotional challenges (Staff et al., 2021). Adolescents diagnosed with ADHD in adolescence tend to be lonelier and have lower self-esteem than adolescents diagnosed as children, suggesting an increased burden of suspended diagnosis (Zahmacioglu & Kilic, 2017). Impaired self-esteem and perceived criticism are common themes for those with ADHD (Beaton et al., 2022). Interventions improving social acceptance had concomitant improvement in academic achievement, particularly for children with inattentive type ADHD (Dvorsky et al., 2018). While academic concerns are often forefront in the discussion of ADHD, social and emotional interventions are of equal import and have the potential to globally improve symptoms of ADHD (Hare et al., 2021).

Comorbidities

Adults with ADHD who are undiagnosed are more likely to have comorbid psychiatric disturbances, including anxiety, depression, eating disorders and substance use disorders. Anxiety and depression are more prevalent comorbidly, with earlier depression onset and more frequent treatment resistance (Ahnemark et al., 2018; Powell et al., 2021; Richter et al., 2020). Increased rates of anxiety and depression in children

with ADHD correlate with symptoms of internalization (Becker et al., 2018). Children with more severe ADHD symptoms are at increased risk for eating disorders (Yilmaz et al., 2017). Furthermore, adult women with ADHD and comorbid eating disorders are less likely to recover from the eating disorder, particularly with inattentive type ADHD (Svedlund et al., 2017). Adults with symptomatic ADHD are 456% more likely to develop substance use disorder than those without ADHD or those with ADHD who are no longer symptomatic (Ilbegi et al., 2018). Adults with cocaine use disorder (CUD) who are identified and newly diagnosed with ADHD, then treated for ADHD with medications are 80% more likely to experience improvement of ADHD symptoms and 90% more likely to have improvement in CUD symptoms (Manni et al., 2019).

Burgeoning evidence suggests ADHD is associated with Alzheimer's Disease and dementia (Zhang et al., 2021). However, magnetic resonance imaging suggests cognitive decline in ADHD is structurally and pathophysiologically different from other dementias (Callahan et al, 2022). Future study may illuminate if ADHD treatment may mitigate or subvert this cognitive decline. Interestingly, increased incidence of automobile accidents is lowered when ADHD is treated (Bikic et al., 2018; Currey et al., 2017). While methylphenidate adversely affects bone mass, its use in those with ADHD had a protective effect, reducing the incidence of broken bones compared to those with ADHD who were not treated (Schermann et al., 2018).

Myriad physical comorbidities are also associated with ADHD and are exacerbated with failure to diagnose and treat it (Stickley et al., 2017). For example, ADHD is strongly correlated with diabetes (Xu et al., 2020). In children and adolescents with diabetes, ADHD is associated with poorer glycemic control, which is markedly worse

when ADHD is untreated (Mazor-Aronovitch et al., 2021; Nylander et al., 2018). Other physical comorbidities correlated with ADHD include asthma, chronic pain, allergies, lower urinary tract symptoms like urgency, sleep disorders, hypertension, and obesity (AlAhmari &Uddin, 2022; Chen et al., 2018; Guner et al., 2019; Joseph et al., 2022; Kaas et al., 2021; Mahjani et al., 2022; Rensberg et al., Wong et al., 2022).

Risks

Many risks are also associated with a diagnosis of ADHD. In children with mild behavioral issues pre-diagnosis, labeling the symptoms may elicit worsened behaviors (Owens, 2020). Diagnosis and treatment correlate with worsened behavior and diminished self-efficacy in children of high SES with matched controls, but not children of low SES (Owens, 2020). To correct for this paradoxical outcome, stigma reduction, treatment, and empowerment of those with ADHD is the objective. Stigma is the automatic negative perception others have of someone based on a particular characteristic. Qualitative studies identify the importance of identification and subsequent treatment of ADHD for individuals frequently citing the emotional burden undiagnosed ADHD may have on children. This sentiment is echoed in adults who discover they have ADHD, feeling relief they understand from where so many of their past difficulties came (Aoki et al., 2020). This highlights the need for adequate services and reduced stigma. Knowing where the difficulties lie and why is the first step toward seeking treatment and developing coping strategies.

Instruments

The tool used to screen for ADHD must be specific to ADHD, or narrowband, meeting criteria for ADHD as defined by the DSM-5. The tool must also have adequate

sensitivity to detect ADHD. The Conner's Rating Scales (CRS) have excellent sensitivity and specificity, but at a cost of $4.75 per use are inappropriate for this project (Chang, 2016; Multi-Health Systems, 2022). The Swanson, Nolan, and Pelham Rating Scale (SNAP-IV) has high sensitivity but low specificity (Hall et al., 2020). VARS, a narrowband tool like CRS and SNAP-IV, is free with adequate sensitivity and specificity, which is appropriate for this project (Bard et al., 2013; Wolraich et al., 2013).

Three landmark studies evaluate the Vanderbilt ADHD Diagnostic Parent Rating Scale (VADPRS) and the Vanderbilt ADHD Diagnostic Teacher Rating Scale (VADTRS), versions differing in who completes the assessment (Bard et al., 2013, Wolraich et al., 2003, 2013). VADPRS demonstrates high measures of internal consistency in a community population (Bard et al., 2013). Cronbach's alpha for all symptom measures ranges from .91 to .94, indicating high reliability (Bard et al., 2013). Likewise, the KR_{20} coefficient measures range from .88 to .91, indicating moderate to high homogeneity and thus confirming reliability (Barde et al., 2013). Test-retest reliability for all summed scores is great than .80, indicating reliability. Sensitivity and specificity are .80 and .75 respectively, while the positive and negative predictive value are .19 and .98 respectively. Concurrent validity with the Diagnostic Interview Schedule for Children Version IV for inattention and hyperactivity impulsivity are .69 and .66 respectively (Bard et al., 2013). Due to its high reliability, adequate sensitivity and specificity, and cost effectiveness, VADPRS is ideal for this project.

Limitations

The evidence for underdiagnosed ADHD is consistent. However, studies are primarily qualitative or observational, though many are longitudinal. Sample sizes varied

greatly from very small with tens of participants, to cohort studies with tens of thousands of participants, as well as one systematic review with millions of participants. These studies used convenience sampling methods. Screening tools for assessing risk of ADHD varied in the literature, using tools such as the Conners Scale, VARS, and Strength and Difficulties Questionnaire. Tools for quantifying the dependent variables were likewise diverse. Many of the tools used are subject to either rater- or response bias. A key strength is the longitudinal design of several of the studies. Additionally, many important studies originate from countries other than the U.S.

