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Attention Deficit Hyperactivity Disorder and Psychopathy in the General Adult Population

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Abstract

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Abstract

Attention deficit hyperactivity disorder (ADHD) is one of the fastest growing mental disorders in the United States. More children are being diagnosed than ever before, and many of these individuals are finding that at least one other emotional, behavioral, or mental disorder often accompanies ADHD (including psychopathy). The number of individuals in the prison population with both ADHD and psychopathy is on the rise. Because of these increases, including what is being seen in the prison population, this study aimed to identify if there was a relationship between ADHD and psychopathy in the general population, and if there were specific maternal prenatal behaviors that may increase the likelihood of this relationship. This study used a survey composed of both the Brown Attention-Deficit Disorder Scales assessment, the Carlson Psychological Survey assessment, and additional demographic questions to gather data. Social media groups specific to ADHD were used to recruit a convenience sample of 88 participants who endorsed symptoms of ADHD. A quantitative analysis was conducted to explore the degree of the relationship between ADHD and psychopathy in the general population who endorsed symptoms of ADHD. Additionally, this study used a multiple linear regression to determine if maternal nicotine, alcohol, or drug consumption had any effect on the degree of this relationship. Results indicated that there was not a statistically significant relationship between ADHD and psychopathy in the general population, unlike what is seen in the prison population. However, even though the finding were not statistically significant, there are still implications for future research and evidence that the social stigma around ADHD and delinquent behaviors is inaccurate.

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Table of Contents

List of Tables

List of Figures

Chapter 1: Introduction to the Study

Introduction

Attention deficit hyperactivity disorder (ADHD) is one of the fastest growing mental disorders in the United States (George Washington University Milken Institute School of Public Health, 2015). According to the Centers for Disease Control and Prevention (2017), in 2003, 7.8% of children ages 4 to 17 were diagnosed with ADHD. However, by 2011, that number jumped by 43% (George Washington University Milken Institute School of Public Health, 2015). Attention deficit hyperactivity disorder is often accompanied by other disorders and conditions. In 2016, two-thirds of parent reports of U.S. children ages 2 to 17 with diagnosed ADHD also reported that their children had at least one other mental, emotional, or behavior disorder (Centers for Disease Control and Prevention, 2018a). In fact, it was reported that 50% of children diagnosed with ADHD also had a behavior or conduct problem (Centers for Disease Control and Prevention, 2018a).

In the prison population in the United States, rates of ADHD among the inmates are elevated. One study suggested that the rates of ADHD among adult male long-term prison inmates to be around 40% (Ginsberg, Langstrom, Larsson, & Lindefors, 2015). Additionally, it has been found that individuals with ADHD have more arrests, are more often convicted of a crime, and are more frequently incarcerated than the general population (Mohr-Jensen & Steinhausen, 2016). With an increase in the number of children with ADHD who also have a behavior or conduct problem, it is not surprising that there is also an increase in the number of individuals incarcerated with ADHD.

In addition to issues with behavior and conduct, ADHD is also associated with poor social adaption, impulsivity, and antisocial behavior (Retz, Boureghda, Retz-Junginger, Philipp-Wiegmann, & Rosler, 2013). These are also characteristics seen in psychopathy. Previous studies have implicated that there is similar symptomology between ADHD and psychopathy (Retz et al., 2013). Psychopathic inmates were four times more likely to have a childhood history of hyperactivity-impulsivity-attention problems as well as conduct issues than their nonpsychopathic counterparts (Allely & Cooke, 2016). These two disorders share many similarities. Due to the increases in both ADHD in the general population, as well as the increase in ADHD seen in the prison population, combined with the similarities of symptoms, it was hypothesized that there was a correlation between these two disorders. This study aimed to identify if there was a relationship between ADHD traits and psychopathic traits in the general population and also to identify if there are specific maternal variables that increase the likelihood of ADHD traits and psychopathic traits.

Background

There is an extensive body of literature addressing the relationship between ADHD and criminality. Knecht, de Alvaro, Martinez-Raga, and Balanza-Martinez (2015), for instance, evaluated the literature to find that the proportion of both adolescents and adults in the prison system diagnosed with ADHD is much greater than the number of individuals with ADHD in the general population; however, this group is also underdiagnosed. Cahill et al. (2012) agreed that the rates of ADHD in the prison population are significantly higher than that seen in the general population. In fact, a childhood history of ADHD that persists into adulthood is a risk factor for a variety of criminal offenses (Knecht et al., 2015). Knecht et al. also showed that children with

ADHD demonstrate more criminal behaviors and have more frequent arrests, convictions, and imprisonment in adolescence and adulthood. This could be explained by the neural information processing pathways in those with ADHD being more pronounced than in those without ADHD, leading Meier, Perrig, and Koenig (2012) to conclude that ADHD is a strong risk factor for recklessness and delinquency, which can be linked to response inhibition commonly found in individuals with ADHD.

