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GENDER DIFFERENCES IN ADHD DIAGNOSIS

by
Anthony G. Rizzo

A Thesis

Submitted to the
Department of Psychology
College of Science and Mathematics
For the degree of
Master of Arts in School Psychology
at
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Thesis Chair: Roberta Dihoff, Ph.D

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Dedications

I would like to dedicate this thesis to my parents, Tony and Kathie Rizzo.

As well as my grandparents, Walt and Patricia Smith.

Acknowledgements

I would like to acknowledge Dr. Roberta Dihoff for supporting us throughout the duration of this project. I would also like to thank all of the professors that I had the opportunity to learn from throughout the course of this Master's degree.

Abstract

Anthony G. Rizzo
GENDER DIFFERENCES IN ADHD DIAGNOSIS
2015-2016
Roberta Dihoff, Ph.D
Master of Arts in School Psychology

There is a great disparity in the amount of males diagnosed with ADHD compared to females. This paper reviews a large collection of literature ranging from the history of the disorder, neurological studies, potential genetic differences between genders, as well as potential gender biases. These topics are all examined with the purpose of trying to determine which effect, if any, they may have had in creating the criteria necessary for a diagnosis and how that relates to each gender. The study examined each individual symptom necessary for an ADHD diagnosis and asked teachers to complete a survey designed to attempt to associate that symptom with a specific gender. Teachers were specifically chosen due to their involvement in the diagnosis of school aged children as they are often required to fill out ADHD rating scales. Data was analyzed in SPSS 23 using a Repeated Measures One-Way Analysis of Variance (ANOVA). The study revealed that there was a significant ($p \leq .0001$) association of the male gender with the symptoms required for an ADHD diagnosis.

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Chapter 1

Introduction

Attention deficit hyperactivity disorder (ADHD) is one of the most prevalent disorders in school settings across the United States. Common perception of the disorder focuses on the “inability to pay attention”, but attention deficit hyperactivity disorder is much more than that. Generally ADHD presents itself in one of two ways, Inattentiveness or Hyperactive-Impulsiveness, but most cases of ADHD present criteria from both of the two sides. ADHD is commonly accepted to be found in a 3:1 Male:Female ratio (Barkley 2006; Gaub 1997) although some studies show it ranging to as high as 9:1 (Reid et al., 2000; Jackson & King 2004) and some show it as low as 2:1 (Hermens et al., 2005).

Purpose

This study examined the relationship between the symptoms, and diagnosis, of ADHD in the male and female gender. The purpose of this study was to identify if females were being underdiagnosed due to the fact that they typically do not show the hyperactivity that males with ADHD display. The study is significant because of its attempt to gather information on the individual symptoms of an ADHD diagnosis to see which symptoms are more closely associated with each gender.

Background

In an interview with NPR, Dr. Stephen Hinshaw, chair of the department of Psychology at the University of California Berkeley, said, girls are more likely than boys to have the inattentive subtype ADHD where they display spacey and unorganized behavior as opposed to hyperactive behavior (Stewart 2008).

Hinshaw's statement has been backed up by studies and research. Girls are more likely to be inattentive without being hyperactive or impulsive, compared with boys. (Staller & Faraone, 2006; Newcorn et al., 2001). In addition to being more likely to be inattentive, females with ADHD are also more likely to display major depressive disorder as well as anxiety when compared to boys with ADHD (Faraone 2000; Rucklidge & Tannock 2001). The rates between adult females with ADHD and adult males with ADHD are as follows: major depressive disorder, 20% and 8%, respectively; agoraphobia, 25% and 3%, respectively; social phobia, 20% and 4%, respectively (Biederman et al., 2010; Biederman et al., 2008).

The above statistics are important when considering that a boy displaying hyperactive behavior is more likely to be identified as potentially having ADHD and eventually receiving a diagnosis while a girl who displays inattentive

behavior will be harder to discover because the symptoms are more subtle.

(Stewart 2008).

While it is easy to pass off spacey, inattentive, and disorganized behaviors off as subtle, it is undeniable that these behaviors are quantifiable and observable within a classroom and at home. This also means that females with ADHD are not only more likely to suffer from depression and anxiety disorder but these issues of depression and anxiety are also more likely to go unnoticed in a classroom because their symptoms are subtle.