Framework

The IHI Model for Evidence-Based Practice using the PDSA cycle was chosen to guide this project implementation. The PDSA cycle shows efficacy in changing behavior over time. In a study with an aim similar to that of this project, an initial PDSA cycle aimed at reducing free thyroid testing demonstrated a modest reduction, multiple PDSA cycles more than doubled the reduction (Taher et al., 2020). Additionally, utilizing PDSA cycles with a straightforward strategy can increase referral rates, as demonstrated in another study with the aim to increase cardiac rehab referrals (Sangani et al., 2022).

The PDSA cycle was chosen to promote change in identifying children with ADHD, with increasing utilization over time and an overall increase in referral for children with ADHD. A plan of change was developed. A literature review was completed, and site identified. A Pareto chart was completed identifying comorbidities associated with ADHD for children aged 4- to 12-years and 12+ years of age. Economic impacts associated with undiagnosed ADHD were evaluated. Finally, a logic model and timeline were developed. The do stage began with implementation of VADPRS at the

consenting site. The study stage began at the initiation of data analysis for the significance of the instrument VADPRS used for detecting ADHD symptoms. The act stage began by determining the significance of use of VADPRS and ended the cycle upon completion of disseminating future recommendations for use of VADPRS as a screening tool for ADHD. The next PDSA cycle will utilize what was learned from the first cycle to improve upon the process, which is beyond the scope of this quality improvement project.

ADHD is a pervasive mental health issue for children that can last a lifetime. ADHD affects social and academic functioning and impacts both physical and mental health. By screening children and adolescents for ADHD, lifelong consequences of ADHD may be mitigated.

Method

Design

This quality improvement project was an observational prospective cohort design with both quantitative and qualitative data collected. This project was conducted at a Midwest counseling and therapy practice over an eight-week period. This project was implemented with all pediatric clients by one psychotherapist at the participating agency as opposed to only those clients who indicate possible symptoms of ADHD, which has been standard practice in the past.

Setting

The setting for this project is a Midwest counseling and therapy practice providing psychotherapy to clients of all ages serving Illinois and Indiana. The population of the area sampled from is 5,109,292 (United States Census Bureau [USCB], 2022).

Approximately 13.8% of those in this area live in poverty, whereas about 34.8% of the population are minorities (UCSB, 2022). While Illinois ranks third among states for access to mental health care, Indiana ranks forty-third (Mental Health America [MHA], 2023). When considering prevalence of mental illness and youth access to care, Illinois ranks thirteenth and Indiana twenty third among states (MHA, 2023). Individuals to mental health care providers are 370:1 in Illinois and 560:1 in Indiana, placing both states squarely in the lowest 45% of mental health workforce availability.

Population/Sample

This project used a convenience sample of children aged 6- to 12-years receiving psychotherapy services at a Midwest counseling and therapy practice serving clients of all ages by one participating psychotherapist. Inclusion criteria were children aged 6- to 12-years, receiving services at the participating practice and seeing the participating psychotherapist, and parental consent for screening. Exclusion criteria were children younger than 6-years or older than 12-years of age, children previously diagnosed with ADHD, those not being served by this practice or seen by this provider and lack parental consent. The project estimated 5-20 participants over eight weeks.

Data Collection

Data was collected prospectively via use of the VADPRS. The VADPRS form was given by the child psychotherapist to each parent whose child receives services at the organization. Parental consent was implied by completion of the screening tool and returning it to the psychotherapist who stated with each parent that it was optional. The psychotherapist scored each returned VADPRS, made a deidentified copy for the primary investigator (PI) to access, and the psychotherapist linked it to the graphed collection

form. The graphed collection form tracked each client offered a VADPRS; participating client information included child age, gender, insurance status, zip code, and deidentified screening number. Information regarding the declination reason was also included, as well as if follow-up was initiated, if ADHD was diagnosed, and if treatments were sought, and why or why not. A positive screen for ADHD resulted in education about ADHD by the psychotherapist, additional testing materials included the VADTRS, referral to the client's primary care provider or psychotherapist as appropriate, as well as an educational infographic about ADHD in children at the next appointment. At the end of data collection, the psychotherapist received a questionnaire regarding the process. Information gathered included both open- and closed-ended questions including feedback the psychotherapist had about the process and any feedback parents volunteered about the process. All data was stored in the psychotherapist's office and transcribed to a password protected computer owned by the PI. All data was de-identified prior to the PI accessing it. Demographic data included age, gender, insurance status, and zip code of the children.

Data Analysis

Both descriptive and inferential statistics were used to analyze the data. Descriptive statistics included a frequency-count table to delineate positive and negative screenings, gender, and zip code. The nominal data was analyzed using independent samples *t*-test. Screening data was analyzed relative to gender and zip code using descriptive statistics. Statistical Package for Social Sciences version 29 (SPSS v.29) was used to analyze the data. Qualitative responses were typed verbatim into a Microsoft Word document and thematic analysis was completed by the primary researcher.

Approvals

The participating community agency does not have an Institutional Review Board (IRB). However, approval was obtained by the Clinical Psychotherapist to conduct this quality improvement project at this agency. Approval for this quality improvement project was also obtained by the IRB at the University of Missouri-Saint Louis to ensure human subjects protection.

Results

Demographics

Of the six children ($N = 6$) eligible for VADPRS screening, consent from parents was obtained for 100% of children, none of whom were previously diagnosed with ADHD. The age distribution for these children ranged from ages 8- to 12-years old, as depicted in Figure 1. Seventeen percent ($n = 1$) of participants were male and 83% ($n = 5$) were female, as shown in Figure 2. All six children lived in the greater Chicago area. Approximately 17% of children lived in each of the zip codes 60304, 60638, 60630, and 60301, whereas roughly 33% resided in 60506, see Figure 3.

VADPRS

The rate of ADHD diagnosis prior to administration of the VADPRS was 0%. The rate of ADHD diagnosis following ADHD screening with VADPRS was 16.7%. Implementation of universal screening for one psychotherapist at the Midwest counseling and therapy practice resulted in an increase in ADHD diagnosis at a rate of 16.7%, see Figure 4. ADHD subscale frequency rating reveals one participant screened positive for ADHD reaching the threshold of six affirmative responses, whereas no participants screened positive for hyperactive/impulsive or combined type ADHD, see Figure 5. Of participants who screened positive for ADHD, 100% were seen by a psychologist for diagnostic evaluation. Total summed hyperactive/impulsive subscale scores for all

participants were calculated to a value of 3, whereas total summed inattentive subscale scores were calculated to a value of 19.

