2014

Adult ADHD in DSM-IV-TR and DSM-5: impact of increased age-of-onset on prevalence

Morgan Ashwill Grinnell
Louisiana State University and Agricultural and Mechanical College

ADULT ADHD IN *DSM-IV-TR* AND *DSM-5*: IMPACT OF INCREASED AGE-OF-ONSET ON PREVALENCE

A Thesis

Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Master of Arts

in

The Department of Psychology

by
Morgan A. Grinnell
B.A., University of North Carolina at Chapel Hill, 2011
May 2014

TABLE OF CONTENTS

ABSTRACT

Attention-Deficit/Hyperactivity Disorder (ADHD) is a prevalent disorder estimated to affect 3%-7% of children and about 4% of the adult population. In adults, ADHD is associated with lower academic achievement, more interpersonal conflicts and a bevy of other negative outcomes. Research on the assessment and treatment of ADHD in adults has considerably lagged behind research conducted with children. Existing research has been influential in the American Psychiatric Association's (APA) decision to update the *Diagnostic and Statistical Manual of Mental Disorders (DSM)* definition of ADHD to include more developmentally expansive criteria. Modifications to the fifth edition of the manual (*DSM-5)* included an increase in the age-of-onset from seven to twelve, and the addition of more applicable symptom exemplars for older patients. The current study explored effects that the modification of criteria had on the prevalence of ADHD in college students. Results suggested that the relaxed age-of-onset criteria led to a three-fold increase in the number of ADHD diagnoses in the sample. The symptom severity for those who met *DSM-IV-TR* and *DSM-5 ADHD* did not differ significantly. Surprisingly, there was little agreement in diagnostic status between established measures of ADHD and the symptom checklist used as the primary diagnostic tool. Implications of the findings and future directions for research are discussed after the presentation of the results.

Keywords: Adult ADHD, DSM-5, age-of-onset, prevalence

INTRODUCTION

For years, Attention-Deficit/Hyperactivity Disorder (ADHD) was categorized as a childhood disorder and assumed to remit in later adolescence and adulthood. There is increasing recognition, however, that the disorder often continues into adulthood (Biederman, Monuteaux, et al., 2006; Heiligenstein, Conyers, Berns, & Miller, 1998; Karam et al., 2009; McGough & Barkley, 2004). Throughout the development of the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5)* (American Psychiatric Association [APA], 2013) proposals to make ADHD criteria more developmentally expansive, alongside other proposed edits sparked debates among professionals (Bell, 2011; Coghill & Seth, 2011; Faraone et al., 2006; Ghanizadeh, 2012; Hudziak, Achenbach, Althoff, & Pine, 2007; Kieling et al., 2010; Naglieri & Goldstein, 2006; Nigg, Tannock, & Rohde, 2010; Polanczyk, 2010; Ramtekkar, Reiersen, Todorov, & Todd, 2010; Willcutt et al., 2012). The aim of the current study is to compare the proposed *DSM-5* criteria with the existing diagnostic formulation of ADHD provided in the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition- Text Revision (DSM-IV-TR)* (APA, 2000). Specifically, the current study will examine differences in the resulting prevalence rates and subtype variations when using *DSM-IV-TR* and *DSM-5* for diagnosis. The following discusses *DSM-IV-TR* ADHD criteria as well as the development of the *DSM-5*.

Overview of ADHD in Children and Adults

The estimates of childhood ADHD prevalence ranges between 3 and 7%, while the prevalence for adults is estimated to be about 4.4%, suggesting that roughly half of all children with ADHD continue to meet criteria in adulthood (APA, 2000; Kessler et al., 2006; Kessler et al., 2010). ADHD has been linked to a multitude of outcomes in both children and adults.

Regarding social functioning, people with ADHD tend to have lower self-esteem, more peer rejection, family relationships characterized by resentment and conflict, and a higher likelihood of divorce (APA, 2000; Biederman, Faraone, et al., 2006; Biederman, Monuteaux, et al., 2006; Murphy, Barkley, & Bush, 2002). Students with ADHD: are less likely to complete college, earn lower grades than their peers, have lower career decision-making self-efficacy, show poorer study and organization skills, demonstrate deficits in cognitive functioning, and have lower IQs than their counterparts (APA, 2000; Biederman, Faraone, et al., 2006; Biederman, Monuteaux, et al., 2006; Kessler et al., 2006; Murphy et al., 2002; Norwalk, Norvilitis, & MacLean, 2009; Richards, Rosén, & Ramirez, 1999; Wender, Wolf, & Wasserstein, 2001). Furthermore, ADHD has been linked to lower life satisfaction, higher rates of arrests, increased likelihood of attempted suicide, more frequent job changes and higher rates of unemployment (Kessler et al., 2006; Murphy et al., 2002).

ADHD is highly co-morbid with other psychological disorders, which further confounds diagnosis and treatment. Nearly half of children diagnosed with ADHD before the age of seven also meet criteria for Oppositional Defiant Disorder or Conduct Disorder; however, this rate of comorbidity often decreases with late-onset ADHD. Late-onset ADHD is designated as ADHD with an onset after the age of seven and usually before the age of twelve (APA, 2000; Karam et al., 2009). As ADHD persists through development, research has shown that adults with ADHD have higher rates of antisocial behavior, substance abuse, and addiction; as well as mood and anxiety disorders (Biederman, Faraone, et al., 2006; Biederman, Monuteaux, et al., 2006; Karam et al., 2009; Murphy et al., 2002; Weyandt, Linterman, & Rice, 1995).

In recent decades, research supporting the continuity of ADHD symptomatology through the lifespan has increased in volume. Since ADHD influences life beyond childhood, more

research is needed to: validate *DSM* symptoms, develop processes to aid in identification, and improve empirically-based treatments for adult ADHD (McGough, & Barkley, 2004).

ADHD in *DSM-IV-TR*

Attention-Deficit/Hyperactivity Disorder is defined by five primary criteria in *DSM-IV-TR*. Criterion A requires at least six of nine inattentive symptoms or six out of nine impulsive/hyperactive symptoms to be present for at least six months and fall outside the range of developmentally appropriate and adaptive behavior (APA, 2000). Criterion B requires that at least some of the symptoms were present before the age of seven, and Criterion C states that symptoms that cause impairment must be present in at least two different settings (APA, 2000). According to Criterion D, there should be clear evidence of occupational, social or academic impairment; and finally, Criterion E necessitates that the symptoms must not occur exclusively or be better accounted for by another mental disorder (APA, 2000).

There are three subtypes of ADHD in the *DSM-IV-TR*: Combined Type (ADHD-C), Predominately Inattentive Type (ADHD-I), and Predominately Hyperactive/Impulsive Type (ADHD-H/I) (APA, 2000). Individuals with ADHD Predominately Inattentive Type have difficulty maintaining sustained attention and are easily distracted. Additional symptoms include forgetfulness, procrastination, daydreaming, and disorganization (APA, 2000). Individuals with ADHD Predominately Hyperactive/Impulsive Type are constantly driven or "on-the-go," and tend to fidget or feel restless. Other symptoms include not being able to engage in quiet leisure activities, talking excessively, and having difficulty awaiting their turn (APA, 2000). Those with ADHD Combined Type have symptoms consistent with both of the previously mentioned subtypes (APA, 2000). Finally, a diagnosis of ADHD-Not Otherwise Specified is utilized for patients whose symptom presentation does not fit neatly into one of the previous categories.

Critiques of *DSM-IV-TR*

Since its release in 2000, the criteria presented in *DSM-IV-TR* have been researched in preparation to make revisions in future editions. Mental health professionals have presented multiple weaknesses in the ADHD criteria. One criticism is that the subtype classifications are unstable over time (APA, 2010; Willcutt et al., 2012). For example ADHD-H/I is seen less frequently after first grade, while rates of ADHD-I tend to increase throughout development. ADHD-C also varies over the lifespan which some partially attribute to the strict cut-offs for diagnosis and weighted importance of hyperactivity over impulsivity symptoms (Bell, 2011; Coghill & Seth, 2011; Heiligenstein et al., 1998; Martel, von Eye, & Nigg, 2012; McGough & Barkley, 2004; Solanto, Wasserstein, Marks, & Mitchell, 2012; Willcutt et al., 2012).

ADHD diagnosis is further complicated by its arbitrarily set age-of-onset criterion. *DSM-IV-TR* states that it is difficult to accurately diagnose ADHD before the age of four to five, yet in order to meet criteria for diagnosis there must be evidence of impairment before the age of seven (APA, 2000). Multiple studies have shown that the criterion is too stringent, and thus, excludes many people from being diagnosed as adolescents and adults (APA, 2010; Bell, 2011; Coghill & Seth, 2011; Faraone et al., 2006; Karam et al., 2009; McGough, & Barkley, 2004; Polanczyk et al., 2010; Willcutt et al., 2012). Additionally, there were discussions of adding new impulsivity symptoms, defining a new related diagnosis called Sluggish Cognitive Tempo (SCT), revising the criteria exemplars to be more developmentally expansive, lowering symptom thresholds, and discarding subtypes in favor of a more dimensional approach (APA, 2010; Bell, 2011; Coghill & Seth, 2011; Faraone et al., 2006; Ghanizadeh, 2012; Hartman, Willcutt, Rhee, & Pennington, 2004; Heiligenstein et al., 1998; Kessler et al., 2010; McGough & Barkley, 2004; Naglieri & Goldstein, 2006; Solanto et al., 2012; Willcutt et al., 2012). Some of these suggestions had more

merit and empirical support than others, though many did not make the final cut into *DSM-5* (APA, 2013). For example, a new Inattentive Presentation (Restrictive) was included in the last public draft of the *DSM-5* criteria in December 2012. However, the presentation was missing from the final publication in May 2013.   The Inattentive Presentation (Restrictive) diagnosis would have been assigned when six symptoms of Inattention and no more than two symptoms from Hyperactivity-Impulsivity were present for at least the prior six months (APA, 2013). The proposed presentation would have also altered the Predominately Inattentive Presentation (previously known as ADHD-I) to only apply when at least six symptoms from Inattention and between three and five symptoms of hyperactivity/impulsivity were present for the previous six months (APA, 2013). The now defunct presentation with restricted hyperactivity/impulsivity would have addressed the appeal for a purely inattentive subtype and accounted for the changes of ADHD symptom presentation throughout development (APA, 2010; Coghill & Seth, 2011; Heiligenstein et al., 1998; Kessler et al., 2010; Martel et al., 2012; Nigg et al., 2010; Ramtekkar et al., 2010).