Significance

Identifying if both ADHD behaviors, Inattentive and Hyperactive-Impulsive, are being looked at when testing and diagnosing a child is necessary because it can help us learn more about the disorder. It is possible that there are simply more males with ADHD than females and that since males often display hyperactivity it is reasonable that diagnosis often coincide with hyperactive symptoms. It is also possible that many of the females who suffer from ADHD are not being referred for a diagnosis because they do not display hyperactive symptoms and the perception of ADHD is too focused on hyperactivity while neglecting the other symptoms.

Furthermore in his interview with NPR, Dr. Hinshaw states, boys with ADHD are 99 percent of those studied (Stewart 2008). The lack of inclusion of the female gender in ADHD studies suggests that the potential for an underdiagnosis is great as females have not been studied enough to determine the differences, if any, between genders within the disorder. It also illustrates a potential bias toward the male gender as males are more likely to be diagnosed and more likely to be studied.

Definitions

Attention-Deficit Hyperactivity Disorder (ADHD) is the current term for a specific developmental disorder seen in both children and adults that is comprised of deficits in behavioral inhibition, sustained attention and resistance to distraction, and the regulation of one's activity level to the demands of a situation (hyperactivity or restlessness). This disorder has had numerous different labels over the past century, including Hyperactive Child Syndrome, Hyperkinetic Reaction of Childhood, Minimal Brain Dysfunction, and Attention Deficit Disorder (with or without hyperactivity). (Barkley & Murphy 2006)

Inattentive ADHD is characterized as an individual moving between tasks without completing any one activity, seemingly losing interest in one task because they become diverted to another. Individuals with inattention are often

easily distracted and forgetful, and experience difficulties when organizing activities. (ADHD Institute, 2015).

Hyperactive-Impulsive refers to excessive motor activity, and may present differently depending on the patient's age. In children, it may present as the child running and jumping around at inappropriate times, getting up from a seat when he or she is supposed to remain seated, fidgeting and wriggling, or excessive talkativeness and noisiness. In adolescents and adults, hyperactivity may manifest as inner feelings of extreme restlessness and wearing others out with their activity. (ADHD Institute, 2015)

Limitations

Data was only collected from one elementary school in New Jersey. This study lacks the necessary resources to collect large scale significant data. Due to the small sample size the results of the study may not be viewed as significant until the study is repeated with a larger sample size. This study also assumes that all responses to the survey were truthful.

Assumptions

This study assumes that there is a possibility that females are being underdiagnosed because of a gender bias pertaining to ADHD. This study assumes that since females typically display less signs of hyperactivity they may

not be getting as much attention as males due in regards to the disorder. It also assumes that more studies done, on females specifically, would uncover additional information about the difference of ADHD in males and females.

Chapter 2

Literature Review

History of the Disorder and Diagnosis

The DSM-III in 1980 marked the first time that Attention Deficit Hyperactivity Disorder (ADHD) was acknowledged as having different subtypes. This was the first time that the diagnostic criteria featured inattention and impulsivity. It also featured specific symptom lists for and a cutoff score for required symptoms necessary for a diagnosis. This was also the first time that other childhood psychiatric conditions that presented similar symptoms needed to be ruled out prior to giving an ADHD diagnosis (Barkley, 2014). The greater emphasis on impulsivity is significant as men engage in impulsive behaviors more frequently than women (Cross, 2011; Kruger & Nesse 2006)

The introduction of the ADHD subtypes was considered “a radical departure from the ICD-9 criteria set forth by the World Health Organization (1978) in its own taxonomy of psychiatric disorders, which continued to emphasize pervasive hyperactivity as a hallmark of this disorder” (Barkley, p.20, 2014).

At this point in time the disorder was known as Attention Deficit Disorder (ADD) and was looked at as two subtypes: those displaying signs of

hyperactivity and those not (+H/-H). This was considered controversial as, “Little, if any, empirical research on this issue existed at the time these subtypes were formulated” (Barkley, p.20, 2014). The controversial decision to differentiate ADD between those displaying signs of hyperactivity and those not was a catalyst for much research to be done on the subject which ultimately led to the next version of the DSM, the DSM-III-R, to rename ADD to Attention Hyperactivity Deficit Disorder (ADHD) with a renewed focus on hyperactivity. In his 2014 book, *Attention-Deficit Hyperactivity Disorder: A Handbook for Diagnosis and Treatment*, Professor Russell A. Barkley elaborates on the research that was done after the controversial decision to differentiate ADHD between +H and -H and how the subsequent revision in the DSM-III-R was not indicative of the research conducted. These studies found that there was in fact a difference between ADD -H and ADD +H. Although ADD -H had been removed from the DSM, these studies found that people who suffered from ADD -H suffered academically and were prone to daydreaming and lethargy. While these studies showed that ADD -H presented its own set of symptoms it was no longer considered a subtype of ADD or an official diagnosis. (Barkley, p.20, 2014; see also Milich 2001; Chhabildas 2001)

