

**A Program to Improve the Assessment of a Child for Attention Deficit Hyperactivity
Disorder**

Michelle Lukomski, RN, BSN, MSN, CCRN-K; DNP Student; Lenoir-Rhyne University

Diane Caruso, DNP, FNP-BC; Director DNP/FNP Program; Lenoir-Rhyne University

Kerry Thompson, PhD, RN; Professor/Chair of School of Nursing; Lenoir-Rhyne University

Melissa DiNatale, Ed.D, RN-BC; Associate Professor of Nursing; Lenoir-Rhyne University

Author Note

The authors report no actual or potential conflicts of interest.

Acknowledgement. No external or intramural funding was received.

Correspondence concerning this article should be addressed to Michelle Lukomski, Lenoir-

Rhyne University, 3364 Eastwood Avenue, Morganton, NC 28655. Email:

michelle.lukomski@lr.edu

Abstract

Problem: Due to the number of children diagnosed with ADHD, increased risk of these children having co-morbidities, and insufficient documentation of the *DSM-5* criteria for an ADHD diagnosis, an ADHD program was developed for a child presenting for an initial ADHD evaluation.

Methods: A mixed method design utilizing a retrospective chart review evaluated the system change and provider adherence by percentage of *DSM-5* criteria met prior to and after the implementation of the ADHD program. A thematic analysis identified the recruited participants' satisfaction of the ADHD program.

Findings: The two-tailed Mann-Whitney U test was significant based on $p < .001$. Providers met 100% of the *DSM-5* criteria after implementation of the ADHD program in the EHR, compared to 50% prior to implementation. The thematic analysis identified recruited participants were satisfied with the ADHD program which provided a more standardized means of documenting the *DSM-5* criteria for ADHD.

Conclusions: The ADHD program, increased provider's adherence and consistency to the *DSM-5* criteria decreasing the use of the unspecified ADHD ICD-10 code, allowing the provider to develop a more successful plan of care for patients between the ages of five and 18.

Keywords: attention deficit hyperactivity disorder, assessment tools, assessment methods, assessing

A Program to Improve the Assessment of a Child for Attention Deficit Hyperactivity Disorder

In 2018, over 5.3 million children in the United States between the ages of three and 17 were diagnosed with Attention Deficit Hyperactivity Disorder (ADHD) with approximately 190,000 living in North Carolina (Child and Adolescent Health Maintenance Initiative [CAHMI], 2021). Of this nationwide population group, the majority were male, non-Hispanic children living in low-income households and with private insurance (CAHMI, 2021). Approximately 63% of the nationwide population were receiving medications for their current diagnosis of ADHD, and 43% had obtained behavioral therapy within the past year (CAHMI, 2021). Healthy People 2020 (2019) set a goal to increase the number of parents who seek care for children exhibiting signs of any learning, development, or behavioral concerns, including ADHD.

ADHD is a common neurodevelopmental disorder associated with a habitual inability to stay focused and/or acting without thinking (American Psychiatric Association, 2013; Center for Disease Control and Prevention [CDC], 2020). This disorder is most often diagnosed in children but has been found to continue well into adulthood (CDC, 2020). The American Psychiatric Association (2013) *Diagnostic and Statistical manual of Mental Disorders* (5th ed.; *DSM-5*) designated criteria to assist in the diagnosis of ADHD (See Appendix A).

Review of Literature

There are several components to consider when performing an initial ADHD evaluation on a child between the ages of five to 18: (a) *DSM-5* criteria, (b) tools used to diagnose ADHD, (c) adverse childhood experiences, (d) system change, (e) ADHD caregiver awareness, and (f)

ICD-10 codes for an ADHD diagnosis. Each of these components should be taken into consideration when developing a program to assess and diagnose a child for ADHD.