Development of *DSM-5*

The fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* was in development for more than twelve years and gained international contributions from professionals in mental health fields including: psychiatry, psychology, counseling, social work and nursing. The American Psychiatric Association called for a complete reform of the current manual and empirical validation (APA, 2012b). In 2010, APA began field trials on its outlined criteria for the new manual, and despite harsh criticism resulting from arguably poor psychometrics, removed the proposed criteria for all diagnoses from the *DSM-5* website on December 1, 2012 in order to ready the final document for publication (APA, 2012a; Brooks,

2012; Clarke et al., 2013; Frances, 2012; Jones, 2012; Narrow et al., 2013; Regier et al., 2013).

DSM-5 was released in May of 2013.

The *DSM-5* diagnostic criteria for ADHD included a change in the age-of-onset from seven to twelve, and added examples of symptoms pertinent to older patients (APA, 2013). For instance, one of the new examples for Criterion A, symptom (f) in the Inattention category, will now read: "Often avoids, dislikes, or is reluctant to engage in tasks that require sustained mental effort (e.g., schoolwork or homework; for older adolescents and adults, preparing reports, completing forms, or reviewing lengthy papers)."(APA, 2013). The most substantial change in the new criteria is the relaxation of the age-of-onset criteria (APA, 2013). Some critics expressed concern regarding skyrocketing prevalence rates, despite the initial empirical support for this expansion; meanwhile, others argued that the effect would be minimal (Faraone et al., 2006; Kieling et al., 2010; Polanczyk et al., 2010). The *DSM-5* has also proposed modification of subtype names. What was previously known as ADHD-C will now be known as Combined Presentation, ADHD-I will now read Predominately Inattentive Presentation, and ADHD-H will be Predominately Hyperactive/Impulsive Presentation (APA, 2013).

THE CURRENT STUDY

ADHD can be a lifelong impairment creating both subtle and profound effects on a person's quality of life. Functional deficits associated with ADHD impact academic functioning, interpersonal relationships and work performance (APA, 2000; APA, 2013). The specific presentation of ADHD can change over time and development, which has been acknowledged and reflected in the new *DSM-5* criteria (APA, 2013). Because of the recent revisions, an exploratory study was necessary to determine the effects of the modification to the ADHD age-of-onset criteria. The purpose of the current study was to evaluate ADHD criteria in a group of young adults and compare potential differences in the prevalence rates in ADHD based on *DSM-IV-TR* and *DSM-5* criteria. This allowed the effects of the new age-of-onset criterion to be examined on the rate of diagnosis. Furthermore, the severity of symptomatology and comparison with existing measures of ADHD were explored based on diagnostic status.

Hypotheses

The following hypotheses were proposed in this study:

1. It was hypothesized that the prevalence of ADHD diagnoses would be greater based on *DSM-5* criteria, when compared to the criteria outlined by *DSM-IV-TR* (Faraone et al., 2006; Kieling et al., 2010). The predicted increase in prevalence from *DSM-IV-TR* to *DSM-5* was posited to be due to the change in the age-of-onset criterion.

2. It was predicted that the individuals meeting criteria solely for *DSM-5* ADHD (i.e., late-onset of symptoms) would not differ in severity when compared to the group who met criteria for ADHD based on more stringent *DSM-IV-TR* standards (i.e., childhood-onset of symptoms).

3. Given that an individual met criteria for ADHD according to *DSM-IV-TR* and/or *DSM-5* as assessed by the Adult ADHD Self-Report Scale (ASRS), the commonly used Wender Utah Rating Scale (WURS) and Conners' Adult ADHD Rating Scale – Self-Report: Long Version (CAARS) measures should correspond with his or her diagnosis.

METHOD

Participants

The sample consisted of 150 undergraduate students from a large southern university. Students ranged in age from 18 to 26, and were recruited on the basis of having a self-reported diagnosis of ADHD and/or current concerns regarding inattention, hyperactivity or impulsivity. Prior studies have suggested that participants who self-report a diagnosis of ADHD are very similar to participants recruited from clinical settings (Biederman, Faraone, et al., 2006; Richards et al., 1999). The literature also indicates that individuals who report significant problems maintaining sustained attention without a confirmed diagnosis can provide fairly accurate accounts of current and previous symptoms, as many cases of ADHD are unidentified and untreated (Kessler et al., 2006; Murphy & Schachar, 2000). Thus, these recruitment procedures and population were determined to be appropriate for the current study.

The mean age of the participants was 19.62 (SD=1.79). As seen in Table 1, more than two-thirds of the sample were female participants, and over 80% of the sample identified their ethnicity as Caucasian.

Although a prior diagnosis of ADHD was not required, participants were asked to show verification of a previous diagnosis if they had been previously diagnosed in order to confirm the documentation of the disorder in their medical chart. Examples of documents that served as verification of an ADHD diagnosis include: prescriptions or prescription bottles of ADHD medication (or pictures of either), psychological evaluation reports, and documentation from the university's disability services office. As depicted in Table 1, over half of the participants were previously diagnosed with ADHD by a doctor or clinician.

Table 1

Demographic Characteristics of the Sample

	n	Percent (%)	*n* Missing
Gender			0
Female	102	68%	
Male	48	32%	
Ethnicity			5
American Indian/ Alaskan Native	1	0.7%	
Asian/ Pacific Islander	6	4%	
African American/ Black	13	8.7%	
Caucasian/White	122	81.3%	
Hispanic/ Latino	3	2%	
Previous ADHD Diagnosis			0
No Verification	65	43.3%	
Verified	85	56.7%	

Measures

     Demographic Questionnaire. Participants completed a demographics questionnaire (Appendix B) which addressed: basic identification information, age, sex, information about their previous diagnosis of ADHD including age of diagnosis, prescribed ADHD medication, if applicable, and psychological history (i.e., previous non-ADHD diagnoses).

     Adult ADHD Self-Report Scale (ASRS). The ASRS (Appendix C) (Kessler et al., 2005) is an 18-item diagnostic checklist of current symptoms based on *DSM-IV-TR* ADHD criteria. It has two underlying subscales, in which nine items assess inattention and nine measure hyperactivity-impulsivity. The symptom frequency is rated on a 5-point Likert scale from 0-4 (i.e., Never to Very Often) (Adler et al., 2006; Kessler et al., 2005; Taylor, Deb, & Unwin, 2011). The questionnaire takes approximately five minutes to complete, and answers can be categorized on a yes/no basis or scored as a continuous variable (Taylor et al., 2011). For this study, the measure was be scored in a dichotomous approach so that a symptom count for each subtype could be ascertained. Traditionally, a cut off score of nine out of eighteen items is used when using the full ASRS measure (Taylor, et al., 2011). However, because the aim of the

current study is to use criteria and cut-offs from *DSM-IV-TR* and *DSM-5*, students who reported at least six of nine symptoms on either scale were included in the primary analyses.

The ASRS was initially piloted as a symptoms checklist on a clinical sample of 60 adults diagnosed with ADHD and compared to clinicians' rating. (Adler, et al., 2006). The internal consistency for the ASRS is between 0.75 and 0.89, and the sensitivity and specificity is 56% and 98%, respectively, with a total classification accuracy of 96% (Adler et al., 2006; Kessler et al., 2005; Kessler et al., 2007; Taylor et al., 2011).

Age of Onset. Age of onset was determined by including a single question as an addendum to the ASRS (Appendix C). The question asked the participant to include the age at which he/she began noticing the symptoms endorsed on the ASRS (if any). Because the answer to this question was essential to the research question, it was featured prominently and verified during data collection to ensure that the participant recorded a specific age (e.g., eight years old instead of 2nd grade).

In the current study, variables were created and dummy coded to indicate whether diagnostic criteria for ADHD in *DSM-IV-TR* or *DSM-5* were met for each participant according to their responses on the ASRS (i.e. at least six of nine symptoms were endorsed for either subscale) and the age first noticed. Therefore, those who met *DSM-IV-TR* diagnostic criteria noticed their symptoms no later than age seven, and those who met criteria for *DSM-5* ADHD according to the ASRS included those who were identified by the *DSM-IV-TR* criteria as well as those who endorsed similar criteria and had an onset of symptoms no later than age twelve.