The removal of ADD -H in the 1987 version of the DSM-III-R was considered controversial just as its addition was in the DSM-III in 1980. The nature of the absence of hyperactivity and its relation to Attention Deficit Hyperactivity Disorder is extremely paradoxical. The confusion of whether or not to include non-hyperactive symptoms during the times when the development of its criteria were at their most prominent may be a reason why there is still a large association with hyperactivity and an ADHD diagnosis.

David Shaffer (1994) published an editorial, for the American Journal of Psychiatry, titled, "Attention Deficit Hyperactivity Disorder in Adults" coinciding with the release of the DSM-IV. In this editorial he highlighted the paradoxical nature of ADHD and the controversy that surrounded the removal of the -H symptoms from the criteria. Shaffer noted that many researchers and clinicians wanted ADD -H to once again be featured as part of an ADD diagnosis. There was also a focus on making sure that the symptoms applied to adults as well as children and a request for things to be worded in a way that did not present a bias toward childhood diagnosis. These researchers and clinicians believed that hyperactivity symptoms would reduce with age but the cognitive impairments of the disorder would remain. They also realized that ADHD was predominantly considered a childhood disorder but when kids with ADHD

reached adulthood. It was imperative to them for these issues to be addressed which is why they requested a renewed focus on non-hyperactive symptoms that could apply to children as well as adults. (Shaffer, p.633, 1994)

Attention Deficit Hyperactivity Disorder was once again redefined when the DSM-IV was released in 1994, and this time the disorder featured three subtypes: Attention Deficit Hyperactivity Disorder predominantly inattentive type (ADHD-I), Attention Deficit Hyperactivity Disorder predominantly hyperactive-impulsive type (ADHD-HI), and Attention Deficit Hyperactivity Disorder combined type (ADHD-C) (Gaub, 1997; see also Gratz et al., 2001).

Subtype Specific Research

The readdition of subtypes led to more research into the distinction between hyperactivity (ADHD-HI) and inattention (ADHD-I). This research was also done with the added benefit of having more capable technology. The Canadian Journal of Psychiatry published a study titled, "Neuropsychological Performance in DSM-IV ADHD Subtypes: An Exploratory Study With Untreated Adolescents" with the objective to explore neuropsychological performance in untreated Brazilian adolescents suffering from attention-deficit hyperactivity disorder (ADHD). This study was conducted by assessing 30 undiagnosed adolescents with ADHD in conjunction with 60 healthy control adolescents,

using a neuropsychological battery including the Wisconsin-Card Sorting Test (WCST), the Stroop Test (ST), the Digit Span, and the Word Span. (Schmitz et al., 2002,).

This study found that those who suffered from the inattentive form of ADHD (ADHD-I) performed the worst in the Digit Span and Stroop Test. This was in contrast to the hyperactive form of ADHD (ADHD-HI) whose subjects did not significantly differ from the control group in any of the tests that were performed. It also found that those with the combined form of ADHD (ADHD-C) also displayed more impairments than the control group, scoring the poorest out of all groups on the Wisconsin Card Sorting Test. Also notable was the ADHD-I group having the most errors in the Stroop Test as well as taking the longest amount of time to complete it. (Schmitz et al., 2002, p.863). These results suggest that ADHD-HI presents the least amount of impairment and that those who suffer from ADHD-I or ADHD-C are more likely to have impairments which could negatively impact academic functioning.

There were thirty children with ADHD that were studied, ten children with ADHD-HI, ten children with ADHD-I, and ten children with ADHD-C. In addition to that sixty healthy children were included in the study as part of the control group. Children with ADHD had a mean IQ of 88.3 while the control

group had a mean IQ of 92.9, however children with ADHD-HI had a mean IQ of 91.3 which is much closer to the control group than the mean IQ of ADHD-I and ADHD-C which were 87.8 and 85.8 respectively. It is also interesting to note that, in contrast to commonly held beliefs, females actually outnumbered males over 2:1 in being diagnosed with ADHD-HI. This is a noteworthy statistic because of the predominance of hyperactive females, but the small sample size prevents it from drawing any significant conclusions. (Schmitz et al., 2002, pp 865-867,).