DSM-5 Criteria

The American Psychiatric Association (2013) has outlined specific *DSM-5* criteria to assist providers in appropriately assessing and diagnosing ADHD in all age groups: (a) six or more symptoms of inattention or hyperactivity/impulsiveness up to age 16 for at least six months; (b) five or more symptoms in ages 17 and older for at least six months; (c) symptoms present before the age of 12; (d) symptoms present in at least two different settings; (e) symptoms cause functional impairment in work, school or socially; and (f) ruled out other behavioral health disorders (American Psychiatric Association, 2013; Austerman, 2015; Rigler et al., 2016; Wolraich, 2019). Symptoms of hyperactivity, impulsivity and inattentiveness can be found in Appendix A. Of the six *DSM-5* criteria for ADHD, there is predominately a lack of documentation of symptoms present in two different settings and in ruling out other behavioral health disorders (Nelson et al., 2019; Yuki et al., 2016). Healthcare providers are responsible for adherence to all components of *DSM-5* criteria for an ADHD diagnosis to be made (American Psychiatric Association, 2013; Austerman, 2015; Nelson et al., 2019; Rigler et al., 2016; Wolraich, 2019; Yuki et al., 2016).

Tools Used to Diagnose ADHD

Several tools are used within pediatric primary care practice settings to help providers assess and diagnose ADHD in children (Austerman, 2015; Yuki et al., 2016). The Vanderbilt ADHD Diagnostic Teacher and Parent Rating Scales (VADRS) are most often utilized in practice settings due to their moderate sensitivity and specificity to predictive validity of ADHD in a child (Austerman, 2015; Felt et al., 2014; Yuki et al., 2016). The VADRS assist healthcare

providers in meeting all *DSM-5* criteria except the following: symptoms present before the age of 12 and symptoms present for at least six months (Austerman, 2015; Felt et al., 2014; Yuki et al., 2016). This tool standardizes the documentation of a child's ADHD symptoms between the caregiver and teacher and is an integral component to be used for the assessment and diagnosis of a child for ADHD (Yuki et al., 2016).

Adverse Childhood Experiences

Adverse Childhood Experiences (ACEs) refers to how different types of abuse, neglect, and household dysfunction that occurred in an adult's life prior to the age of 18 increases the likelihood of developing co-morbidities such as ADHD in the future (Felitti et al., 1998). There is a correlation between an increased risk of a child being diagnosed with ADHD and the child having at least one ACE before the age of 18 (CAHMI, 2021; Germán, et al., 2016; Schneider et al., 2019). Between 60 and 100% of those diagnosed with ADHD have a co-morbid condition and over 60% of children are diagnosed with at least one ACE (CDC, 2020; CAHMI, 2021; Efron et al., 2016; Gnanavel et al., 2019). Providers should assess for ACEs in the pediatric population age groups, identifying those at risk in order to develop appropriate strategies and treatment plans to prevent future complications (CDC, 2020; Centers for Disease Control and Prevention, 2019).

System Change

Revolutionizing the process by which a healthcare provider obtains and documents data through a system change can improve the care given to patients (Agency for Healthcare Research and Quality [AHRQ], 2020). A template is a tool designed and placed into the EHR, as a system change to standardize documentation by assisting providers in accurately assessing and diagnosing patients in the inpatient and outpatient healthcare settings (AHIMA Practice Belief, 2018; AHRQ, 2020). This standardization of documentation promotes consistency between

providers, increases the accuracy of diagnoses, and ultimately improves the quality of care given to patients (AHIMA Practice Belief, 2018; AHRQ, 2020).

ADHD Caregiver Awareness

Early identification of ADHD is key to initiate timely, effective treatment plans and prevent poor outcomes in children (Madsen, 2017). There is lack of caregiver commitment to the recommended treatment for ADHD, which consists of medication and/or behavioral therapy (CDC, 2020; Dodangi et al., 2017; Paidipati et al., 2017). Clinicians who provide educational information to the caregiver regarding the child's diagnosis and treatment options, result in better outcomes for the child (CDC, 2020; Paidipati et al., 2017).

ICD-10 Codes for ADHD

The World Health Organization's (2019) *International Statistical Classification of Diseases and Related Health Problems* (10th ed; ICD-10) codes are used to justify and track statistics regarding specific diagnosis (American Academy of Pediatrics [AAP], 2021). The World Health Organization's (2019) *International Statistical Classification of Diseases and Related Health Problems* (10th ed; ICD-10) codes for ADHD in children are: (a) F90.9, ADHD, predominantly inattentive type; (b) F90.1, ADHD, predominantly hyperactive type; (c) F90.2, ADHD, combined type; (d) ADHD, unspecified type. The unspecified ICD-10 code should only be utilized when there is inadequate data in the EHR for the provider to make a more specific diagnosis (AAP, 2019). Templates assist providers in obtaining the necessary documentation to diagnose a patient more accurately, decreasing the use of unspecified ICD-10 codes (AHIMA, 2018).