An independent samples *t*-test compared the sample mean to the mean of children ages 3-17 years diagnosed with ADHD in Illinois. According to the Centers for Disease Control and Prevention (CDC), the prevalence rate of ADHD in Illinois children is 8.4% (CDC, 2022). Results indicate screening for ADHD using the VADPRS (M = 0.1.3207, SD = 0.408), $t(5) = .496$, $p = .320$ is not significantly different from CDC prevalence rates in Illinois (M = 0.084).

Discussion

Implementation of ADHD screening using the VADPRS resulted in successfully screening children ages 6- to 12- years old for ADHD at a rate of 100%. Descriptive data and inferential statistics collected during this first PDSA cycle lends greater understanding to demographics and the screening initiative for ADHD. A second PDSA cycle may be able to provide greater depth of information for statistical analysis both descriptively and inferentially.

Gender distribution was positively skewed toward female participation (83%). The reason for this is unknown but a second PDSA cycle may bring greater understanding. Additionally, ADHD symptomology skewed toward the inattentive subtype compared to the hyperactive/impulsive subtype at a ratio of 19:3. This data supports prior research suggesting females, more typically of the inattentive subtype, are under-evaluated for ADHD and thus a greater burden of untreated symptoms befall women and girls. The ADHD positive participant not previously diagnosed with ADHD was likewise of a predictable demographic based upon prior research. The participant was female, tested

positive for inattentive ADHD, and was comorbidly positive for anxiety/depression, consistent with previous research findings (Madsen et al., 2018; Martin et al., 2019; Russell, 2019; Slobodin & Davidovich, 2019). Universal screening for ADHD can reduce failure to diagnose ADHD in females and perhaps mitigate the development of anxiety and depression, the initial mental health diagnoses most frequently attributed to this population.

Provider feedback was positive. ADHD screening gave a platform for conversations with families more directly about ADHD symptoms and a discussion about symptoms on a continuum. Parents were able to ask and answer questions, allowing them to feel more involved in understanding their children's needs. The process went smoothly, and families were happy with the outcome.

Due to the small sample size and limited time frame of this quality improvement project, statistical significance could not be established. Nevertheless, the increased rate of ADHD above the prevalence rate in Illinois coupled with a mean not statistically different from the prevalence rate supports a likely underdiagnosis of ADHD in this population and clinical significance. As such, universal screening for ADHD creates the opportunity to provide meaningful treatment to children ages 6- to 12-years old, minimizing consequences in social, emotional, and academic areas as well as in physical and mental health.

The results of this QI project have marked implications for gender equity. Because males more often exhibit symptoms of hyperactive/impulsive ADHD, the disruptive behavior of this subtype is more often recognized. However, females who more often exhibit symptoms of inattention, are often quietly suffering with symptoms directed more

inward. Universal screening for ADHD presents an easy and cost-effective opportunity to alleviate this gender specific inequity.

Based upon the quality improvement findings, implementation of universal screening for ADHD using VADPRS within this organization to all providers beyond the single provider of this study over six months is recommended. Meaningful data may then be additionally garnered to include household income or socioeconomic status (SES), location or zip code, and racial/ethnic characteristics. As evidence gathers, this quality improvement evolves, and potentially a future PDSA cycle ensues, the hope is every child will be screened for ADHD, so the consequences of undiagnosed ADHD may not inhibit even one more child.

Recommendations for Future Research

Implementing universal screening using the VADPRS in children ages 6- to 12-years old with a larger population size and a longer collection time may allow determination of statistical significance. Additionally, educating communities, families, and teachers about ADHD within the context of a continuum of symptoms, gender disparities in identifying ADHD, and universal screening to mitigate gender disparities is needed. Further, any reticence to universally or otherwise screen children for ADHD related to stigma may be diminished with greater societal understanding. As reported by the participating psychotherapist, universal screening for ADHD creates an opportunity for engaging parents in the care and understanding of their children and their children's needs. As the stigma associated with ADHD declines, the opportunity to screen children within the context of academia becomes more tenable, as teachers are often integral in recognizing these symptoms as children struggle to learn.

Conclusion

Implementation of universal ADHD screening using the VADPRS in children ages 6- to 12- years old being seen by a mental health provider increased identification of ADHD. Continuation and advancement of this quality improvement endeavor with additional PDSA cycles reaching all children ages 6- to 12-years seeking treatment at this Midwest counseling and therapy practice should continue for ongoing analysis. Future quality improvement work guided by Advanced Practice Registered Nurses may expand to the educational setting and include the use of the Vanderbilt ADHD Diagnostic Teacher Rating Scale (VADTRS). The quiet girl sitting in the back of the class may need as much intervention for ADHD as the rambunctious boy interrupting and jumping out of his seat.

References

Ahnemark, E., Di Schiena, M., Fredman, A., Medin, E., Soderling, J. K., & Ginsberg, Y. (2018). Health-related quality of life and burden of illness in adults with newly diagnosed attention-deficit/hyperactivity disorder in Sweden. *BMC Psychiatry, 18*(1), 223-223. https://doi.org/10.1186/s12888-018-1803-y

AlAhmari, F., & Uddin, M. (2022). Prevalence of obesity in treated and untreated patients with attention deficit hyperactivity disorder. *Saudi Medical Journal, 43*(8), 873–880. https://doi.org/10.15537/smj.2022.43.8.20220247

American Psychiatric Association. (2013). *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.). https://doi.org/10.1176/appi.books.9780890425596

Aoki, Y., Tsuboi, T., Furuno, T., Watanabe, K., & Kayama, M. (2020). The experiences of receiving a diagnosis of attention deficit hyperactivity disorder during adulthood in Japan: A qualitative study. *BMC Psychiatry, 20*(1), 373-373. https://doi.org/10.1186/s12888-020-02774-y

Arnold, L. E., Hodgkins, P., Kahle, J., Madhoo, M., & Kewley, G. (2020). Long-term outcomes of ADHD: Academic achievement and performance. *Journal of Attention Disorders, 24*(1), 73. https://doi.org/10.1177/1087054714566076