The results of these tests led the authors of the study to conclude that there were no differences of neuropsychological measure between ADHD-HI and the control group. Significant differences in neuropsychological measure between the ADHD-I and ADHD-C groups when compared to controls caused them to speculate that neuropsychological impairment only presents in ADHD subtypes that feature inattention. (Schmitz et al., 2002, p.5; see also Barkley et al., 2006)

The conclusion that inattention is necessary is consistent with the earlier research that those with ADD -I are more likely to have poor academic achievement. This research done by Dr. Russell Barkley (2006) stated that inattention symptoms were the largest predictor of poor educational achievement (p.1). Barkley also concluded that more symptoms meant that there

was more potential for possible impairments in different domains. More domains of impairment would cause a greater severity of impairment overall. (Barkley, 2006, p.5). Barkley's statement is consistent with the results from the "Neuropsychological Performance in DSM-IV ADHD Subtypes: An Exploratory Study With Untreated Adolescents" study which showed that those suffering from ADHD-Combined had a lower Mean IQ than both of the other ADHD subtypes and the control groups.

Schmitz et al.'s (2002) study also supports the DSM-IV distinction between subtypes due to the fact that it revealed neuropsychological impairment and cognitive deficits were being caused by ADHD-I rather than ADHD-HI. The support of the subtypes used in the DSM IV is important because its predecessor, the DSM-III-R, was heavily criticized for the removal of non-hyperactive symptoms from the criteria needed for an ADHD diagnosis (Fisher, 2007). This study affirms the notion that the inattentive form of ADHD is not only real but also presents significant impairment for educational functioning.

Public Perception and Females

It is important to understand the history of the ADHD diagnosis due to the amount of changes it has gone through over the years. While ongoing studies that relate to a better diagnosis are incredibly useful, the ever changing nature of

the diagnosis can cause some confusion in regards to public perception. Public perception of the disorder is important as it is often parents and teachers who initiate the process for a diagnosis. If public perception of this disorder differs from the current diagnostic criteria it could create an over or under diagnosis. This is significant because of the fact that hyperactivity has always been a hallmark for an ADHD diagnosis while inattentiveness has fluctuated in and out of the DSM criteria. If the public perception of an ADHD diagnosis is based on hyperactivity it could lead to the parents or teachers not recognizing the other tell-tale signs of the disorder in both genders. This is especially significant for females as they are far less likely to display signs of hyperactivity than males.

A study conducted by Quinn & Wigal (2004) titled "Perceptions of Girls and ADHD: Results From a National Survey" attempted to gain an understanding how the public and teacher perceive the disorder in relation to each gender. Interviews were conducted with 1797 adults (general public), 541 parents of children with ADHD, 550 teachers, and 346 children aged 12 to 17 years with ADHD. Responses were examined to determine perceptions of ADHD. (Quinn & Wigal 2004).

The results of the study concluded that the 52% of the general public and 82% of teachers think that ADHD is a predominantly male disorder. It also

concluded that boys with ADHD are more likely than girls to have behavioral problems (public: 52% vs 26%; teachers: 36% vs 18%, respectively), girls with ADHD are more likely to have more subtle problems (public: 19% vs 11%; teachers: 29% vs 10%, respectively) or suffer from depression (public: 16% vs 1%; teachers: 12% vs 0.0%, respectively). (Quinn & Wigal 2004).

The study also mentions that there is evidence that ADHD may be more disruptive in females and that females may have greater cognitive or attentional deficits. It also showed that adult females with ADHD showed educational and cognitive impairment as well as higher rates of depression, anxiety, and conduct disorder. (Quinn & Wigal, 2004; see also Quinn, 2005; Waite, 2007).

The above data is consistent with data previously referenced and also representative of the real problems that females with ADHD are facing. The above study concluded that 85% of teachers believe the female students are more likely than boys to remain undiagnosed, and 92% of those teachers believe that the reason for this is that girls are less likely to act out (Quinn & Wigal, 2004).

These results suggest a belief that ADHD is primarily a behavioral disorder even though brain imaging has shown those suffering from ADHD have prefrontal lobe alterations as well as changes in regional cerebral bloodflow (Schneider et al., 2006; Kim et al., 2002; Schweitzer 2014' Yu-Feng et al. 2007; Gustafsson et al.,

2000). It also suggests that if a child is not displaying behavioral problems they will not be referred for an ADHD diagnosis.