Conners' Adult ADHD Rating Scale – Self-Report: Long Version (CAARS). The CAARS was developed to assist in the diagnosis of ADHD in adults (Conners, Erhardt, & Sparrow, 1999). Though information can be obtained from two different sources (observer and

self) the current study utilized only the self-report measure. The CAARS has 66 items scored on a 4-point scale from 0 (Not at all, never) to 3 (Very much, very frequently). Items were derived from a 93-item pool administered to 839 nonclinical adults. The measure was then normed using a sample of 1,026 nonclinical adults, and norms for four age ranges for each gender were developed. The long form of this self-report has 4-factor derived subscales along with an inconsistency index, an ADHD index and three *DSM-IV* ADHD symptoms subscales (Conners et al., 1999). The estimated time necessary to complete the CAARS is between ten and fifteen minutes.

Overall, the CAARS is a valid and reliable measure of adult ADHD, with internal consistency between 0.74 and 0.92 and test-retest reliability between 0.80 and 0.91(Adler et al., 2008; Taylor et al., 2011). Taylor and colleagues (2011) also reported an 85% total classification accuracy for the CAARS measure, with 82% sensitivity and 87% specificity. The CAARS is a sound measure and appropriate to use in this study to assess for current ADHD symptomatology in college students.

For the current study, the CAARS ADHD Index scale was utilized in creating a cut-off score to determine those who likely met criteria for ADHD according to the CAARS. Previous research as well as the manual for the measure suggest that the ADHD Index score is the single best predictor of ADHD on the CAARS, as it is an overall measure of the likelihood that ADHD is present (Conners et al., 1999; Hudziak, Derks, Althoff, Rettew, & Boomsma, 2005; Solanto, Wasserstein, Marks, & Mitchell, 2012). The cutoff score of $t \geq 70$ ($SD = 2.0$) was used in creating a new variable which indicated whether the person likely has clinically significant ADHD according to the CAARS. Previous research has used a more lenient cut-off score of $t \geq 65$, which generally indicates a moderately elevated score and the need for further evaluation

(Adler et al., 2008; Hudziak et al., 2005; Rodriguez & Simon-Dack, 2013; Solanto et al., 2012). Thus $t \geq 70$ was chosen to eliminate ambiguity and employ the criteria suggested for clinical significance (Conners et al., 1999).

Wender Utah Rating Scale (WURS). The WURS, is a 61-item retrospective self-report questionnaire of childhood symptoms (Appendix D). Twenty-five items assess the presence of childhood ADHD symptomatology (Ward, Wender, & Reimherr, 1993). The measure is based on a five-point Likert scale (0-4), and item responses are summed to arrive at a total score. The cut-off score for the ADHD subscale is 46 or higher if depression is absent, and greater than or equal to 36 if depression is present (Taylor et al., 2011).

The WURS was initially administered to 81 outpatient adults with ADHD, 100 normal controls, and 70 psychiatric inpatients with depression (Ward et al., 1993). Twenty-five items were then chosen based on their ability to differentiate those with ADHD from those without ADHD. The internal consistency of the WURS-25 is between 0.86 and 0.92, while test re-test reliability fell between r=0.62 - 0.98. Both the sensitivity and specificity of the measure was 96%, indicating that the measure demonstrates adequate psychometrics as well as good validity and reliability (McGough & Barkley, 2004; Rossini & O'Connor, 1995; Taylor et al., 2011; Ward et al., 1993; Wender et al., 2001; Weyandt et al., 1995; Wierzbicki, 2005).

For the current study, the higher cut-off score of 46 was used, since depression was not adequately assessed. This data was coded into a dummy variable which indicated if each participant's scores exceeded 46, suggesting that he or she would meet diagnostic criteria for ADHD according to the WURS.

Procedure

After receiving IRB approval (IRB #3381), participants were recruited through psychology classes and received class credit for participation. Participants met with the researcher individually. At the beginning of the 45-minute data collection session, participants were told the purpose of the study and given directions for completing each questionnaire. After each participant gave informed consent (Appendix A), he or she completed the questionnaires independently while the researcher was available to answer questions. Once questionnaires were filled, the researcher inspected answers for completion, and gave the participant the opportunity to provide verification of their ADHD diagnosis if applicable.

RESULTS

Preliminary Analyses

Prior to analysis, it was determined whether each participant qualified for a research diagnosis of ADHD. For the purposes of this study, a research diagnosis was operationalized as endorsing at least six out of nine inattention or impulsive/hyperactive symptoms of ADHD as detailed in the *DSM* version in question. That is, in order for a participant to be classified as meeting criteria for ADHD, he or she must have endorsed the minimum number of symptoms in either category and reported that the "age noticed" was no later than seven years of age for *DSM-IV-TR* and twelve years of age for *DSM-5*. Symptom endorsement was established using the dichotomous rating of each item on the ASRS.

Several new variables were created for the purpose of analyses. First, the ASRS data were dichotomously scored (Kessler et al., 2005; Taylor et al., 2011) and coded to create symptom counts for inattentive symptoms, hyperactive/impulsive symptoms, and total symptoms. The average number of total symptoms endorsed on the ASRS across all participants was $M = 10.91$ ($SD = 4.12$).

Individuals were classified as to whether they met diagnostic criteria according to *DSM-IV-TR* and *DSM-5* based on the ASRS. Table 2 demonstrates the frequency of ADHD in the sample, as classified by the ASRS. As seen in Table 2, 8.7% ($n = 13$) of the participants met *DSM-IV-TR* ADHD diagnostic criteria according to the ASRS, while 30.7% ($n = 46$) of the participants met *DSM-5* ADHD diagnostic criteria. Thus, 33 additional participants only met criteria for *DSM-5* diagnostic criteria according to the ASRS.

As mentioned in the description of the measures, separate dummy variables were coded for the presence or absence of an ADHD diagnosis based on the WURS cut-off score of 46, and

the CAARS ADHD Index scale endorsed at a clinically elevated level ($t \geq 70$). Table 3 illustrates

the number of instances that exceeded the cut-off scores for the WURS and CAARS.

Table 2
Frequency of ADHD Diagnoses based on the ASRS

	Frequency (*n*)	Percent
DSM-IV-TR ADHD diagnosis	13	8.7%
DSM-5 ADHD diagnosis	33	22%
Total ADHD diagnoses (*DSM-IV-TR* and *DSM-5*)	46	30.7%
No diagnosis	104	69.3%

Table 3
Frequency of Clinically Significant Scores on CAARS and WURS

	WURS	CAARS
	n (%)	*n* (%)
Exceeds Cutoff	60 (40%)	87 (58%)
Below Cutoff	90 (60%)	63 (42%)
Total	150 (100%)	150 (100%)

Note. WURS =Wender Utah Rating Scale; CAARS= Conners Adult ADHD Rating Scale: Self-Report – Long Version

Prevalence Comparison

The primary hypothesis proposed that the prevalence of ADHD diagnoses would increase

in *DSM-5* compared to *DSM-IV-TR,* due to the extension of the age-of-onset criteria. A

McNemar's test was conducted to evaluate this proposition. McNemar's test is similar to a

Pearson's chi-square analysis and is appropriately used in situations comparing two dichotomous

variables that are related to one another, or for within-subject designs such as in a pre-test vs.

post-test, which results in a 2x2 matrix (Lowry, 1998).

A McNemar's test was performed to examine the relationship between rates of ADHD

diagnoses using *DSM-IV-TR* and *DSM-5* criteria. The prevalence of ADHD increased

significantly using *DSM-5* criteria compared to *DSM-IV-TR* criteria ($p \leq .001$). As shown in

Table 4, 8.7% ($n = 13$) of the total sample met criteria for ADHD in *DSM-IV-TR,* while 30.6%

($n= 46$) met criteria for *DSM-5* ADHD. Because the only criterion that changed between the

DSM-IV-TR classification and the *DSM-5* classification was the age-of-onset (i.e., "age noticed"), the results support the primary hypothesis. In other words, the relaxation of the age-of-onset criterion from seven years of age to twelve years of age produced a significant increase in the prevalence of ADHD in the current sample of participants.

Table 4
DSM-IV-TR Diagnostic Status vs. *DSM-5* Diagnostic Status Crosstabulation

		DSM-IV-TR ADHD Diagnosis		
		Yes	No	Total
DSM-5 ADHD	Yes	13	33	46
Diagnosis	No	0	104	104
Total		13	137	150

Note. McNemar's χ^2 Test, Exact Significance (2-sided) $p < .001$

Severity Comparison

The second hypothesis proposed that those who met criteria for *DSM-IV-TR* ADHD as assessed by the ASRS would have symptoms similar in severity to those who met criteria for *DSM-5* ADHD, as classified by the ASRS. To make this comparison, an independent samples *t*-test was conducted using the symptom counts for the ASRS Inattention subscale, the ASRS Hyperactivity/Impulsivity subscale and the Total Symptoms count. The variables were grouped according to their diagnostic status (i.e., *DSM-IV-TR* or *DSM-5* ADHD diagnosis). Symptom counts from each of the subscales were able to range from zero symptoms to nine symptoms, and the total symptom count could range between zero and eighteen symptoms. The results of this comparison, along with confidence intervals are located in Table 5. Neither the total number of symptoms, nor either of the subscales were significantly different based on diagnostic status. As such, the predicted null hypothesis cannot be rejected, lending support to the research hypothesis.

Table 5

Results of *t*-test comparing symptom endorsement in participants with *DSM-IV-TR* and *DSM-5* ADHD.