Project Aim

Due to the number of children diagnosed with ADHD within the United States, the increased risk of these children having co-morbidities and at least one adverse childhood experience, and insufficient documentation of the *DSM-5* criteria for an ADHD diagnosis, an ADHD evaluation program was developed for the initial assessment of a child presenting for an ADHD evaluation (American Psychiatric Association, 2013; Austerman, 2014; CAHMI, 2021.; Nelson et al., 2019; Rigler et al., 2016; Wolraich, 2019; Yuki et al., 2016). The purpose of this quality improvement (QI) project was to develop a comprehensive ADHD evaluation program to be embedded as a template into the EHR within a pediatric primary care practice, to standardize provider documentation of the *DSM-5* criteria for an ADHD diagnosis in children ages five to 18.

The primary outcome of the ADHD evaluation program was the EHR system change within the pediatric primary care practice. The secondary outcomes were provider's adherence to the *DSM-5* criteria for an ADHD diagnosis and recruited participant's satisfaction of the ADHD evaluation program. Process measures included providers utilizing a more accurate ICD-10 code for ADHD, rather than using the F90.9; (ADHD, unspecified type). A retrospective chart review of children between the ages of five and 18 with a diagnosis of ADHD was conducted to compare provider adherence to *DSM-5* criteria and the ICD-10 code for ADHD with that of the post-intervention population group.

Methods

This was a four-month prospective QI project implementing an ADHD evaluation program in a pediatric primary care setting, using a mixed method design to obtain both primary and secondary outcomes and additional process measures.

Participants

A convenience sample of two providers and an office manager at a local, rural pediatric primary care practice responsible for obtaining information for the initial assessment, diagnosis, and management of a child for ADHD was used. Inclusion criteria included any employee within the practice responsible for obtaining information for the initial assessment, diagnosis, and management of a child for ADHD.

Measures***System Change***

A system change was measured by evaluating the percentage of providers who utilized the ADHD evaluation template in the EHR.

Provider's Adherence

Provider's adherence was defined as the provider meeting the *DSM-5* criteria for a diagnosis of ADHD. This measure evaluated how many of the six *DSM-5* criteria were met by the providers prior to and after the implementation of the ADHD evaluation program within the EHR.

Provider's Satisfaction

Provider's satisfaction was measured using inductive reasoning by summarizing common themes found within the three questions asked on an anonymous questionnaire distributed to the recruited participants after the ADHD evaluation program had been implemented for approximately four months within the EHR (Williams & Moser, 2019).

Process Measure

Providers utilizing a more accurate ICD code for ADHD were assessed by comparing percentage use of the F90.9 (ADHD, unspecified type) by chart review both prior to and after

implementation of the ADHD evaluation program within the EHR.

Retrospective Chart Review

A retrospective chart review was conducted on randomly selected charts of patients aged five to 18 containing one of the four ADHD ICD-10 codes seen by the pediatric primary care practice for an initial ADHD evaluation. This pre-intervention sample group was compared to the post-intervention sample group, using the same inclusion criteria, to compare the primary and secondary outcomes and process measures.

Procedures

The ADHD evaluation program consisted of embedding an ADHD evaluation template based on the *DSM-5* criteria for ADHD into the EHR, inclusion of the ACE's questionnaire to be included in the paperwork completed by the caregiver of the child ages five to 18 scheduled for an initial ADHD evaluation, and an ADHD brochure to be given to the caregiver by the provider at the time of diagnosis.

The QI project was approved by the Institutional Review Board (IRB) at Lenoir-Rhyne University in Hickory, North Carolina prior to the implementation of the QI project. All participants were protected by the HIPPA Act of 1996, which protects the privacy of patients' health information.

With the assistance of the pediatric primary care practice's office manager, the ADHD evaluation template was entered into the practice's EHR. Due to the COVID-19 pandemic, the decision was made to record a Zoom meeting utilizing the screen sharing option to demonstrate how to utilize the ADHD template within the EHR and to discuss how the template should be used on a child between the ages of five to 18 being seen for an initial ADHD evaluation. The link and password to this recorded Zoom meeting were sent by email to the office manager, who

distributed it by email to all recruited participants who were willing and verbally consented to participate in the QI project.