Several researchers have evaluated the relationship between ADHD and psychopathy. Becker, Luebbe, Fite, Greening, and Stoppelbein (2013) explored the effects of ADHD on other comorbid neurodevelopmental disorders. They found that boys who are diagnosed with ADHD have higher rates of psychopathy than boys without ADHD (Becker et al., 2013). This finding agreed with Allely and Cooke (2016), who conducted a systematic review to explore the rates and relationships between neurodevelopmental disorders (specifically ADHD and autism) and psychopathy. It is believed that ADHD and psychopathy share common features, such as impulsivity and antisociality (Allely & Cooke, 2016). Retz et al. (2013) discussed how ADHD and psychopathy are both associated with poor social adaptation and antisocial behavior. They also determined that the main construct shared by both ADHD and psychopathy is impulsivity (Retz et al., 2013).

Additional researchers have focused on the relationship between ADHD and criminal behavior. Lundstrom et al. (2014) studied the long-term effects of autism spectrum disorder, tic disorders, and obsessive-compulsive disorders and their association with ADHD and violent crimes. They suggested that ADHD has a negative effect on markers of antisocial behavior among children (Lundstrom et al., 2014). Because of these findings, Lundstrom et al. (2014)

concluded that individuals with ADHD were at an elevated risk for committing violent crimes, and interventions should focus on adolescents and crime reduction.

The aim of this study was to further investigate the relationship between ADHD and psychopathy in the general adult population who endure symptoms of ADHD. Attention deficit hyperactivity disorder was measured by the Brown Attention-Deficit Disorder Scales (BADDS) and psychopathy was measured by the Carlson Pyshological Survey (CPS). This research helps fill the gap between the current research conducted on prison inmates, as well as adolescent delinquents, to show that if there are correlations between symptoms of ADHD and psychopathic characteristics in the general population with ADHD, these can be identified early on for those who are at higher risk for criminal behaviors and beneficial interventions can be provided.

Statement of the Problem

Attention deficit hyperactivity disorder is a disorder of brain development (Moore, Sunjic, Kaye, Archer, & Indig, 2016). Many of the symptoms of ADHD include inattention, hyperactivity, and impulsive behaviors (Moore et al., 2016). The juvenile predominance of ADHD is approximately 5 to 7%, with the symptoms repeatedly continuing into adulthood (Allely & Cooke, 2016). In fact, it has been reported that "45% of youth and 24% of adult male offenders had a childhood history of ADHD, and 14% continued to be symptomatic into adulthood" (Knecht et al., 2015, p. 164). Researchers, when conducting clinical assessments of ADHD in prisoners, have found the occurrence of ADHD to be as high as 20 to 30% in adult inmates (Moore et al., 2016). The number of incarcerated adults with ADHD is much greater than that which is documented in the general population (Knecht et al., 2015).

Psychopathy is characterized by "superficial charm, shallow emotions, lack of empathy, lack of guilt or remorse, irresponsibility, impulsivity, deceitfulness, and persistent antisocial behaviors" (Hare, 2006, p. 709). Although individuals with psychopathy have been found to be only a small percentage of the general prison population (approximately 1-2%), they are responsible for roughly 30% of all violent crimes (Carre, Hyde, Neumann, Viding, & Hariri, 2013). These violent crimes, the subsequent incarceration, and the treatment that is required to prevent recidivism, can cost taxpayers anywhere from $250-400 billion dollars each year (Carre et al., 2013).

A link has been established between childhood ADHD and adult criminality (Becker et al., 2013; Lundstrom et al., 2014). Attention deficit hyperactivity disorder and psychopathy share mutual neurological and biological backgrounds, and this commonality can explain behaviors commonly seen in those who commit criminal offenses, such as impulsivity, rule-breaking, interpersonal issues, criminal activity, substance use/abuse, and sensation seeking (Machado, Rafaela, Silva, Veigas, & Cerejeira, 2017). A childhood history of ADHD that has persisted into adolescence and adulthood is a risk factor for many offenses, "including traffic offenses, fire setting, sexual offenses, and property offenses" (Knecht et al., 2015, p. 165). The continuation of ADHD into adulthood has been identified as "the most powerful predictor of violent delinquency" (Knecht et al., 2015, p. 165). Criminals who were diagnosed as psychopathic were "three times more likely" to also have a diagnosis of ADHD (57%) compared to those who were considered nonpsychopathic (Allely & Cooke, 2016, p. 382).

Psychopathy and ADHD have a lot in common. Cooke and Michie (2001) noted that because of the high rates of criminality in the ADHD population, a possible link is supported

between ADHD and psychopathy. Knecht et al. (2015) suggested that there is a strong link between adult psychopathy and those individuals who were diagnosed with ADHD as adolescents or children. Through their research, they believed that if someone had childhood ADHD, this could be an independent contributor to higher psychopathy scores (Knecht et al., 2015). Further investigation may reveal stronger associations between neurodevelopmental disorders such as ADHD and psychopathy (Allely & Cooke, 2016). Additionally, more research into understanding the link between psychopathic traits and ADHD can assist in providing better treatment interventions among both criminal and general populations (Machado et al., 2017).