This is significant in regards to a female diagnosis as they often do not display hyperactivity and are less likely to act out (Gershon & Gershon, 2002; Biederman et al., 2002). This suggests that there are many females suffering from ADHD but going undiagnosed because they do not display hyperactivity or behavioral problems. While behavior may be a common problem in children suffering from ADHD it is important to recognize that behavior is a byproduct of the disorder and not the disorder itself.

Neurological Bases of ADHD

Hynd, Hem, Voeller & Marshall (1991), as cited in, Barbasaz and Barbasaz (1995), explain that neuroimaging procedures have revealed that children who suffer from ADHD do not show right-greater-than-left frontal lobe asymmetry which would be displayed in a normal child. The distinction in the mass of frontal lobes has led to much research being done on the frontal lobes of those suffering from ADHD. Brain SPECT imaging revealed that there was a decreased perfusion in the prefrontal cortex with intellectual stress as well as decreased activity in the prefrontal cortices. (Amen & Carmichael, 1997, p.81). The conductors of this study, Amen and Carmichael (1997), reasoned that it was not

surprising to see prefrontal cortex dysfunction in those with ADHD because the prefrontal lobe controls functions such as attention span, concentration, judgment, and impulse control (p.83; see also Winstanley et al., 2006; Loge et al., 1990; Grodzinsky 1992; Malloy-Diniz et al., 2007). These prefrontal lobe functions are often functions that those who have ADHD have problems which could suggests a correlation between the decreased prefrontal cortex activity and ADHD.

Additional research has been done on the corpus callosum of children with ADHD and it was discovered that children with ADHD have a smaller splenium than those of the control group (Hynd et al., 1991). It was theorized that this smaller splenium could be causing individuals with ADHD to have hemisphere processing issues (Hutchinson, Mathias, Banich 2008; see also Catherine, 1994; Semrud-Clikeman, 1994).

Hutchinson, Mathias, Banich (2008) also concluded that those suffering from ADHD also had a smaller rostral body than the control group. The authors of this study concluded that the correlation between the rostral body and hyperactivity suggests that some ADHD features could be cause by differences in brain morphology. (pp.665-669; see also Quay, 1997; Moeller, 2005). This correlation between the Connors, a commonly used ADHD diagnostic

questionnaire, and impulsivity/hyperactivity within the rostral body suggests that there could also be a neurological factor within the corpus callosum of those who suffer from ADHD. Other research done shows that children with ADHD display reverse asymmetry (right larger than left) of the caudate nucleus compared to children who do not suffer from ADHD (Hynd et al., 1993; Castellanos, et al., 1994). It was also found that larger caudate nucleus areas were associated with poorer performance on tests of attention (Mataro et al., 1997) and it has also been suggested that a larger caudate nucleus could lead to social cognition impairment (Soliva et al., 2009; see also Park et al., 2013).

Potential Bias Against Females

In addition to providing valuable information about the neurological factors of ADHD this study, titled, "Corpus callosum morphology in children and adolescents with attention deficit hyperactivity disorder: A meta-analytic review" provided further confirmation that there is a distinct bias toward males when studying Attention-Deficit Hyperactivity Disorder.

The study was a meta-analysis which spanned two online databases and thirteen studies over a twenty six year period: January 1980 to October 2006. All of these studies were journals which had used MRI imaging on children and adolescents diagnosed with ADHD. Chi-square tests of the meta-analysis

showed that males were significantly more studied. It also revealed that there were more females in the control group than in the ADHD group. This meant that any differences in gender could not be viewed as significant due to the skewed nature of the samples (Hutchinson, Mathias, Banich 2008).

The admittance that any gender differences found would be confounded by significant difference in the comparison of the samples is significant due to the fact that the meta-analysis spanned 26 years. The lack of focus on studying females with ADHD is a worrying trend. This meta analysis indicates that this trend has been going on since at least 1980 and could be the cause of the referral bias that other studies (Biederman & Faraone, 2004) have indicated to be unfavorable to females.