The ACE's questionnaire was given to the office manager to be included in the handouts the practice distributes to the caregiver of a child being initially evaluated for ADHD. It included the following: NICHQ VADRS teacher and parent forms, a medical history form, and a non-standardized ADHD evaluation form. An ADHD brochure incorporating accurate, evidence-based information regarding the specific ADHD diagnosis and treatment options was given to the office manager to be distributed to the caregiver at the time of diagnosis.

Once all recruited participants completed the recorded Zoom meeting on how to utilize the ADHD evaluation template within the EHR, the intervention was implemented within the practice. After a four-month implementation phase, an anonymous questionnaire (See Appendix B) regarding the ADHD evaluation program was given to each of the recruited participants. The confidentiality of the recruited participants was maintained by allowing the office manager to distribute and collect questionnaires from each of the recruited participants.

Data was collected utilizing Microsoft Excel on a password-protected computer that had a firewall protection program to prevent unauthorized persons from gaining access.

Data Analysis

Descriptive statistics was used to report the percentage of providers who used the ADHD evaluation template in the EHR for each initial assessment of a child presenting for an evaluation for ADHD. The Mann-Whitney U test was used to compare the percentage of *DSM-5* criteria met for ADHD prior to and after the implementation of the ADHD evaluation program within the EHR. A thematic analysis identified the recruited participants' feedback on the ADHD program embedded in the EHR and descriptive statistics reported the percentage of the ICD-10,

F90.9 (ADHD, unspecified) codes used prior to and after implementation of the ADHD evaluation program within the EHR.

Results

Descriptive statistics of the randomly selected charts of patients seen by the pediatric primary care practice for an initial ADHD evaluation, both before and after the implementation of the ADHD program in the EHR revealed a mean age of 8.3 (SD 3.2) (Table 1, Figure 1), with 30.8% (N=8) females and 69.2% (N=18) males (Table 2, Figure 2).

Quantitative

Statistics revealed that 100% of the providers utilized the ADHD evaluation template in the EHR for children aged between ages five and 18 presenting for an initial ADHD evaluation. Summary statistics were calculated for the percentage of *DSM-5* criteria met by comparing the pre- and post-intervention groups. The observations of percentage of *DSM-5* criteria met for the pre-intervention group had an average of 0.50 (*SD* = 0.17) and the post-intervention group had an average of 1.00 (*SD* = 0.00). The summary statistics can be found in Table 3 and Figure 3.

The result of the two-tailed Mann-Whitney *U* test was significant based on a $p < .001$. This p-value of $<.001$ is statistically significant, thus, the null hypothesis is rejected; distributions in both pre- and post-intervention groups are identical. The mean rank for the pre-intervention group was 7.00, and the mean rank for post-intervention group was 20.00. When there is a notable difference between the mean ranks of the groups being compared, this results in a small p-value, suggesting that the distribution of percentage of *DSM-5* criteria met for the pre-intervention group was significantly different from the distribution of percentage of *DSM-5* criteria met for the post-intervention group. The median for the pre-intervention group (*Mdn* = 0.50) was significantly lower than the median for the post-intervention group (*Mdn* = 1.00).

Table 4 presents the result of the two-tailed Mann-Whitney U test. Figure 4 presents a graph of the ranks of percentage of *DSM-5* criteria met by pre/post intervention.

Qualitative

Of the recruited participants surveyed using an anonymous questionnaire, 100% response was obtained. When asked about the ADHD evaluation program, three themes emerged by the participants: (1) utilize for all initial ADHD evaluations, (2) confirms an ADHD diagnosis, and (3) supports standardizing documentation.

Utilize for All Initial ADHD Evaluations

When asked how the recruited participants planned on utilizing the ADHD evaluation program in practice, one participant stated, “I plan to use the ADHD evaluation program primarily for first time ADHD evaluations.” Patients present to pediatric primary care practices for both initial and follow-up visits for ADHD. The initial ADHD evaluation is defined as the first visit to which the patient is being assessed for a primary concern of ADHD. This intention of utilizing the ADHD evaluation template for all patients presenting to the practice for an initial ADHD evaluation, was the common theme found by all recruited participants.

Confirms an ADHD Diagnosis

When asked to share thoughts on how the ADHD evaluation program will change their practice, one recruited participant stated the “ADHD evaluation program helps to confirm the ADHD diagnosis on paper.” Confirmation is defined as the documentation of all six of the *DSM-5* criteria for the diagnosis of ADHD. The thematic analysis revealed the utilization of a template within the EHR assisted in confirming an ADHD diagnosis by adhering to the *DSM-5* criteria.