Bard, D. E., Wolraich, M. L., Neas, B., Doffing, M., & Beck, L. (2013). The psychometric properties of the Vanderbilt attention-deficit hyperactivity disorder diagnostic parent rating scale in a community population. *Journal of Developmental and Behavioral Pediatrics*, *34*(2), 72–82. https://doi.org/10.1097/DBP.0b013e31827a3a22

Beaton, D. M., Sirois, F., & Milne, E. (2022). Experiences of criticism in adults with ADHD: A qualitative study. *PloS One, 17*(2), e0263366-e0263366. https://doi.org/10.1371/journal.pone.0263366

Becker, S. P., Schindler, D. N., Holdaway, A. S., Tamm, L., Epstein, J. N., & Luebbe, A. M. (2018). The revised child anxiety and depression scales (RCADS): Psychometric evaluation in children evaluated for ADHD. *Journal of*

Psychopathology and Behavioral Assessment, 41(1), 93-106. https://doi.org/10.1007/s10862-018-9702-6

Bikic, A., & Dalsgaard, S. (2018). Pharmacological treatment reduces the risk of motor vehicle crashes among men and women with ADHD. *Evidence-Based Mental Health, 21*(2), 79. https://doi.org/10.1136/eb-2017-102816

Bitsko, R. H., Claussen, A. H., Lichstein, J., Black, L. I., Jones, S. E., Danielson, M. L., Hoenig, J. M., Davis Jack, S. P., Brody, D. J., Gyawali, S., Maenner, M. J., Warner, M., Holland, K. M., Perou, R., Crosby, A. E., Blumberg, S. J., Avenevoli, S., Kaminski, J. W., & Ghandour, R. M. (2022). Mental health surveillance among children - United States, 2013-2019. *Morbidity and Mortality Weekly Report. Supplement, 71*(2), 1-42. https://doi.org/10.15585/mmwr.su7102a1

Boston Children's Hospital. (2022). *Initial Validation of the Vanderbilt ADHD Measure for Adolescent Patients in the ICISS Project*. Retrieved from https://beta.clinicaltrials.gov/study/NCT01964209?distance=50&cond=ADHD&term=Screening%20Test&rank=2

Callahan, B. L., Ramakrishnan, N., Shammi, P., Bierstone, D., Taylor, R., Ozzoude, M., Goubran, M., Stuss, D. T., & Black, S. E. (2022). Cognitive and neuroimaging profiles of older adults with attention deficit/hyperactivity disorder presenting to a memory clinic. *Journal of Attention Disorders, 26*(8), 1118-1129. https://doi.org/10.1177/10870547211060546

Centers for Disease Control and Prevention. (2022). *Attention-Deficit/Hyperactivity Disorder (ADHD): State Based Prevalence of ADHD Diagnosis and Treatment 2016-2019.* Retrieved from https://www.cdc.gov/ncbddd/adhd/data/diagnosis-treatment-data.html

Centers for Disease Control and Prevention. (2023). *Children's Mental Health: Behavioral Health Services in Illinois.* Retrieved from https://www.cdc.gov/ncbddd/adhd/data/diagnosis-treatment-data.html

Chang, L. Y., Wang, M. Y., & Tsai, P. S. (2016). Diagnostic accuracy of rating scales for Attention-Deficit/Hyperactivity Disorder: A meta-analysis. *Pediatrics, 137*(3), e20152749. https://doi.org/10.1542/peds.2015-2749

Chen, Q., Hartman, C. A., Haavik, J., Harro, J., Klungsøyr, K., Hegvik, T.-A., Wanders, R., Ottosen, C., Dalsgaard, S., Faraone, S. V., & Larsson, H. (2018). Common psychiatric and metabolic comorbidity of adult attention-deficit/hyperactivity disorder: A population-based cross-sectional study. *PLoS ONE*, *13*(9), 1–12. https://doi.org/10.1371/journal.pone.0204516

Children and Adults with Attention Deficit Hyperactivity Disorder. (2022). *About ADHD.* https://chadd.org/about-adhd/overview/

Child and Adolescent Health Measurement Initiative. (n.d.) *National Survey of Children's Health, 2016-Present.* Data Resource Center for Child and Adolescent Health supported by the U.S. Department of Health and Human Services, Health Resources and Services Administration (HRSA), Maternal and Child Health Bureau (MCHB). https://www.childhealthdata.org/browse/survey

Curry, A. E., Metzger, K. B., Pfeiffer, M. R., Elliott, M. R., Winston, F. K., & Power, T. J. (2017). Motor vehicle crash risk among adolescents and young adults with attention-deficit/hyperactivity disorder. *Journal of American Medical Association Pediatrics, 171*(8), 756. https://doi.org/10.1001/jamapediatrics.2017.0910

Downey, V. A., & Zun, L. S. (2018). Identifying undiagnosed pediatric mental illness in the emergency department. *Pediatric Emergency Care*, 34(2), e21–e23. https://doi.org/10.1097/PEC.0000000000001151

Dvorsky, M. R., Langberg, J. M., Evans, S. W., & Becker, S.P. (2018). The protective effects of social factors on the academic functioning of adolescents with ADHD. *Journal of Clinical Child and Adolescent Psychology* 47 (5): 713–26. https://doi.org10.1080/15374416.2016.1138406

Fayyad, J., Sampson, N. A., Hwang, I., Adamowski, T., Aguilar-Gaxiola, S., Al-Hamzawi, A., Anade, L. H., Borges, G., de Girolamo, G., Florescu, S., Gureje, O., Haro, J. M., Hu, C., Karam, E. G., Lee, S., Navarro-Mateu, F., O'Neill, S., Pennell, B. E., Piazza, M., . . . on behalf of the WHO World Mental Health Survey Collaborators. (2017). The descriptive epidemiology of DSM-IV adult ADHD in the World Health Organization world mental health surveys. *Attention Deficit and Hyperactivity Disorders, 9*(1), 47-65. https://doi.org/10.1007/s12402-016-0208-3

Fogleman, N. D., Slaughter, K. E., Rosen, P. J., Leaberry, K. D., & Walerius, D. M. (2018). Emotion regulation accounts for the relation between ADHD and peer victimization. *Journal of Child and Family Studies, 28*(9), 2429-2442. https://doi.org/10.1007/s10826-018-1297-8

Guner, S. T., Goker, Z., & Uneri, O. Ş. (2019). Comorbidity of attention deficit and hyperactivity disorder and obesity: A systematic review. *Current Approaches in Psychiatry, 11*(4), 466–482. https://doi.org/10.18863/pgy.457600