	DSM-IV-TR	DSM-5			95% Confidence Interval	
	M (SD)	M (SD)	t	p-value	Lower	Upper
Inattention Symptom Count	7.08 (1.55)	7.21 (1.56)	-.27	.792	-.135	.509
Hyperactivity/Impulsivity Symptom Count	6.54 (2.07)	5.21 (2.04)	1.98	.054	1.33	.67
Total Symptom Count	13.62 (2.84)	12.42 (2.70)	1.33	.192	1.19	.898

Agreement with Established Measures

The final hypothesis suggested that if a person endorsed clinically significant levels of ADHD diagnostic criteria on the ASRS, his or her ratings on the WURS and CAARS measures would also predict his or her diagnostic status (i.e., would be in agreement). In order to evaluate this hypothesis, Cohen's kappa (κ) was calculated to compare the diagnostic status produced by the ASRS to each of the establish measures. Because all participants who met criteria for according to *DSM-IV-TR* also met criteria for *DSM-5,* a single dummy-coded variable for all participants with *DSM-5* ADHD was used as a categorical variable in each of the comparisons. The diagnostic status of the Wender Utah Rating scale was based on a pre-established cut off score of 46 based on the answers to a subset of 25 questions that are most related to a diagnosis of ADHD (Ward, Wender & Reimherr, 1993). The CAARS diagnostic status was determined by a clinically significant score ($t \geq 70$) on the ADHD Index Scale. Results for the crosstabulation for the WURS can viewed in Table 6, while Table 7 includes the results of the comparison with the CAARS measure.

The diagnoses based on the ASRS and WURS matched 64.00% of the time ($n = 96$), which is greater than the 53.87% agreement ($n = 80.8$) expected by chance. Thus, $\kappa = 0.22$, $p = .007$, $SE = 0.08$, 95% CI [0.063, 0.377]. The agreement is statistically significant, although the

strength of the agreement between the ASRS and WURS is fair. The ADHD diagnoses based on scores from the CAARS and ASRS were in agreement for 68.00% ($n = 102$) of the participants. Based on chance, the CAARS and ASRS could be expected to agree in 60.05% ($n = 90.1$) of the instances. Therefore, $\kappa = 0.199$, $p = .013$, $SE = 0.09$, 95% CI [0.033, 0.365]. The strength of agreement between the ASRS and CAARS is considered poor, but statistically significant. In both cases, the relationship between the measure in question and the ASRS-based ADHD diagnosis is significant; however, the agreement between the measures is much lower than would have been expected, given that all were designed to measure the same construct.

Table 6

Agreement of ADHD Diagnosis between the ASRS and WURS

			WURS ADHD Diagnosis		
			Yes	No	Total
ASRS ADHD Diagnosis	Yes	Count	26	20	46
		% of Total	17.3%	13.3%	30.7%
	No	Count	34	70	104
		% of Total	22.7%	46.7%	69.3%
Total		Count	60	90	150
		% of Total	40.0%	60.0%	100.0%

Note. WURS =Wender Utah Rating Scale; ASRS= Adult ADHD Self-Report Scale

Table 7

Agreement of ADHD Diagnosis between the ASRS and CAARS

			CAARS ADHD Diagnosis		
			Yes	No	Total
ASRS ADHD Diagnosis	Yes	Count	17	29	46
		% of Total	11.3%	19.3%	30.7%
	No	Count	19	85	104
		% of Total	12.7%	56.7%	69.3%
Total		Count	36	114	150
		% of Total	24.0%	76.0%	100%

Note. CAARS= Conners Adult ADHD Rating Scale – Self-Report: Long Version

DISCUSSION

The goal of the present study was to explore one primary and two secondary hypotheses related to the diagnosis of ADHD in young adults because of recent debates regarding modifications to the diagnostic criteria. The increased age-of-onset criteria was of primary interest. It was hypothesized that with the change of the age-of-onset criteria from age seven or younger to age twelve or younger, the prevalence of ADHD diagnoses would increase within the population. Statistical analysis of the data resulted in the rejection of the null hypothesis, and lends support to the hypothesis. Although only 13 of the 150 participants endorsed sufficient criteria to procure a "research diagnosis" of ADHD as assessed by the ASRS using *DSM-IV-TR* standards, an additional 33 participants endorsed that their symptoms of ADHD began after the age of seven but before the age of twelve. The increase of ADHD diagnoses from *DSM-IV-TR* to *DSM-5* in the current sample was more than three-fold.

The second hypothesis suggested that those who would qualify for a *DSM-5* diagnosis of ADHD (i.e., late-onset ADHD) would have symptoms similar in severity to those who qualified for a childhood-onset *DSM-IV-TR* diagnosis of ADHD. Based on the results of the *t*-test, neither the total number of symptoms endorsed nor the number of symptoms endorsed on either subscale differed significantly between groups. Thus, the null hypothesis cannot be rejected which supports the proposed hypothesis. However, there was a group difference on the Hyperactivity/Impulsivity symptom scale that approached statistical significance, $p = .054$. With a larger sample of participants, this comparison would likely reach statistical significance.

The final hypothesis stated that a person's scores and diagnostic status on the WURS and CAARS would coincide with the presence or absence of a research diagnosis of ADHD, as determined by the ASRS. Surprisingly, the κ-values of these comparisons were less than

impressive for measures designed to assess the same underlying construct. The ASRS is essentially written as a diagnostic checklist, so one would infer that established ADHD measures would result in strong agreement of diagnostic status compared to the ASRS. The WURS κ-value was statistically significant ($p = .007$), and the strength of the association was fair. The WURS is a self-report questionnaire that has the benefit of eliciting a retrospective report of symptomatology, but has also been associated with mood disorders, dysfunctional personality traits, and diverges from criteria outlined by the *DSM-IV-TR* (Hill, Pella, Singh, Jones, & Gouvier, 2009; McGough & Barkley, 2004; Wierzbicki, 2005). The CAARS κ-value was also statistically significant ($p = .031$), but the strength of the association between classification systems was poor. Despite its popularity and evidence of robust psychometric properties (Taylor et al., 2011), some research suggests the CAARS may fail to differentiate between adults with ADHD and those with other psychiatric disorders (Van Voorhees, Hardy, & Kollins, 2011). Additionally, the ASRS in the current study was used in a slightly altered manner than outlined by its authors so that items were reorganized by subtypes during analyses and a cutoff of six symptoms was used for each subtype. However, the method matched items in a precise 1-to-1 ratio with diagnostic criteria outlined in APA's *DSM-IV-TR* and *DSM-5*.

Implications

The results from first and second hypothesis are similar to those in previous studies and which investigated the age-of-onset criteria and syntheses of research, although previous studies were not able to utilize and evaluate official *DSM-5* diagnostic criteria (Bell, 2011; Coghill & Seth, 2011; Faraone et al., 2006; Kieling et al., 2010; Todd, Huang, & Henderson, 2008). One suggested interpretation is that adults with ADHD may not be accurate reporters of the age-of-onset because of imprecise memories of their own behavior before the age of seven. Childhood

ADHD research suggests that children are often poor reporters and lack insight of their own behavior until at least middle childhood (Hoza, Vaughn, Waschbusch, Murray-Close, & McCabe, 2012). Furthermore, people are notoriously poor reporters of their own externalizing behaviors (Manor et al., 2012; Richards et al., 1999; Sibley et al., 2012). Some researchers have suggested that those who are able to recall symptomatology by the age of twelve, may have also experienced symptoms of ADHD at the age of seven (Polanczyk et al., 2010).

Findings of this study suggest that a substantial subset of those with previously undiagnosed ADHD (due to a lack of historical evidence), may gain access to helpful services and accommodations. This outcome may be viewed positively or negatively. For the faction that believes that the age-of-onset criterion is too stringent, this finding implies that more people may be able to gain access to services and accommodations that are needed would result in those people gaining optimal opportunities to succeed. However, for the group that believes ADHD should be a disorder of childhood and is already diagnosed far too frequently, these results imply that an even larger number of people may be able to seek and receive unfair advantages through unnecessary accommodations and pharmacotherapy.

A discovery of such a marked increase in prevalence may also be construed as a critique of the revised diagnostic criteria in *DSM-5*. Many people feared that the relaxation of criteria would result in pathologizing normal behavior, and a subsequent rise in stimulant prescriptions which already have controversial efficacy in adult populations (Advokat, Lane, & Luo, 2011). The results from the current study seem to lend credence to these concerns. However, the dramatic increase observed may partially be a reclassification of those who might have previously received diagnoses of ADHD-Not Otherwise Specified, which should be considered as a possible alternative and area of future research.

The results of the current study also contradict from some claims made in past research. For example, Polanczyk et al. (2010) suggested that an increased age-of-onset criteria would likely contribute little to the prevalence rate of ADHD. However, the utilization of an increased age-of-onset criterion in the current sample more than tripled the number of ADHD diagnoses, despite requiring at least six symptoms in either category when five would suffice for adults (APA, 2013). Further, Karam et al. (2009) found that those with late-onset ADHD had milder severity in some domains, despite exhibiting sufficient symptomatology to meet all but the age-of-onset criteria. The initial results of the current study suggest that symptomatology does not differ significantly between early- and late- onset ADHD. This result should be interpreted cautiously and further examination is warranted because some tests neared clinical significance in the current study, and none accounted for effects of potentially co-occurring disorders.