While the general acceptance that ADHD is a 3:1 Male:Female disorder (Barkley, 2006; Gaub, 1997) makes it likely that more males will be studied than females it does not excuse the severity to which females have been understudied. It is also concerning that the ADHD group, in the meta-analysis, has a majority of males while the control group has a majority of females (Hutchinson, Mathias, Banich, 2008). This is concerning because it further devalues the ability to study gender differences in ADHD. If males with ADHD are being compared to females without ADHD on a significant basis it makes it challenging to

determine the differences within each gender; i.e. understanding how males with ADHD differ from males without ADHD, and, how females with ADHD differ from females without ADHD.

That is not to say that research between ADHD groups and non-ADHD groups is unnecessary, because it is certainly valuable. However gender differences should be more valued and more information could be attained about the gender differences in an ADHD diagnosis if studies were more gender specific; i.e. Males with ADHD vs. Males without ADHD, Females with ADHD vs. Females without ADHD, Males with ADHD vs. Females with ADHD.

Female Specific Studies

Current research has seemed to acknowledge the lack of female specific ADHD studies. In a study comparing females with ADHD to those who do not have the disorder, Claesdotter-Hybbinette et al., (2015) discovered that ADHD females have a significant difference in auditory brainstem response when compared to control subjects. Current research also suggests that females with ADHD are more likely to attempt suicide or display self-injurious behavior. Over 22% of females who were diagnosed with the combined type of ADHD (ADHD-C) had attempted suicide (Hinshaw, 2015). The effects of the drug methylphenidate, commonly known as Ritalin, which is commonly used to treat

ADHD, were studied in a comparison of males and females. This study reported that methylphenidate showed a significant effect on cognitive tests as opposed to emotional tests. It also reported that the change in cognition was only observed in females and not males. This suggests that the efficacy of different drugs used to treat ADHD could differ depending on the gender of the person who is prescribed them. (Bloch et al., 2015)

Chapter 3

Methodology

Subjects

All subjects were employed, or certified, as teachers in an elementary school in New Jersey. Out of a total of 40 teachers who were given the survey, 15 chose to complete it. All of the subjects were over the age of 18. There was also a large variance in the amount of experience that each of the subjects had in their field.

Materials

This study's survey was designed to identify which gender each individual symptom of ADHD was most closely associated with. This was done by creating a list of all of the symptoms the DSM-V lists for an ADHD diagnosis. For each individual symptom participants had the option to select Male, Female, or Both. All teachers completed the same survey which is located in the Appendix of this paper.

Design

This survey was designed to identify which gender teachers associated more closely with ADHD based on their classroom experience. It also had the

intended effect of being able to analyze each individual symptom to determine percentages for all three options for each symptom.

Procedure

Access to the group of teachers was given to the author of this study with permission from the elementary school's Principal and teachers themselves. This study was approved by Rowan University's Institutional Review Board. The survey was given to the teachers using the interschool mailboxes and completed surveys were placed in a closed box in the school's main office. It is estimated that it will take the teacher's an average of 10-15 minutes to complete the survey and all surveys will be collected the day they are given. Each survey also includes alternate consent paper forms as dictated by Rowan University and adapted to the author's specific study. Once all surveys were collected and scored, the data was analyzed by using a One-Way Repeated Measures Analysis Of Variance (ANOVA).

Chapter 4

Results

In order to understand the responses collected by the survey it is necessary to calculate the statistics in order to determine whether or not the results were significant. Before calculating the results it is first necessary to code the results so that they can be entered into SPSS 23 and analyzed. All 15 (N = 15) surveys were analyzed to determine which gender each person surveyed associated more closely with ADHD. Individual symptoms were also analyzed to determine the percentage each option received.

Hypothesis One

Males will be more closely associated with symptoms than females due to the higher incidence of a male ADHD diagnosis. Descriptive statistics were calculated with SPSS 23. A One-Way Repeated Measures Analysis Of Variance (ANOVA) was also chosen because of its usefulness in detecting the significance within the three options. The results shown in Figure 1 display the means of all three options (Male, Female, Both) the teachers were given. Males have a mean score of 14.26 (SD = 3.55), Females have a mean score of 1.80 (SD = 2.67), and Both have a mean score of .933 (SD = 2.57). Results of the One-Way Repeated

Measures Analysis of Variance are as follows: $F(2,13) = 41.460$ significant at the $p \leq .0001$ level.