Hall, C. L., Guo, B., Valentine, A. Z., Groom, M. J., Daley, D., Sayal, K., & Hollis, C. (2020). The validity of the SNAP-IV in children displaying ADHD symptoms. *Assessment*, *27*(6), 1258–1271. https://doi.org/10.1177/1073191119842255

Hare, M. M., Garcia, A. M., Hart, K. C., & Graziano, P. A. (2021). Intervention response among preschoolers with ADHD: The role of emotion understanding. *Journal of School Psychology*, *84*, 19-31. https://doi.org/10.1016/j.jsp.2020.11.001

Henning, C., Summerfeldt, L. J., & Parker, J. D. A. (2022). ADHD and academic success in university students: The important role of impaired attention. *Journal of Attention Disorders, 26*(6), 893-901. https://doi.org/10.1177/10870547211036758

Ilbegi, S., Groenman, A. P., Schellekens, A. F. A., Hartman, C. A., Hoekstra, P. J., Franke, B., Faraone, S. V., Lambregts-Rommelse, N. N. J., & Buitelaar, J. K. (2018). Substance use and nicotine dependence in persistent, remittent, and late-onset ADHD: A 10-year longitudinal study from childhood to young adulthood. *Journal of Neurodevelopmental Disorders, 10*(1), 42-42. https://doi.org/10.1186/s11689-018-9260-y

Joseph, A. A., Gupta, A., Hazari, N., Kalaivani, M., Pandey, R. M., Sagar, R., Mehta, M., & Shukla, G. (2022). A cross-sectional comparative study of sleep disturbances in children with ADHD and matched controls. *Brain Sciences (2076-3425)*, *12*(9), 1158. https://doi.org/10.3390/brainsci12091158

Kaas, T. H., Vinding, R. K., Stokholm, J., Bønnelykke, K., Bisgaard, H., & Chawes, B. L. (2021). Association between childhood asthma and attention deficit hyperactivity or autism spectrum disorders: A systematic review with meta-analysis. *Clinical & Experimental Allergy*, *51*(2), 228–252. https://doi.org/10.1111/cea.13750

Kazda, L., Bell, K., Thomas, R., McGeechan, K., & Barratt, A. (2019). Evidence of potential overdiagnosis and overtreatment of attention deficit hyperactivity disorder (ADHD) in children and adolescents: Protocol for a scoping review. *BMJ Open*, *9*(11), e032327-e032327. https://doi.org/10.1136/bmjopen-2019-032327

Kazda, L., Bell, K., Thomas, R., McGeechan, K., Sims, R., & Barratt, A. (2021). Overdiagnosis of attention-Deficit/Hyperactivity disorder in children and adolescents: A systematic scoping review. *Journal of American Medical Association Network Open*, *4*(4), e215335-e215335. https://doi.org/10.1001/jamanetworkopen.2021.5335

Keilow, M., Holm, A., & Fallesen, P. (2018). Medical treatment of attention deficit/hyperactivity disorder (ADHD) and children's academic performance. *PLoS ONE*, *13*(11). https://doi.org/10.1371/journal.pone.0207905

Lopez-Villalobos, J. A., Sacristan-Martin, A. M., Garrido-Redondo, M., Martínez-Rivera, M. T., Lopez-Sanchez, M. V., Rodriguez-Molinero, L., Camina-Gutierrez, A. B., & Andres-de Llano, J. (2019). Health-related quality of life in cases of attention deficit hyperactivity disorder with and without pharmacological treatment. *Anales De Pediatría*, *90*(5), 272-279. https://doi.org/10.1016/j.anpede.2018.04.010

Madsen, K. B., Ravn, M. H., Arnfred, J., Olsen, J., Rask, C. U., & Obel, C. (2018). Characteristics of undiagnosed children with parent-reported ADHD behaviour. *European Child & Adolescent Psychiatry, 27*(2), 149–158. https://doi.org/10.1007/s00787-017-1029-4

Mahjani, B., Koskela, L. R., Mahjani, C. G., Janecka, M., Batuure, A., Hultman, C. M., Reichenberg, A., Buxbaum, J. D., Akre, O., & Grice, D. E. (2022). Systematic review and meta-analysis: Relationships between attention-deficit/hyperactivity disorder and urinary symptoms in children. *European Child & Adolescent Psychiatry, 31*(4), 663–670. https://doi.org/10.1007/s00787-021-01736-3

Manfro, A. G., Pan, P. M., Gadelha, A., Fleck, M., do Rosário, M. C., Cogo-Moreira, H., Affonseca-Bressan, R., Mari, J., Miguel, E. C., Rohde, L. A., & Salum, G. A. (2017). Psychopathology and friendship in children and adolescents: Disentangling the role of co-occurring symptom domains with serial mediation models. *European Child & Adolescent Psychiatry, 26*(11), 1377-1386. https://doi.org/10.1007/s00787-017-0993-z

Manni, C., Cipollone, G., Pallucchini, A., Maremmani, A. G. I., Perugi, G., & Maremmani, I. (2019). Remarkable reduction of cocaine use in dual disorder (Adult Attention Deficit Hyperactive Disorder/Cocaine Use Disorder) patients treated with medications for ADHD. *International Journal of Environmental Research and Public Health, 16*(20), 3911. https://doi.org/10.3390/ijerph16203911

Martin, J., Taylor, M. J., Rydell, M., Riglin, L., Eyre, O., Lu, Y., Lundström, S., Larsson, H., Thapar, A., & Lichtenstein, P. (2018). Sex-specific manifestation of genetic

risk for attention deficit hyperactivity disorder in the general population. *Journal of Child Psychology and Psychiatry, 59*(8), 908-916. https://doi.org/10.1111/jcpp.12874

May, F., Ford, T., Janssens, A., Newlove-Delgado, T., Emma Russell, A., Salim, J., Ukoumunne, O. C., & Hayes, R. (2021). Attainment, attendance, and school difficulties in UK primary schoolchildren with probable ADHD. *British Journal of Educational Psychology, 91*(1), 442-462. https://doi.org/10.1111/bjep.12375