Limitations

Sample Characteristics. A number of limitations in the findings can be attributed to sample characteristics. Firstly, participants were a convenience sample recruited from a student participant pool primarily consisting of Psychology majors, and all were currently enrolled in psychology courses. Despite ADHD being a well-known and popularized disorder, this characteristic of recruitment may have resulted in the sample having supplemental background knowledge, especially concerning diagnostic criteria. Secondly, participants were recruited on the basis of having a current/previous diagnosis of ADHD or a concern about current symptoms of inattention, hyperactivity or impulsivity. Though this achieved the goal of including both a clinical and non-clinical sample, it is unknown if a true "normal" control subgroup was recruited in the sample. Furthermore the participants were overwhelmingly Caucasian and mostly female, which is an expected limitation given the population of the participant pool.

Methodological Limitations. Unsurprisingly but importantly, the reliance on self-report data is a limitation of this study. Gold-standard ADHD diagnoses are not based solely on questionnaires, much less on self-report questionnaires. Clinicians consider observational, interview and questionnaires from multiple-informants before giving a diagnosis of ADHD if at all possible. However, because of restricted time and resources, self-report must often be heavily relied upon in research settings, despite the inherent flaws. Adults with ADHD tend to underreport their symptoms, yet there is evidence that their self-reports are generally a trustworthy source of data (Dias et al., 2008; Manor et al., 2012; Murphy & Schachar, 2000; Richards et al., 1999; Sandra Kooij et al., 2008; Van Voorhees et al., 2011).

Statistical analyses were appropriate given the proposed hypotheses. However, future research should incorporate more sophisticated statistical analyses in order to discover detailed patterns and move beyond nominal and categorical data analyses. Relatedly, other options should be explored for condensing data or integrating more sources of data. For instance, the design of this study called for dichotomous variables, which were created using cut-off scores, sometimes from a single scale (i.e., CAARS ADHD Index scale), but options for integrative data should be considered during the design phase of future research endeavors. Finally, while having an inclusive sample is beneficial for generalizability, future analyses should consider and account for co-morbid disorders.

Future Directions

While the results of the primary research question supported the prediction that the increased age-of-onset would increase the number of diagnoses, it was unexpected that the number of research diagnoses would more than triple in quantity. This surge drastically exceeds

prior estimations and as a result, merits further exploration and replication (Bell, 2011;

Polanczyk et al., 2010; Ramtekkar et al., 2010; Willcutt, 2012).

A considerable disparity was observed between the number of participants who provided

proof of a prior ADHD diagnosis (typically a prescription label) and the number of participants

who endorsed a sufficient number of impairing symptoms to qualify for a research diagnosis of

ADHD. There are a number of potential explanations of this mismatch: (1) physicians may be

overprescribing stimulant medication to people who do not actually have ADHD, (2) the current

diagnostic criteria or measures used in ADHD diagnosis are not valid representation of the

presentation of ADHD symptoms in adults, and (3) participants underreported their symptoms,

and/or completed the questionnaires based on their functioning while taking medication. Because

the source of the disparity is not evident, further exploration and clarification is merited.

Future research should explore the effects of prevalence while varying the age-of-onset

criteria. Research of this type may contribute to a determination of whether there should be a

discrete age cut-off for onset, as well as document the trends of prevalence rates. Based on the

results of diagnostic agreement among established measures, future studies should examine the

relationships and value of each of the measures, while working towards the creation of a gold-

standard measure of adult ADHD. Finally, previously discussed limitations of the current study

should be amended in future research.

REFERENCES

Adler, L. A., Faraone, S. V., Spencer, T. J., Michelson, D., Reimherr, F. W., Glatt, S. J., . . . Biederman, J. (2008). The reliability and validity of self- and investigator ratings of ADHD in adults. *J Atten Disord, 11*(6), 711-719. doi: 10.1177/1087054707308503

Adler, L. A., Faraone, S. V., Spencer, T. J., Michelson, D., Reimherr, F. W., Glatt, S. J., . . . Biederman, J. (2008). The reliability and validity of self- and investigator ratings of ADHD in adults. *J Atten Disord, 11*(6), 711-719. doi: 10.1177/1087054707308503

Adler, L. A., Spencer, T., Faraone, S. V., Kessler, R. C., Howes, M. J., Biederman, J., & Secnik, K. (2006). Validity of Pilot Adult ADHD Self-Report Scale (ASRS) to Rate Adult ADHD Symptoms. *Annals of Clinical Psychiatry, 18*(3), 145-148. doi: 10.1080/10401230600801077

Advokat, C., Lane, S. M., & Luo, C. (2011). College students with and without ADHD: comparison of self-report of medication usage, study habits, and academic achievement. *J Atten Disord, 15*(8), 656-666. doi: 10.1177/1087054710371168

American Psychiatric Association. (2000). *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition;Text Revision*. Washington, DC: American Psychiatric Association.

American Psychiatric Association. (2010). DSM-5: Options Being Considered for ADHD. Retrieved 2012, from http://www.dsm5.org

American Psychiatric Association. (2012a). American Psychiatric Association Board of Trustees Approves *DSM-5*. Retrieved 11/20/2012, from http://www.psychiatry.org/advocacy--newsroom/news-releases

American Psychiatric Association. (2012b). American Psychiatric Association DSM-5 Development. Retrieved 1/8/2013, from http://www.dsm5.org/Pages/Default.aspx

American Psychiatric Association. (2012c). Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition Proposed Revisions. Retrieved October 3, 2012, from http://www.dsm5.org/ProposedRevision/Pages/proposedrevision.aspx?rid=383#

American Psychiatric Association. (2013). *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition*. Arlington, VA: American Psychiatric Publishing.

Bell, A. S. (2011). A critical review of ADHD diagnostic criteria: what to address in the DSM-V. *J Atten Disord, 15*, 3-10. doi: 10.1177/1087054710365982

Biederman, J., Faraone, S. V., Spencer, T. J., Mick, E., Monuteaux, M. C., & Aleardi, M. (2006). Functional impairments in adults with self-reports of diagnosed ADHD: A controlled study of 1001 adults in the community. *Journal of Clinical Psychiatry, 67*(4), 524-540. doi: 10.4088/JCP.v67n0403

Biederman, J., Monuteaux, M. C., Mick, E., Spencer, T., Wilens, T. E., Silva, J. M., . . . Faraone, S. V. (2006). Young adult outcome of attention deficit hyperactivity disorder: A controlled 10-year follow-up study. *Psychological Medicine, 36*, 167-179. doi: 10.1017/s0033291705006410

Brooks, M. (2012). Published DSM-5 Field Trial Results Prompt Renewed Criticism. *Medscape*. Retrieved from Medscape Medical News website: http://www.medscape.com/viewarticle/774475

Clarke, D. E., Narrow, W. E., Regier, D. A., Kuramoto, S. J., Kupfer, D. J., A., K. E., . . . Kraemer, H. C. (2013). DSM-5 field trials in the United States and Canada, part I: Study design, sampling strategy, implementation, and analytic approaches. *Am J Psychiatry, 170*, 43-58. doi: 10.1176/appi.ajp.2012.12070998

Coghill, D., & Seth, S. (2011). Do the diagnostic criteria for ADHD need to change? Comments on the preliminary proposals of the DSM-5 ADHD and disruptive behavior disorders committee. *Eur Child Adolesc Psychiatry, 20*(2), 75-81. doi: 10.1007/s00787-010-0142-4

Conners, C. K., Erhardt, D., & Sparrow, E. (1999). *Conners' Adult ADHD Rating Scales.* North Tonawanda, NY: Multi-Health Systems, Inc.

Dias, G., Mattos, P., Coutinho, G., Segenreich, D., Saboya, E., & Ayrao, V. (2008). Agreement rates between parent and self-report on past ADHD symptoms in an adult clinical sample. *J Atten Disord, 12*(1), 70-75. doi: 10.1177/1087054707311221

Faraone, S. V., Biederman, J., Spencer, T., Mick, E., Murray, K., Petty, C., . . . Monuteaux, M. C. (2006). Diagnosing adult attention deficit hyperactivity disorder: Are late onset and subthreshold diagnoses valid? *Am J Psychiatry, 163*(10), 1720-1729. doi: 10.1176/appi.ajp.163.10.1720

Frances, A. (2012, 10/31/2012). DSM-5 Field Trials Discredit the American Psychiatric Association. Retrieved from http://www.huffingtonpost.com/allen-frances/dsm-5-field-trials-discre_b_2047621.html

Ghanizadeh, A. (2012). Psychometric analysis of the new ADHD DSM-V derived symptoms. *BMC Psychiatry, 12*, 21. doi: 10.1186/1471-244X-12-21

Hartman, C. A., Willcutt, E. G., Rhee, S. H., & Pennington, B. F. (2004). The Relation Between Sluggish Cognitive Tempo and DSM-IV ADHD. *Journal of Abnormal Child Psychology, 32*(5), 491-503. doi: 10.1023/b:jacp.0000037779.85211.29

Heiligenstein, E., Conyers, L. M., Berns, A. R., & Miller, M. A. (1998). Preliminary normative data on DSM-IV attention deficit hyperactivity disorder in college students. *J Am Coll Health, 46*(4), 185-188. doi: 10.1080/07448489809595609

Hill, B. D., Pella, R. D., Singh, A. N., Jones, G. N., & Gouvier, W. D. (2009). The Wender Utah Rating Scale: Adult ADHD diagnostic tool or personality index? *J Atten Disord, 13*(1), 87-94. doi: 10.1177/1087054708320384

Hoza, B., Vaughn, A., Waschbusch, D. A., Murray-Close, D., & McCabe, G. (2012). Can children with ADHD be motivated to reduce bias in self-reports of competence? *J Consult Clin Psychol, 80*(2), 245-254. doi: 10.1037/a0027299

Hudziak, J. J., Achenbach, T. M., Althoff, R. R., & Pine, D. S. (2007). A dimensional approach to developmental psychopathology. *Int J Methods Psychiatr Res, 16 Suppl 1*, S16-23. doi: 10.1002/mpr.217

Hudziak, J. J., Derks, E. M., Althoff, R. R., Rettew, D. C., & Boomsma, D. I. (2005). The genetic and environmental contributions to attention deficit hyperactivity disorder as measured by the Conners' Rating Scales—Revised. *American Journal of Psychiatry, 162*(9), 1614-1620.