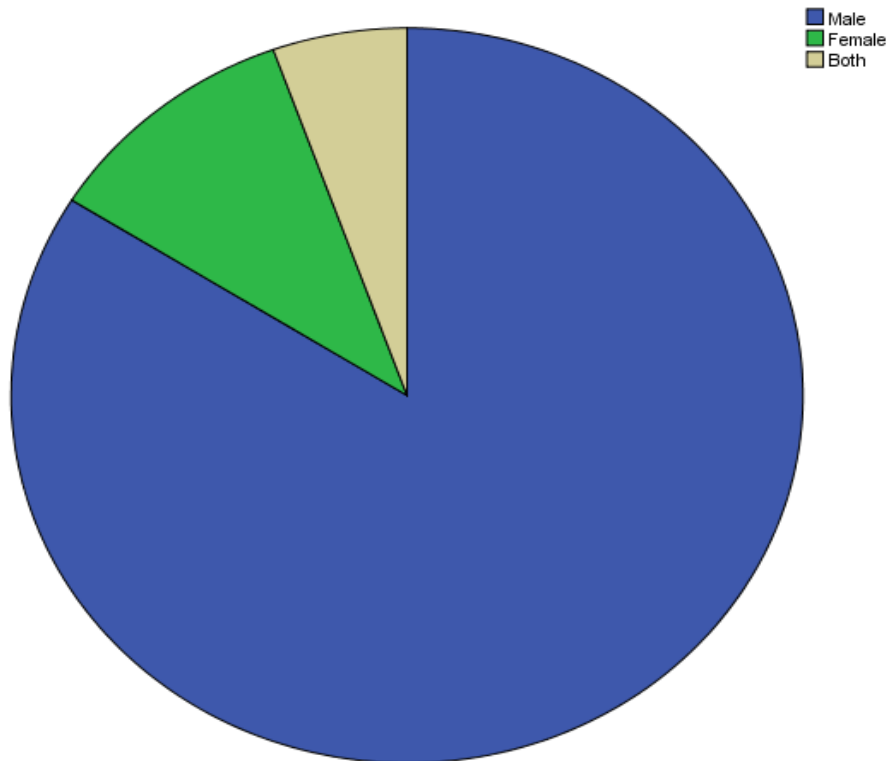


Figure 1. Gender Differences in ADHD Results

As mentioned earlier, Males received a Mean score of 14.26 (SD = 3.55) and the Repeated Measures ANOVA reveals that the results are significant to the

$p \leq .0001$ level. The significance of the results confirms hypothesis one which stated that more males would be associated with ADHD.

Hypothesis Two

There is a bias against female referral and diagnosis due to the fact that they do not typically present hyperactive symptoms. While this study was not designed in such a way to determine if there is in fact quantifiable bias, the results can be observed to determine if the potential for bias exists. It is important to remember that the criteria for an ADHD diagnosis is gender non-specific which means that all of these symptoms could be exhibited by either gender.

Responses to all nine hyperactivity symptoms were logged for each individual survey. Once logged, the responses were then tallied up for all three options (Male, Female, Both) and percentages were calculated for each individual symptom. All nine hyperactivity symptoms as well as their percentages are displayed below in Table 1.

Table 1

Hyperactivity Symptoms Percentages

Hyperactivity Symptoms	Male %	Female %	Both %
Often fidgets with or taps hands or feet, squirms in seat.	86.67%	13.33%	0%
Often leaves seat in situations when remaining seated is expected.	86.67%	13.33%	0%
Often runs about or climbs in situations where it is not appropriate.	100%	0%	0%
Often unable to play or take part in leisure activities quietly.	86.67%	6.66%	6.66%
Is often "on the go" acting as if "driven by a motor".	100%	0%	0%
Often talks excessively.	46.67%	40%	13.33%
Often blurts out an answer before a question has been completed.	80%	13.33%	6.66%
Often has trouble waiting his/her turn.	93.33%	6.66%	0%
Often interrupts or intrudes on others.	53.33%	33.33%	13.33%
<i>Note.</i> N = 15.			

It is impossible to confirm potential bias against females to any significant level using the results of this survey. These results do allow us to confirm that

hyperactivity symptoms are heavily associated with males as the highest non-male percentage for any of them was 13.33%.

Hypothesis Three

Inattention symptoms will be more closely associated with females. Responses to all nine inattentive symptoms were logged for each individual survey. Once logged, the responses were then tallied up for all three options (Male, Female, Both) and percentages were calculated for each individual symptom. All nine inattentive symptoms as well as their percentages are displayed below in Table 2.

Table 2.