Mazor-Aronovitch, K., Pinhas-Hamiel, O., Pivko-Levy, D., Modan-Moses, D., Levek, N., Miller, S., Yackobovitch-Gavan, M., Gruber, N., Ben-Ami, M., Stern, E., Ben-Ari, T., Graf-Barel, C., Frumkin Ben-David, R., Levy-Shraga, Y., & Landau, Z. (2021). Dual diagnosis of type 1 diabetes mellitus and Attention-Deficit Hyperactivity Disorder. *Pediatric Diabetes*, *22*(4), 649. https://doi.org/10.1111/pedi.13195

Mental Health America. (2023). *The State of Mental Health in America.* Retrieved from https://mhanational.org/sites/default/files/2023-State-of-Mental-Health-in-America-Report.pdf?eType=EmailConfirmation&eId=ba69fd5f-0e00-404e-bec5-abbab0f91eef

Mowlem, F., Agnew-Blais, J., Taylor, E., & Asherson, P. (2019). Do different factors influence whether girls versus boys meet ADHD diagnostic criteria? Sex differences among children with high ADHD symptoms. *Psychiatry Research, 272*, 765-773. https://doi.org/10.1016/j.psychres.2018.12.128

Multi-Health Systems. (2022). *Conners 4*. Retrieved from https://storefront.mhs.com/collections/conners-

4?utm_source=google&utm_medium=paid_search&utm_campaign=ce_conners4_paidsearch_20220706&utm_id=launch_conners4&gclid=EAIaIQobChMI86TK5L3M-gIV7ClMCh1SmwFOEAMYASAAEgLd6vD_BwE#PricingOrdering

Nylander, C., Lindstrom, K., Khalifa, N., & Fernell, E. (2018). Previously undiagnosed attention-deficit/hyperactivity disorder associated with poor metabolic control in adolescents with type 1 diabetes. *Pediatric Diabetes, 19*(4), 816–822. https://doi.org/10.1111/pedi.12651

Okumura, Y., Yamasaki, S., Ando, S., Usami, M., Endo, K., Hiraiwa-Hasegawa, M., Kasai, K., & Nishida, A. (2021). Psychosocial burden of undiagnosed persistent ADHD symptoms in 12-year-old children: A population-based birth cohort study. *Journal of Attention Disorders, 25*(5), 636. https://doi-org.ezproxy.umsl.edu/10.1177/1087054719837746

Owens, J. (2020). Relationships between an ADHD diagnosis and future school behaviors among children with mild behavioral problems. *Sociology of Education, 93*(3), 191-214. https://doi.org/10.1177/0038040720909296

Powell, V., Agha, S. S., Jones, R. B., Eyre, O., Stephens, A., Weavers, B., Lennon, J., Allardyce, J., Potter, R., Smith, D., Thapar, A., & Rice, F. (2021). ADHD in adults with recurrent depression. *Journal of Affective Disorders, 295*, 1153-1160. https://doi.org/10.1016/j.jad.2021.09.010

Rensburg, R. van, Meyer, H. P., Hitchcock, S. A., & Schuler, C. E. (2018). Screening for Adult ADHD in patients with Fibromyalgia Syndrome. *Pain Medicine, 19*(9), 1825–1831. https://doi.org/10.1093/pm/pnx275

Richter, M., Spangenberg, H., Ramklint, M., & Ramirez, A. (2020). The clinical relevance of asking young psychiatric patients about childhood ADHD symptoms. *Nordic Journal of Psychiatry, 74*(1), 23-29. https://doi.org/10.1080/08039488.2019.1667427

Russell, A. E., Ford, T., & Russell, G. (2019). Barriers and predictors of medication use for childhood ADHD: Findings from a UK population-representative cohort. *Social Psychiatry and Psychiatric Epidemiology: The International Journal for Research in Social and Genetic Epidemiology and Mental Health Services, 54*(12), 1555–1564. https://doi.org/10.1007/s00127-019-01720-y

Sangani, D., Krupadev, V., Crawford, M., Deere, B., & Hendel, R. (2022). A quality improvement initiative for increasing cardiac rehabilitation referrals using Plan-Do-Study-Act (PDSA) methodology. *The American Journal of Medicine, 135*(4), 512–516. https://doi.org/10.1016/j.amjmed.2021.10.027

Schermann, H., Gurel, R., Ankory, R., Kadar, A., Yoffe, V., Snir, N., Sternheim, A., & Karakis, I. (2018). Lower risk of fractures under methylphenidate treatment for ADHD: A dose–response effect. *Journal of Orthopaedic Research, 36*(12), 3328-3333. https://doi.org/10.1002/jor.2412

Sibley, M. H., Arnold, L. E., Swanson, J. M., Hechtman, L. T., Kennedy, T. M., Owens, E., Molina, B. S. G., Jensen, P. S., Hinshaw, S. P., Roy, A., Chronis-Tuscano, A., Newcorn, J. H., Rohde, L. A., MTA Cooperative Group, & for the MTA Cooperative Group. (2021). Variable patterns of remission from ADHD in the multimodal treatment study of ADHD. *The American Journal of Psychiatry, 179*(2), 142-151. https://doi.org/10.1176/appi.ajp.2021.21010032

Slobodin, O., & Davidovitch, M. (2019). Gender differences in objective and subjective measures of ADHD among clinic-referred children. *Frontiers in Human Neuroscience, 13,* 441-441. https://doi.org/10.3389/fnhum.2019.00441

Staff, A. I., Luman, M., van der Oord, S., Bergwerff, C. E., van den Hoofdakker, Barbara J, & Oosterlaan, J. (2021). Facial emotion recognition impairment predicts social and emotional problems in children with (subthreshold) ADHD. *European Child & Adolescent Psychiatry, 31*(5), 715-727. https://doi.org/10.1007/s00787-020-01709-y

Stickley, A., Koyanagi, A., Takahashi, H., Ruchkin, V., Inoue, Y., & Kamio, Y. (2017). Attention-Deficit/Hyperactivity Disorder and physical multimorbidity: A population-based study. *European Psychiatry: The Journal of the Association of European Psychiatrists*, *45*, 227–234. https://doi.org/10.1016/j.eurpsy.2017.07.010

Svedlund, N. E., Norring, C., Ginsberg, Y., & Hausswolff-Juhlin, Y. (2018). Are treatment results for eating disorders affected by ADHD symptoms? A one-year follow-up of adult females. *European Eating Disorders Review*, *26*(4), 337–345. https://doi.org/10.1002/erv.2598