Jones, K. D. (2012). A critique of the DSM-5 field trials. *J Nerv Ment Dis, 200*(6), 517-519. doi: 10.1097/NMD.0b013e318257c699

Karam, R. G., Bau, C. H., Salgado, C. A., Kalil, K. L., Victor, M. M., Sousa, N. O., . . . Grevet, E. H. (2009). Late-onset ADHD in adults: milder, but still dysfunctional. *J Psychiatr Res, 43*(7), 697-701. doi: 10.1016/j.jpsychires.2008.10.001

Kessler, R. C., Adler, L., Ames, M., Demler, O., Faraone, S., Hiripi, E. V. A., . . . Walters, E. E. (2005). The World Health Organization adult ADHD self-report scale (ASRS): a short screening scale for use in the general population. *Psychological Medicine, 35*(2), 245-256. doi: 10.1017/s0033291704002892

Kessler, R. C., Adler, L., Barkley, R., Biederman, J., Conners, C. K., Demler, O., . . . Zaslavsky, A. M. (2006). The prevalence and correlates of adult ADHD in the United States: results from the National Comorbidity Survey Replication. *Am J Psychiatry, 163*(4), 716-723. doi: 10.1176/appi.ajp.163.4.716

Kessler, R. C., Adler, L. A., Gruber, M. J., Sarawate, C. A., Spencer, T., & Van Brunt, D. L. (2007). Validity of the World Health Organization Adult ADHD Self-Report Scale (ASRS) Screener in a representative sample of health plan members. *Int J Methods Psychiatr Res, 16*(2), 52-65. doi: 10.1002/mpr.208

Kessler, R. C., Green, J. G., Adler, L. A., Barkley, R. A., Chatterji, S., Faraone, S. V., . . . Van Brunt, D. L. (2010). Structure and diagnosis of adult attention-deficit/hyperactivity disorder: Analysis of expanded symptom criteria from the adult ADHD clinical diagnostic scale. *Archives of General Psychiatry, 67*(11), 1168-1178. doi: 10.1001/archgenpsychiatry.2010.146

Kieling, C., Kieling, R. R., Rohde, L. A., Frick, P. J., Moffitt, T., Nigg, J. T., . . . Castellanos, F. X. (2010). The age at onset of attention deficit hyperactivity disorder. *Am J Psychiatry, 167*(1), 14-16. doi: 10.1176/appi.ajp.2009.09060796

Lowry, R. (1998). Correlated proportions. *VassarStats: Website for statistical computation.* Retrieved Novermber 19, 2013, from http://vassarstats.net/propcorr.html

Manor, I., Vurembrandt, N., Rozen, S., Gevah, D., Weizman, A., & Zalsman, G. (2012). Low self-awareness of ADHD in adults using a self-report screening questionnaire. *Eur Psychiatry, 27*(5), 314-320. doi: 10.1016/j.eurpsy.2010.08.013

Martel, M. M., von Eye, A., & Nigg, J. (2012). Developmental differences in structure of attention-deficit/hyperactivity disorder (ADHD) between childhood and adulthood. *International Journal of Behavioral Development, 36*(4), 279-292. doi: 10.1177/0165025412444077

McGough, J. J., & Barkley, R. A. (2004). Diagnostic controversies in adult attention deficit hyperactivity disorder. *Am J Psychiatry, 161*(11), 1948-1956. doi: 10.1176/appi.ajp.161.11.1948

Murphy, K. R., Barkley, R. A., & Bush, T. (2002). Young adults with attention deficit hyperactivity disorder: Subtype differences in comorbidity, educational and clinical history. *Journal of Nervous and Mental Disease, 190*(3), 147-157. doi: 10.1097/00005053-200203000-00003

Murphy, P., & Schachar, R. (2000). Use of self-ratings in the assessment of symptoms of attention deficit hyperactivity disorder in adults. *Am J Psychiatry, 157*(7), 1156-1159. doi: 10.1176/appi.ajp.157.7.1156

Naglieri, J. A., & Goldstein, S. (2006). The role of intellectual processes in the DSM-V diagnosis of ADHD. *J Atten Disord, 10*(1), 3-8. doi: 10.1177/1087054705286059

Narrow, W. E., Clarke, D. E., Kuramoto, S. J., Kraemer, H. C., Kupfer, D. J., Greiner, L., & Regier, D. A. (2013). DSM-5 Field Trials in the United States and Canada, Part III: Development and Reliability Testing of a Cross-Cutting Symptom Assessment for DSM-5. *Am J Psychiatry, 170*, 71-82. doi: 10.1176/appi.ajp.2012.12071000

Nigg, J. T., Tannock, R., & Rohde, L. A. (2010). What is to be the fate of ADHD subtypes? An introduction to the special section on research on the ADHD subtypes and implications for the DSM-V. *J Clin Child Adolesc Psychol, 39*, 723-725. doi: 10.1080/15374416.2010.517171

Norwalk, K., Norvilitis, J. M., & MacLean, M. G. (2009). ADHD Symptomatology and Its Relationship to Factors Associated With College Adjustment. *J Atten Disord, 13*(3), 251-258. doi: 10.1177/1087054708320441

Polanczyk, G., Caspi, A., Houts, R., Kollins, S. H., Rohde, L. A., & Moffitt, T. E. (2010). Implications of Extending the ADHD Age-of-Onset Criterion to Age 12: Results from a Prospectively Studied Birth Cohort. *Journal of the American Academy of Child & Adolescent Psychiatry, 49*(3), 210-216. doi: http://dx.doi.org/10.1016/j.jaac.2009.12.014

Polanczyk, G., Caspi, A., Houts, R., Kollins, S. H., Rohde, L. A., & Moffitt, T. E. (2010). Implications of extending the ADHD age-of-onset criterion to age 12: results from a prospectively studied birth cohort. *J Am Acad Child Adolesc Psychiatry, 49*(3), 210-216. doi: http://dx.doi.org/10.1016/j.jaac.2009.12.014

Ramtekkar, U. P., Reiersen, A. M., Todorov, A. A., & Todd, R. D. (2010). Sex and age differences in attention-deficit/hyperactivity disorder symptoms and diagnoses: Implications for DSM-V and ICD-11. *Journal of the American Academy of Child & Adolescent Psychiatry, 49*(3), 217-228. doi: 10.1097/00004583-201003000-00005

Regier, D. A., Narrow, W. E., Clarke, D. E., Kraemer, H. C., Kuramoto, S. J., Kuhl, E. A., & Kupfer, D. J. (2013). DSM-5 Field Trials in the United States and Canada, Part II: Test-Retest Reliability of Selected Categorical Diagnoses. *Am J Psychiatry, 170*, 59-70. doi: 10.1176/appi.ajp.2012.12070999

Richards, T. L., Rosén, L. A., & Ramirez, C. A. (1999). Psychological functioning differences among college students with confirmed ADHD, ADHD by self-report only, and without ADHD. *Journal of College Student Development, 40*(3), 299-304.

Rodriguez, P. D., & Simon-Dack, S. L. (2013). Factor analysis of five adult ADHD self-report measures: are they all the same? *J Atten Disord, 17*, 64-69. doi: 10.1177/1087054711423627

Rossini, E. D., & O'Connor, M. A. (1995). Retrospective self-reported symptoms of attention-deficit hyperactivity disorder: Reliability of the Wender Utah Rating Scale. *Psychological Reports, 77*(3), 751-754. doi: 10.2466/pr0.1995.77.3.751

Sandra Kooij, J. J., Marije Boonstra, A., Swinkels, S. H., Bekker, E. M., de Noord, I., & Buitelaar, J. K. (2008). Reliability, validity, and utility of instruments for self-report and informant report concerning symptoms of ADHD in adult patients. *J Atten Disord, 11*(4), 445-458. doi: 10.1177/1087054707299367

Sibley, M. H., Pelham, W. E., Molina, B. S., Gnagy, E. M., Waxmonsky, J. G., Waschbusch, D. A., . . . Kuriyan, A. B. (2012). When diagnosing ADHD in young adults emphasize informant reports, DSM items, and impairment. *J Consult Clin Psychol, 80*(6), 1052-1061. doi: 10.1037/a0029098

Solanto, M. V., Wasserstein, J., Marks, D. J., & Mitchell, K. J. (2012). Diagnosis of ADHD in adults: what is the appropriate DSM-5 symptom threshold for hyperactivity-impulsivity? *J Atten Disord, 16*(8), 631-634. doi: 10.1177/1087054711416910