Inattention Symptoms Percentages

Inattention Symptoms	Male %	Female %	Both %
Often fails to give close attention to details or makes careless mistakes in schoolwork, at work, or with other activities.	100%	0%	0%
Often has trouble holding attention on tasks or play activities.	80%	6.66%	13.33%
Often does not seem to listen when spoken to directly.	86.66%	6.66%	6.66%
Often does not follow through on instructions and fails to finish schoolwork, chores, or duties in the workplace.	93.33%	0%	6.66%
Often has trouble organizing tasks and activities.	93.33%	0%	6.66%
Often avoids, dislikes, or is reluctant to do tasks that require mental effort over a long period of time.	86.66%	13.33%	0%
Often loses things necessary for tasks and activities.	86.66%	6.66%	6.66%
Is often easily distracted.	80%	13.33%	6.66%
Is often forgetful in daily activities.	73.33%	20%	6.66%
<i>Note.</i> N = 15.			

Hypothesis three was refuted by the results obtained from the survey. Inattention symptoms were expected to be closely associated with females because females with ADHD typically display those symptoms. However all 9 inattention symptoms were more closely associated with the male gender. The highest female inattentive percentage was "Is often forgetful in daily activities" which received 20%.

Chapter 5

Discussion

Summary

Results from the data collected shows that the teachers believe the ADHD symptoms to be more closely associated with males at a significant level ($p \leq .0001$). This is to be expected as males are diagnosed with ADHD at a much higher rate than females. This also means that the teachers' experience with the disorder in the classroom is more likely to have been with male students.

While the results seem to support the prevailing belief that ADHD is a predominantly male disorder, they also bring up some interesting questions in regards to females. It is important to point out that all of the behaviors and symptoms that are required for an ADHD diagnosis are all gender neutral. This potentially makes the results concerning as every single symptom was more closely associated with males than females. It is entirely possible that ADHD occurs more frequently in males as well as being underdiagnosed in females. While the sample size is small these results indicate that males are heavily associated with ADHD, and its specific symptoms, while females are not. This is concerning as ADHD affects both males and females yet the majority of the attention is focused on males.

The association of males being ADHD is consistent with earlier referenced literature. Although earlier studies referenced the significance of inattention symptoms and the female association with said symptoms it still seems as though females are not being looked at for a possible diagnosis. Hyperactivity bias preventing females from being referred for a diagnosis is a significant problem as it does not allow females who are suffering to be identified.

Limitations

The major limitation of this study is the small sample size (N=15). This is in part because the school where the study was conducted is small and not all teachers within the school elected to participate. Another limitation is that this study only surveyed elementary school teachers. Different behaviors present themselves at different ages and results could be altered if secondary education teachers were surveyed. Furthermore, this study was only collected in one elementary school. This study did not have access to multiple schools or multiple school districts.

Future Research

Future research should be expanded to include a larger sample size that spans multiple schools and multiple districts. This study focused on the association of symptoms but future studies should focus on the association of

symptoms as well as the teachers familiarity with ADHD. It would be interesting to see there is any differences in symptom association based upon the teacher's experience with the disorder. Research should also focus on how familiarity with the disorder and its symptoms effects the chances of a female diagnosis.

Additional research should also focus on symptom association and sorted by the teacher's grade level. Hyperactive behavior can normalize with age and it would be interesting to see if this was reflected in the association of symptoms by teachers of higher grade levels. If possible, these research topics should also be expanded to include parents as well as teachers. This would be beneficial because parents and teachers are typically the two parties who fill out ADHD rating scales. This research could create a better understanding about how parents and teachers associate the symptoms of the disorder as well as attempt to gauge awareness about non-hyperactive symptoms of the disorder and how that could affect referral for diagnosis.

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Appendix

Survey Used

Symptoms	Male	Female
Often fails to give close attention to details or makes careless mistakes in schoolwork, at work, or with other activities.		
Often has trouble holding attention on 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 (e.g., loses focus, side-tracked).		
Often has trouble organizing tasks and activities.		

Often avoids, dislikes, or is reluctant to do tasks that require mental effort over a long period of time (such as schoolwork or homework).		
Often loses things necessary for tasks and activities (e.g. school materials, pencils, books, tools, wallets, keys, paperwork, eyeglasses, mobile telephones).		
Is often easily distracted		
Is often forgetful in daily activities.		
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 not appropriate		
Often unable to play or take part 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 trouble waiting his/her turn.		
Often interrupts or intrudes on others (e.g., butts into conversations or games)		

Note: The survey only included options for Male and Female but the option to select Both was given.