Taher, J., Beriault, D. R., Yip, D., Tahir, S., Hicks, L. K., & Gilmour, J. A. (2020). Reducing free thyroid hormone testing through multiple Plan-Do-Study-Act cycles. *Clinical Biochemistry*, *81*, 41–46. https://doi.org/10.1016/j.clinbiochem.2020.05.004

Tan, T. X., Liu, Y., Damjanovic, V., Ledford, E., Li, G., & Li, Y. (2022). Inattention, hyperactivity/impulsivity, and academic competence: Findings from three

cohorts. *British Journal of Educational Psychology*, *92*(1), 82–104. https://doi.org/10.1111/bjep.12439

Te Meerman, S., Batstra, L., Grietens, H., & Frances, A. (2017). ADHD: A critical update for educational professionals. *International Journal of Qualitative Studies on Health and Well-being*, *12*(1), 1298267. https://doi.org/10.1080/17482631.2017.1298267

U.S. Census Bureau (2022). *Quick Facts.* Retrieved from https://www.census.gov/quickfacts/

Wong, R. S., Tung, K. T. S., Leung, H. E., Chow, R., Chua, G. T., Ho, M. H. K., Tso, W. W. Y., Fung, G. P. G., Tao, V. Q. C., Kwan, M. Y. W., Lum, T. Y. S., Wong, I. C. K., & Ip, P. (2022). Comorbidity of ADHD and allergic diseases in early adolescence: The role of parental smoking at home. *Current Psychology: A Journal for Diverse Perspectives on Diverse Psychological Issues*, 1–9. https://doi.org/10.1007/s12144-021-02693-5

Wolraich, M. L., Bard, D. E., Neas, B., Doffing, M., & Beck, L. (2013). The psychometric properties of the Vanderbilt Attention-Deficit Hyperactivity Disorder diagnostic teacher rating scale in a community population. *Journal of Developmental and Behavioral Pediatrics*, *34*(2), 83–93. https://doi.org/10.1097/DBP.0b013e31827d55c3

Wolraich, M. L., Doffing, M. A., Lambert, W., Bickman, L., Simmons, T., & Worley, K. (2003). Psychometric properties of the Vanderbilt ADHD diagnostic parent rating scale in a referred population. *Journal of Pediatric Psychology*, *28*(8), 559-567–567. https://doi.org/10.1093/jpepsy/jsg046

Xu, G., Liu, B., Yang, W., Snetselaar, L. G., & Jing, J. (2021). Association of Attention-Deficit/Hyperactivity Disorder with diabetes mellitus in US adults. *Journal of Diabetes, 13*(4), 299-306. https://doi.org/10.1111/1753-0407.13107

Yilmaz, Z., Javaras, K. N., Baker, J. H., Thornton, L. M., Lichtenstein, P., Bulik, C. M., & Larsson, H. (2017). Association between childhood to adolescent Attention Deficit/Hyperactivity Disorder symptom trajectories and late adolescent disordered eating. *The Journal of Adolescent Health: Official Publication of the Society for Adolescent Medicine*, *61*(2), 140–146. https://doi.org/10.1016/j.jadohealth.2017.04.001

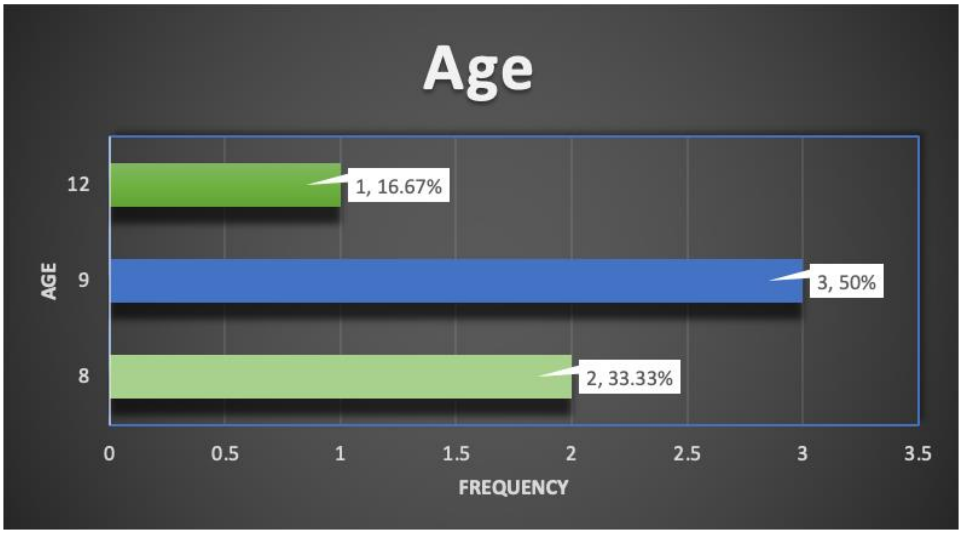
Zahmacioglu, O., & Kilic, E. Z. (2017). Early diagnosis and treatment of ADHD are important for a secure transition to adolescence. *Anadolu Psikiyatri Dergisi*, *18*(1), 79–84. https://doi.org/10.5455/apd.220054

Zhang, L., Du Rietz, E., Kuja-Halkola, R., Dobrosavljevic, M., Johnell, K., Pedersen, N. L., Larsson, H., & Chang, Z. (2021). Attention-Deficit/Hyperactivity Disorder and Alzheimer's disease and any dementia: A multi-generational cohort study in Sweden. *The Journal of the Alzheimer's Association.* Advance online publication. https://doi.org/10.1002/alz.12462

Appendix A

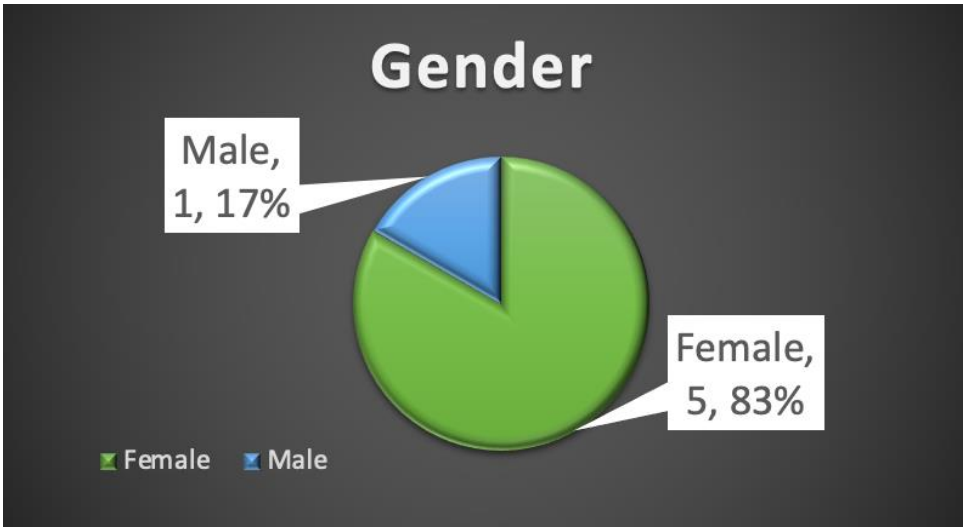
Results

Figure 1



Note. Participant age breakdown, *N* = 6.