Supports Standardizing Documentation

When asked how the program will assist in fulfilling the *DSM-5* criteria for an accurate ADHD ICD-10 code, one recruited participant commented, “It helps since the *DSM-5* criteria are built into the system, providing consistency between the staff.” Standardizing documentation is defined as the process to which all providers within the pediatric primary care practice documented in the ADHD template within the EHR for a patient presenting for an initial ADHD evaluation. The common theme revealed how the template supports standardizing the documentation of adherence to the *DSM-5* criteria for an ADHD diagnosis.

Process Measures

Additional process measures found in this project included providers utilizing a more accurate ICD-10 code for ADHD rather than using the F90.9 (ADHD, unspecified type). Prior to the ADHD program being implemented in the EHR, the unspecified ADHD ICD-10 code was used approximately 85% of the time. When compared to the post-intervention group, providers did not use the F90.9 code as often at 69% and used the following codes: F 90.2 (ADHD, combined type) at 23% and F90.0 (ADHD, predominantly inattentive type) at 8%.

Discussion

The ADHD evaluation template placed in the EHR was successful in meeting the primary outcome of a system change within the pediatric primary care practice since both providers utilized the template for all thirteen children who presented for an initial ADHD evaluation within the four-month implementation phase. The provider’s adherence to the *DSM-5* criteria for a diagnosis of ADHD increased 50% after the implementation of the ADHD evaluation program within the EHR, which supports how templates standardize documentation, promoting consistency between providers and more accurate diagnoses (AHIMA Practice Belief, 2018; AHRQ, 2020).

The recruited participants, identified by thematic analysis, were satisfied with the ADHD evaluation program embedded as a template in the EHR, as it provided a more consistent and standardized means of documenting the *DSM-5* criteria for an ADHD diagnosis. There was a 16% decrease in the usage of the ICD-10 code F90.9 (ADHD, unspecified) after the implementation of the ADHD evaluation program. This finding supports the use of templates to obtain the necessary documentation for diagnosing patients more accurately, thus decreasing the use of unspecified ICD-10 codes (AHIMA Practice Belief, 2018).

Limitations

One limitation of this project is the small sample size, as there were only 13 initial ADHD evaluations within the approximate four-month implementation period. Another limitation is the smaller sample size of the recruited participant population group, which not only used the ADHD program within the EHR but also responded to the questionnaire. Lastly, the ACEs questionnaire was only completed with two of the 13 patients being initially evaluated for ADHD, thus limiting the ability to find an association between an adverse childhood experience and a child diagnosed with ADHD.

Conclusions

There was approximately a one percent increase in the number of children in the United States diagnosed with ADHD from 2017 and 2018, which makes it imperative to ensure these children are accurately diagnosed using the *DSM-5* criteria for ADHD (American Psychiatric Association, 2013; CAHMI, 2021). Since implementation of the ADHD program within the EHR, there has been an increase in providers' adherence to the *DSM-5* criteria to be met for one of the four ICD-10 codes for ADHD. Due to this increase in provider adherence and consistency between the providers within the practice, the unspecified ADHD ICD-10 code was used less

often, allowing the provider to develop a more successful plan of care for patients between the ages of five and 18.

In future QI, initiatives can include whether there is an association of a child with one or more adverse childhood experiences with an ADHD diagnosis, since statistics have revealed a correlation between an increased risk of ADHD and a positive ACE score (CAHMI, 2021).

Unfortunately, the ACEs questionnaire was not completed on approximately 85% of the patients being seen for an initial ADHD evaluation, not allowing the QI project to evaluate this process measure.

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Table 1*Summary of Descriptive Statistics for Age*

Variable	<i>M</i>	<i>SD</i>	<i>n</i>	Min	Max
Age	8.35	3.24	26	5.00	18

Table 2*Total Number of Females and Males*

Variable	Frequency	Percent
Female	8	30.8
Male	18	69.2
Total	26	100

Table 3*Summary Statistics Table for Interval and Ratio Variables by Pre/Post Intervention*

Variable	<i>M</i>	<i>SD</i>	<i>n</i>	<i>SE_M</i>	Min	Max	Skewness	Kurtosis
% DSM-5 Criteria Met								
Pre-Intervention	0.49	0.17	13	0.05	0.00	0.67	-1.67	2.95
Post-Intervention	1.00	0.00	13	0.00	1.00	1.00	-	-

Note. '-' indicates the statistic is undefined due to constant data or an insufficient sample size.