Solanto, M. V., Wasserstein, J., Marks, D. J., & Mitchell, K. J. (2012). Diagnosis of ADHD in adults: What is the appropriate DSM-5 symptom threshold for hyperactivity-impulsivity? *J Atten Disord, 16*(8), 631-634. doi: 10.1177/1087054711416910

Taylor, A., Deb, S., & Unwin, G. (2011). Scales for the identification of adults with attention deficit hyperactivity disorder (ADHD): a systematic review. *Res Dev Disabil, 32*(3), 924-938. doi: 10.1016/j.ridd.2010.12.036

Todd, R. D., Huang, H., & Henderson, C. A. (2008). Poor utility of the age of onset criterion for DSM-IV attention deficit/hyperactivity disorder: recommendations for DSM-V and ICD-11. *J Child Psychol Psychiatry, 49*(9), 942-949. doi: 10.1111/j.1469-7610.2008.01892.x

Van Voorhees, E. E., Hardy, K. K., & Kollins, S. H. (2011). Reliability and validity of self- and other-ratings of symptoms of ADHD in adults. *J Atten Disord, 15*(3), 224-234. doi: 10.1177/1087054709356163

Ward, M. F., Wender, P. H., & Reimherr, F. W. (1993). The Wender Utah Rating Scale: An aid in the retrospective diagnosis of childhood attention deficit hyperactivity disorder. *Am J Psychiatry, 150*(6), 885-890.

Wender, P. H., Wolf, L. E., & Wasserstein, J. (2001). Adults with ADHD. *Annals of the New York Academy of Sciences, 931*(1), 1-16. doi: 10.1111/j.1749-6632.2001.tb05770.x

Weyandt, L. L., Linterman, I., & Rice, J. A. (1995). Reported prevalence of attentional difficulties in a general sample of college students. *Journal of Psychopathology and Behavioral Assessment, 17*(3), 293-304. doi: 10.1007/bf02229304

Wierzbicki, M. (2005). Reliability and validity of the Wender Utah Rating Scale for college students. *Psychol Rep, 96*(3 Pt 1), 833-839. doi: 10.2466/pr0.96.3.833-839

Wierzbicki, M. (2005). Reliability and Validity of the Wender Utah Rating Scale For College Students. *Psychological Reports, 96*(3), 833-839. doi: 10.2466/PR0.96.3.833-839

Willcutt, E. G. (2012). The prevalence of DSM-IV attention-deficit/hyperactivity disorder: a meta-analytic review. *Neurotherapeutics, 9*, 490-499. doi: 10.1007/s13311-012-0135-8

Willcutt, E. G., Nigg, J. T., Pennington, B. F., Solanto, M. V., Rohde, L. A., Tannock, R., . . .
  Lahey, B. B. (2012). Validity of DSM-IV attention deficit/hyperactivity disorder
  symptom dimensions and subtypes. *J Abnorm Psychol, 121*, 991-1010. doi:
  10.1037/a0027347

APPENDIX A: CONSENT FORM

CODE: _____

Consent Form

1. **Study Title:** Diagnostic Differences in the DSM: Comparing the Prevalence of ADHD Using *DSM-IV-TR* and Proposed *DSM-5* Criteria
2. **Performance Sites:** Louisiana State University and Agricultural and Mechanical College
3. **Name and Telephone Numbers of Investigators:** The following investigators are available for questions about the study:
   Mary Lou Kelley, Ph.D.   (225) 578-8745   Morgan Ashwill Grinnell (704) 320-6783
4. **Purpose of the Study:** This study will explore proposed changes made to the Attention-Deficit/Hyperactivity Disorder diagnosis in the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (*DSM-5).*
5. **Participant Inclusion:** College students with a prior diagnosis of ADHD and/or current self-reported concerns about attention deficits, hyperactivity or impulsivity. Participants must be 18 years of age or older, and not currently pregnant.
6. **Number of Participants:** 150
7. **Study Procedures:** You will spend approximately 30-60 minutes answering questions about yourself, your habits and experiences. At the end of the data collection, your packet will be checked for completion. You will then be awarded course credit for participation.
8. **Benefits:** The outcome of this research study will provide practitioners and professionals with new information about updated ADHD criteria and experiences of ADHD in young adults.
9. **Risks:** You may become concerned about whether you qualify for ADHD while completing questionnaires. If this is the case, the investigators will provide you with resources about ADHD, and referrals for evaluation and treatment.
10. **Right to Refuse:** You may choose not to complete the measures or quit the study at any time without any consequences.
11. **Right to Privacy:** This study may be published, but your name will not be included in the publication. No information provided by you will be linked back to you. Contact information will only be used to record participation so you may receive course credit. Once data collection is completed, all identifying information (e.g., contact information) will be replaced by a code and deleted from the data file.

     This study has been discussed with me and all my questions have been answered. I may direct additional questions regarding study specifics to the investigators. If I have questions about participants' rights or other concerns, I can contact Robert C. Mathews, Chairman of the LSU Institutional Review Board, at (225) 578-8692. I agree to participate in the study described above and acknowledge the researchers' obligation to provide me with a copy of this consent form if signed by me.

_____   _____
Signature of Participant   Date

APPENDIX B: DEMOGRAPHIC QUESTIONNAIRE

CODE:_____   Date:_____

Diagnostic Differences in DSMs: Comparing the Prevalence of ADHD using *DSM-IV-TR*
and Proposed *DSM-5* Criteria
Louisiana State University   *Department of Psychology*

1. **Name (Print):** _____   2. **Gender**: Male / Female
3. **Email**: _____   4. **LSU ID**: 89- _ _ _- _ _ _ _
5. **Date of Birth / Age**: _____ / _____
6. **Major Area of Study**: _____
7. **Circle your current classification**:   Senior   Junior   Sophomore   First-Year
8. **What is your racial heritage (select all that apply)?**
_____ American Indian / Alaskan Native
_____ Asian / Pacific Islander
_____ Black / African American
_____ Caucasian / White
_____ Hispanic / Latino
_____ Other
_____ Decline to answer

9. **Have you ever been diagnosed with ADHD by a clinician?** _____ Yes   _____ No (If No,
skip to item #10)
        a) If yes, please list subtype (if known): _____
        b) Year diagnosed: _____   c) Age at diagnosis: _____
        d) Please list your prescribed ADHD medication and
        dosage:_____
        e) Please indicate the answer which is most similar to your medication habits:
                _____ I take it every day as prescribed.
                _____ I take more or less depending on what I need.
                _____ I often forget to take it.
                _____ I only use it for tests/major assignments.
                _____ I typically use someone else's medication or let others use my medication.
10. **Are you currently diagnosed with and/or treated for any other psychological disorder?**
          ___ Yes   ___ No
11. **Please circle disorders you've been formally diagnosed with or have received treatment**
for in the past (or present):

Anxiety	Depression	Learning Disorder	Substance Use/Abuse
Bipolar	Schizophrenia	Personality Disorder	Autism Spectrum
Other:_____			

APPENDIX C: ADULT ADHD SELF-REPORT SCALE (ASRS)

CODE: _____

Adult ADHD Self-Report Scale (ASRS)

Please answer the questions below, rating yourself on each of the criteria shown using the scale on the right. As you answer each question, place an X in the box that best describes how you have felt and conducted yourself over the past six months.	Never	Rarely	Sometimes	Often	Very Often
1. How often do you have trouble wrapping up the final details of a project, once the challenging parts have been done?					
2. How often do you have difficulty getting things in order when you have to do a task that requires organization?					
3. How often do you have problems remembering appointments or obligations?					
4. When you have a task that requires a lot of thought, how often do you avoid or delay getting started?					
5. How often do you fidget or squirm with your hands or feet when you have to sit down for a long time?					
6. How often do you feel overly active and compelled to do things, like you were driven by a motor?					
Part A					
7. How often do you make careless mistakes when you have to work on a boring or difficult project?					
8. How often do you have difficulty keeping your attention when you are doing boring or repetitive work?					
9. How often do you have difficulty concentrating on what people say to you, even when they are speaking to you directly?					
10. How often do you misplace or have difficulty finding things at home or work?					
11. How often are you distracted by activity or noise around you?					
12. How often do you leave your seat in meetings or other situations in which you are expected to remain seated?					
13. How often do you feel restless or fidgety?					
14. How often do you have difficulty unwinding and relaxing when you have time to yourself?					
15. How often do you find yourself talking too much when you are in social situations?					
16. When you're in a conversation, how often do you find yourself finishing the sentences of the people you are talking to, before they can finish them themselves?					

17. How often do you have difficulty waiting your turn in situations when turn taking is required?					
18. How often do you interrupt others when they are busy?					
					Part B

*At what <u>age</u> did you begin to notice any symptoms listed above? _____

APPENDIX D: WENDER UTAH RATING SCALE (WURS)

CODE: _____

Wender Utah Rating Scale (WURS)

For each question, please circle the answer choice to the right (0-4) that best applies to you.