Figure 2

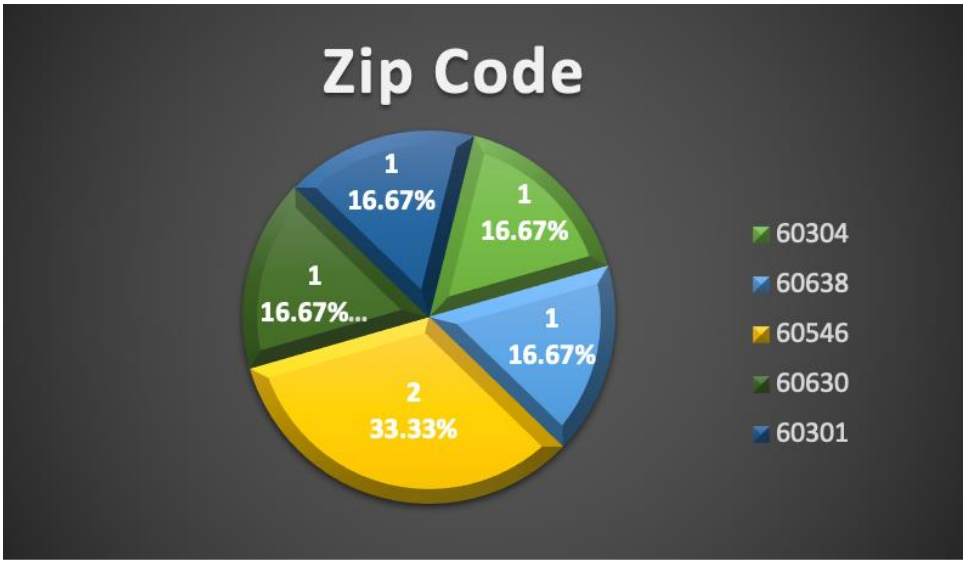


Note. Participant gender breakdown, *N* = 6.

Appendix A (continued)

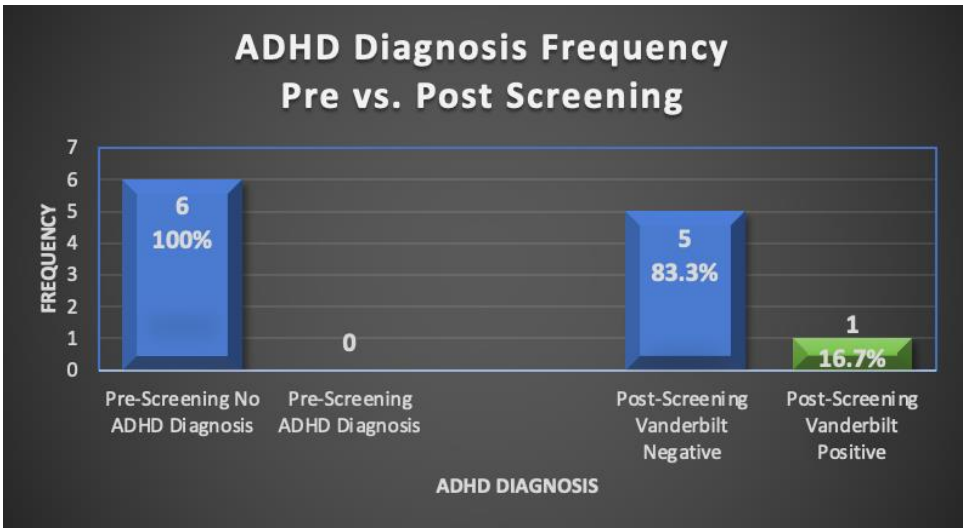
Results

Figure 3



Note. Participant zip code breakdown, *N* = 6.

Figure 4

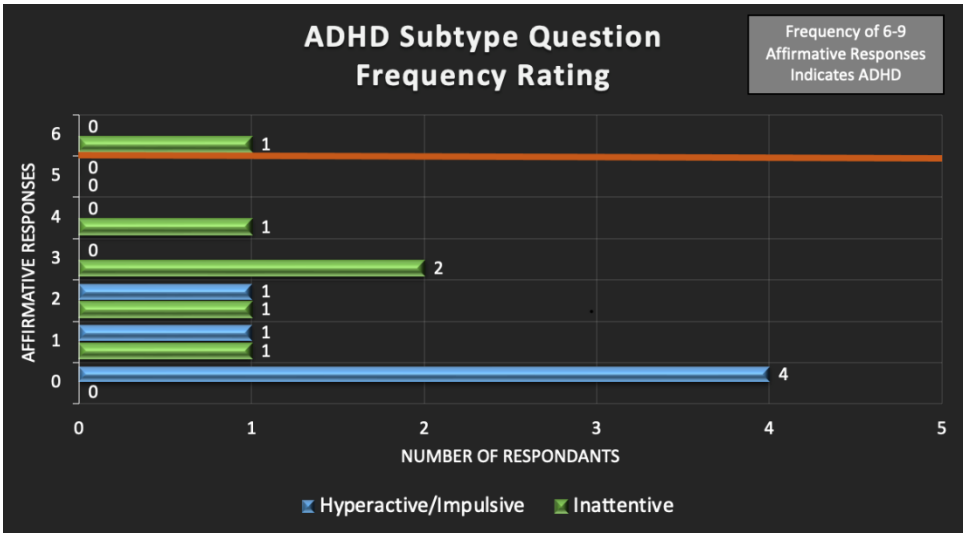


Note. ADHD Diagnosis Pre vs. Post VADPRS Screening, *N* = 6.

Appendix A (continued)

Results

Figure 5



Note. Frequency of ADHD subtype question affirmative responses, $N = 6$.