Table 4*Two-Tailed Mann-Whitney Test for % DSM-5 Criteria Met by Pre/Post Intervention*

Variable	Mean Rank		<i>U</i>	<i>z</i>	<i>p</i>
	no	yes			
% DSM-5 Criteria Met	7.00	20.00	0.00	-4.71	< .001

Figure 1

Percentage of Total Population by Age

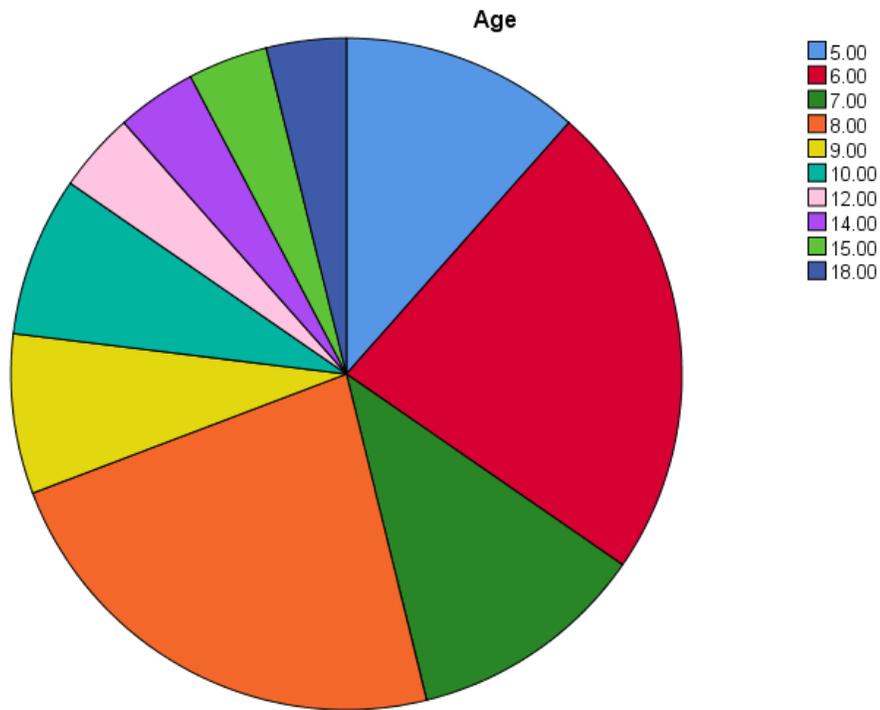


Figure 2

Total Number of Females and Males

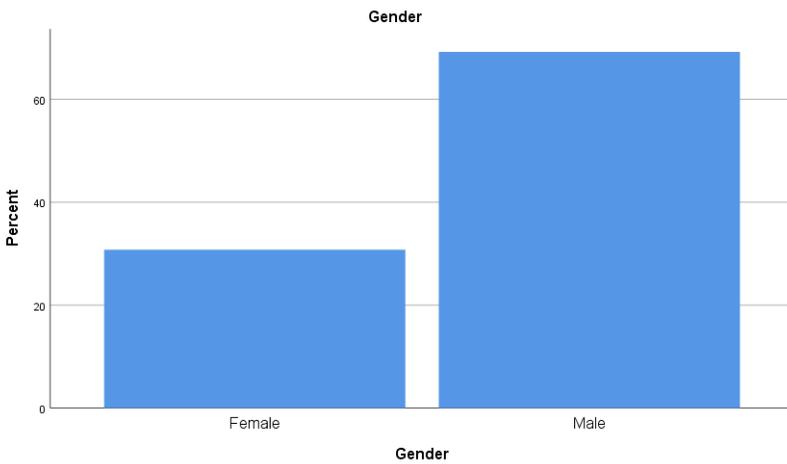


Figure 3

Boxplot of % DSM-5 Criteria Met by Intervention

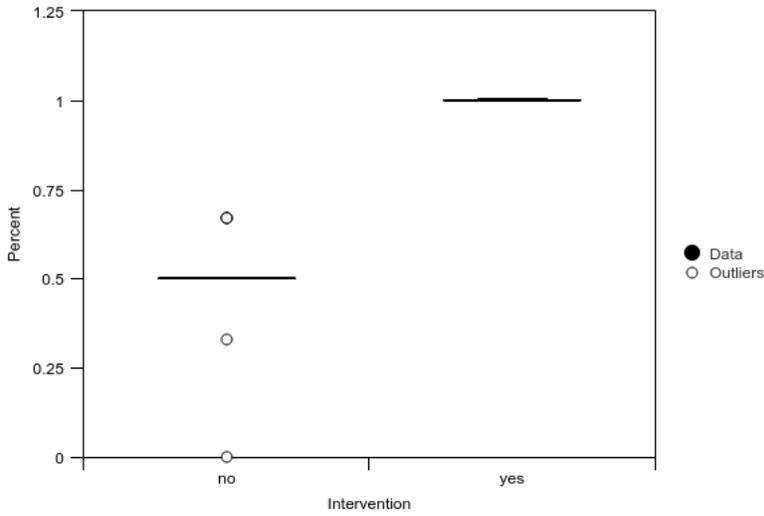
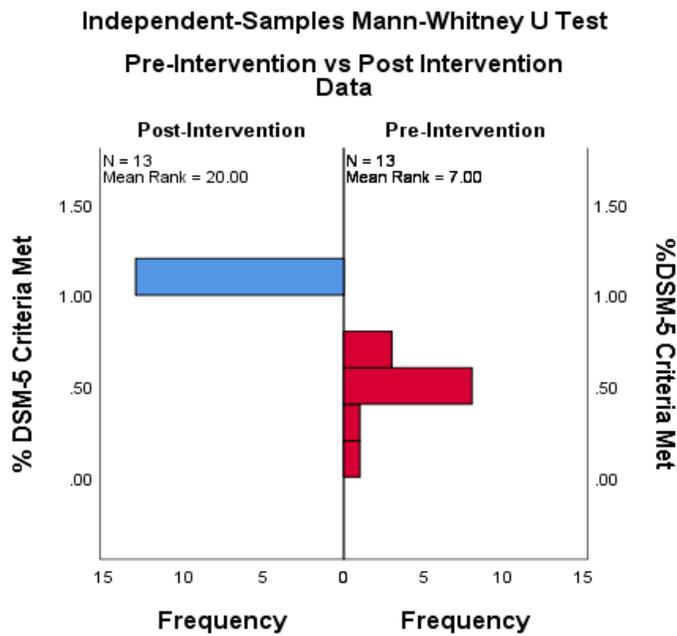


Figure 4

Ranks of % DSM-5 Criteria Met by Pre/Post Intervention



*Appendix A**DSM-5 Criteria for ADHD Diagnosis*

1.	<p>Symptoms of Inattention and/or hyperactivity/impulsivity, characterized by (A) and/or (B):</p> <p>A. Inattention (≤ 16 years of age, 6 or more; ≥ 17 years of age, 5 or more):</p> <ul style="list-style-type: none"> • Often fails to give close attention to details or makes careless mistakes in schoolwork, at work, or during other activities. • Often has difficulty sustaining attention in tasks or play activities. • Often does not seem to listen when spoken to directly. • Often does not follow through on instructions and fails to finish schoolwork, chores, or duties in the workplace. • Often has difficulty organizing tasks and activities. • Often avoids, dislikes, or is reluctant to engage in tasks that require sustained mental effort. • Often loses things necessary for tasks or activities. • Is often easily distracted by extraneous stimuli. • Is often forgetful in daily activities. <p>B. Hyperactivity/Impulsivity (≤ 16 years of age, 6 or more; ≥ 17 years of age, 5 or more):</p> <ul style="list-style-type: none"> • Often fidgets with or taps hands or feet or squirms in seat. • Often leaves seat in situations when remaining seated is expected. • Often runs about or climbs in situations where it is inappropriate. • Often unable to play or engage in leisure activities quietly. • Is often “on the go,” acting as if “driven by a motor.” • Often talks excessively. • Often blurts out an answer before a question has been completed. • Often has difficulty waiting his/ her turn. • Often interrupts or intrudes on others.
2.	Symptoms have persisted for at least six months.
3.	Symptoms present before age 12.
4.	Symptoms present in two or more settings.
5.	Symptoms not better explained by another mental disorder.
6.	Symptoms interfere with social, school and/or work.