As a child I was (or had):	Not at all or very slightly	Mildly	Moderately	Quite a bit	Very Much
1. Active, restless, always on the go	0	1	2	3	4
2. Afraid of things	0	1	2	3	4
3. Concentration problems, easily distracted	0	1	2	3	4
4. Anxious, worrying	0	1	2	3	4
5. Nervous, fidgety	0	1	2	3	4
6. Inattentive, daydreaming	0	1	2	3	4
7. Hot- or short-tempered, low boiling point	0	1	2	3	4
8. Shy, sensitive	0	1	2	3	4
9. Temper outbursts, tantrums	0	1	2	3	4
10. Trouble with stick-to-it-tiveness, not following through, failing to finish things started	0	1	2	3	4
11. Stubborn, strong-willed	0	1	2	3	4
12. Sad or blue, depressed, unhappy	0	1	2	3	4
13. Incautious, dare-devilish, involved in pranks	0	1	2	3	4
14. Not getting a kick out of things, dissatisfied with life	0	1	2	3	4
15. Disobedient with parents, rebellious, sassy	0	1	2	3	4
16. Low opinion of myself	0	1	2	3	4
17. Irritable	0	1	2	3	4
18. Outgoing, friendly, enjoyed company of people	0	1	2	3	4
19. Sloppy, disorganized	0	1	2	3	4
20. Moody, ups and downs	0	1	2	3	4
21. Angry	0	1	2	3	4
22. Friends, popular	0	1	2	3	4
23. Well-organized, tidy, neat	0	1	2	3	4
24. Acting without thinking, impulsive	0	1	2	3	4
25. Tendency to be immature	0	1	2	3	4
26. Guilty feelings, regretful	0	1	2	3	4
27. Losing control of myself	0	1	2	3	4
28. Tendency to be or act irrational	0	1	2	3	4

29. Unpopular with other children, didn't keep friends for long, didn't get along with other children	0	1	2	3	4
30. Poorly coordinated, did not participate in sports	0	1	2	3	4
31. Afraid of losing control of self	0	1	2	3	4
32. Well-coordinated, picked first in games	0	1	2	3	4
33. Tomboyish (for women only)	0	1	2	3	4
34. Running away from home	0	1	2	3	4
35. Getting into fights	0	1	2	3	4
36. Teasing other children	0	1	2	3	4
37. Leader, bossy	0	1	2	3	4
38. Difficulty being awake	0	1	2	3	4
39. Follower, led around too much	0	1	2	3	4
40. Trouble seeing things from someone else's point of view	0	1	2	3	4
41. Trouble with authorities, trouble with school, visits to principal's office	0	1	2	3	4
42. Trouble with police, booked, convicted	0	1	2	3	4
Medical problems as a child:	Not at all or very slightly	Mildly	Moderately	Quite a bit	Very Much
43. Headaches	0	1	2	3	4
44. Stomachaches	0	1	2	3	4
45. Constipation	0	1	2	3	4
46. Diarrhea	0	1	2	3	4
47. Food allergies	0	1	2	3	4
48. Other allergies	0	1	2	3	4
49. Bedwetting	0	1	2	3	4
As a child in school I was (or had):	Not at all or very slightly	Mildly	Moderately	Quite a bit	Very Much
50. Overall a good student, fast	0	1	2	3	4
51. Overall a poor student, slow learner	0	1	2	3	4
52. Slow in learning to read	0	1	2	3	4
53. Slow reader	0	1	2	3	4
54. Trouble reversing letters	0	1	2	3	4
55. Problems with spelling	0	1	2	3	4
56. Trouble with mathematics or numbers	0	1	2	3	4
57. Bad handwriting	0	1	2	3	4

58. Able to read pretty well but never really enjoyed reading	0	1	2	3	4
59. Not achieving up to potential	0	1	2	3	4
60. Repeating grades	0	1	2	3	4
61. Suspended or expelled	0	1	2	3	4

APPENDIX E: IRB APPROVAL FORMS

ACTION ON PROTOCOL APPROVAL REQUEST

Institutional Review Board
Dr. Robert Mathews, Chair
131 David Boyd Hall
Baton Rouge, LA 70803
P: 225.578.8692
F: 225.578.6792
irb@lsu.edu | lsu.edu/irb

LSU

TO: Mary Lou Kelley
Psychology

FROM: Robert C. Mathews
Chair, Institutional Review Board

DATE: April 16, 2013
RE: IRB# 3381

TITLE: Diagnostic Differences in the DSM: Comparing the Prevalence of ADHD Using DSM-IV-TR and Proposed DSM-5 Criteria

New Protocol/Modification/Continuation: _New Protocol_

Review type: Full ___ Expedited _X__   **Review date:** _4/17/2013_

Risk Factor: Minimal __X___ Uncertain _____ Greater Than Minimal_____

Approved_____X____ Disapproved_____

Approval Date: _4/17/2013_   **Approval Expiration Date:** _4/16/2014_

Re-review frequency: (annual unless otherwise stated)

Number of subjects approved: _150_

Protocol Matches Scope of Work in Grant proposal: (if applicable)_____

By: Robert C. Mathews, Chairman _____
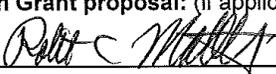
PRINCIPAL INVESTIGATOR: PLEASE READ THE FOLLOWING –
Continuing approval is CONDITIONAL on:

1. Adherence to the approved protocol, familiarity with, and adherence to the ethical standards of the Belmont Report, and LSU's Assurance of Compliance with DHHS regulations for the protection of human subjects*
2. Prior approval of a change in protocol, including revision of the consent documents or an increase in the number of subjects over that approved.
3. Obtaining renewed approval (or submittal of a termination report), prior to the approval expiration date, upon request by the IRB office (irrespective of when the project actually begins); notification of project termination.
4. Retention of documentation of informed consent and study records for at least 3 years after the study ends.
5. Continuing attention to the physical and psychological well-being and informed consent of the individual participants, including notification of new information that might affect consent.
6. A prompt report to the IRB of any adverse event affecting a participant potentially arising from the study.
7. Notification of the IRB of a serious compliance failure.
8. SPECIAL NOTE:
All investigators and support staff have access to copies of the Belmont Report, LSU's Assurance with DHHS, DHHS (45 CFR 46) and FDA regulations governing use of human subjects, and other relevant documents in print in this office or on our World Wide Web site at http://www.lsu.edu/irb

Application for Approval of Projects Which Use Human Subjects

This application is used for projects/studies that cannot be reviewed through the exemption process.

LSU

-- Applicant, Please fill out the application in its entirety and include two copies of the competed application as well as parts A-E, listed below. Once the application is completed, please submit to the IRB Office for review and please allow ample time for the application to be reviewed. Expedited reviews usually takes 2 weeks. Carefully completed applications should be submitted 3 weeks before a meeting to ensure a prompt decision.

-- A Complete Application Includes All of the Following:
    (A) Two copies of this completed form and two copies of part B thru F.
    (B) A brief project description (adequate to evaluate risks to subjects and to explain your responses to Parts 1&2)
    (C) Copies of all instruments to be used.
        *If this proposal is part of a grant proposal, include a copy of the proposal and all recruitment material.
    (D) The consent form that you will use in the study (see part 3 for more information.)
    (E) Certificate of Completion of Human Subjects Protection Training for all personnel involved in the project, including students who are involved with testing or handling data, unless already on file with the IRB. Training link: (http://phrp.nihtraining.com/users/login.php)
    (F) IRB Security of Data Agreement: (http://research.lsu.edu/files/item26774.pdf)

1) Principal Investigator*: Mary Lou Kelley   **Rank** Full Professor
*PI **must be** an LSU Faculty Member

Dept: Psychology   **Ph:** 225-578-4113   **E-mail:** mkelley@lsu.edu

2) Co Investigator(s): please include department, rank, phone and e-mail for each
Morgan Ashwill, Clinical Psychology, Graduate Student, 704-320-6783, mashwi1@lsu.edu

IRB# 3381 LSU Proposal #_____

○ Full
☑ Expedited
☑ Human Subjects Training
☑ Complete Application

3) Project Title: Diagnostic Differences in the DSM: Comparing the Prevalence of ADHD Using DSM-IV-TR and Proposed DSM-5 Criteria

4) Proposal Start Date: 4/1/2013   **5) Proposed Duration Months:** 7

6) Number of Subjects Requested: 150   **7) LSU Proposal #:**

8) Funding Sought From: n/a

ASSURANCE OF PRINCIPAL INVESTIGATOR named above
    I accept personal responsibility for the conduct of this study (including ensuring compliance of co-investigators/co-workers) in accordance with the documents submitted herewith and the following guidelines for human subject protection: The Belmont Report, LSU's Assurance (FWA00003892) with OHRP and 45 CFR 46 (available from http://www.lsu.edu/irb). I also understand that copies of all consent forms **must be maintained at LSU for three years after the completion of the project.** If I leave LSU before that time, the consent forms should be preserved in the Departmental Office.

Signature of PI _Mary L Kelley_   Date 3-17-13

ASSURANCE OF STUDENT/PROJECT COORDINATOR named above. If multiple Co-Investigators, please create a "signature page" for all Co-Investigators to sign. Attach the "signature page" to the application.

I agree to adhere to the terms of this document and am familiar with the documents referenced above.

Signature of Co-PI (s) _Morgan Ashwill_   Date 3/17/2013

VITA

In 2011, Morgan A. Grinnell graduated with honors from the University of North Carolina at Chapel Hill with a Bachelor of Arts degree in Psychology and Sociology. She began her graduate career at Louisiana State University under the supervision of Dr. Mary Lou Kelley in August of 2011. She will be receiving her Master of Arts degree in May of 2014. Morgan is currently a third-year graduate student working towards her Doctorate of Philosophy degree in Psychology. Her area of specialization is clinical child psychology.