Purpose of the Study

The purpose of this quantitative correlational research was to see to what degree a relationship exists between ADHD and psychopathic traits for adults who endure symptoms of ADHD in the general population. Additionally, this research was conducted to see if maternal prenatal factors had any impact on the degree of this relationship between ADHD and psychopathy. This research was being conducted because the number of children diagnosed with ADHD is rising (see Centers for Disease Control and Prevention, 2018b), and while a link between ADHD and psychopathy has been demonstrated in previous research of incarcerated populations, there are still numerous gaps in the understanding of this relationship in the general population.

By using social media to gather participants, it was possible to get a larger, more diverse sample of the general population with ADHD. By understanding this relationship better, what risk factors contribute to the development of this disorder, and if maternal behaviors impact this relationship, earlier interventions may be made available to children and adolescents who

demonstrate behaviors associated with ADHD, psychopathy, and criminal behaviors. Such intervention may help to keep these individuals from incarceration, save the community money, and help prevent these individuals from harming others.

Research Questions and Hypotheses

The research questions and hypotheses that follow were developed after careful review of the literature on ADHD, criminality, and psychopathy. A more detailed description of the study design guided by these research questions can be found in Chapter 3.

Research Question (RQ)1: Do participants who endorse more symptoms of ADHD as measured on the BADDS also endorse more symptoms of psychopathy as measured on the CPS antisocial scale in the general adult population who endure significant symptoms of ADHD?

H_0: Having more symptoms of ADHD as measured on the BADDS does not influence psychopathy scores as measured on the CPS antisocial scale among the general adult population who endures significant symptoms of ADHD.

H_a: Having more symptoms of ADHD as measured on the BADDS does influence psychopathy scores as measured on the CPS antisocial scale among the general adult population.

RQ2: Do participants who endorse significant symptoms of ADHD as measured on the BADDS endorse more symptoms of psychopathy as measured on the CPS antisocial scale when controlling for maternal drug, maternal alcohol, and maternal nicotine exposure?

H_0: Participants who endorse significant symptoms of ADHD as measured on the BADDS endorse less psychopathy as measured on the CPS antisocial scale when controlling for maternal drug, maternal alcohol, and maternal nicotine exposure.

H_a: Participants who endorse significant symptoms of ADHD as measured on the BADDS endorse more psychopathy as measured on the CPS antisocial scale when controlling for maternal drug, maternal alcohol, and maternal nicotine exposure.

This study utilized a quantitative analysis to explore the relationships between the variables being studied. Due to multiple variables being evaluated, the use of multiple linear regression analysis allowed for a greater examination of the multiple types of relationships among these variables (Frankfort-Nachmias & Leon-Guerrero, 2015). RQ1 was addressed using a correlational analysis to understand the degree of the relationship between ADHD and psychopathy. RQ2 was addressed using a multiple linear regression analysis with psychopathy being the dependent variable, ADHD degree being the independent variable, and three control variables (maternal drug, maternal alcohol, or maternal nicotine exposure). These variables were gathered using the BADDS, the CPS antisocial scale to measure psychopathy, and additional individual questions added to the survey by the researcher, including demographic information (see Appendix A for demographic questions). SPSS was used to run the analysis to see the degree of relationships among all the variables reviewed.

The goal of this analysis was to seek the degree to which different variables are impacted by the endorsement of symptoms of ADHD as well as if there is a stronger relationship between ADHD and psychopathy measures in the general population with endorsed symptoms of ADHD. These outcome measures can help to fill gaps in the literature, provide greater insight to possible factors that influence the development of the disorder, and provide insight for future research and interventions.

Guiding Theories

The theoretical framework for this study included Hartmann's (2016) hunter-farmer theory of ADHD, as well as the genetic theory of ADHD. Hartmann discussed how, throughout all history, every human who existed was part of the hunter society. This society continued until the agricultural revolution. At the point of the agricultural revolution, instead of hunting for food, people began to settle down, herd animals, plant crops, and create farming communities (Hartmann, 2016). Hartmann asserted, "When viewed in an anthropological or historical view, the criteria for diagnosing ADHD could also be seen as characteristics that would be survival skills for a person in a hunting society" (p. 28). However, in our current society, the skills necessary for surviving in a hunting society are no longer necessary and are much more obvious as inappropriate.

An additional theory for the development of ADHD was from a genetic and developmental standpoint. Amen's (2018) developmental and genetic theory of ADHD suspected that genetics, maternal alcohol or drug use, brain trauma, and/or birth trauma could all compound to be a causative factor in the development of ADHD symptoms. In mothers who consumed alcohol during pregnancy, the risk of ADHD in their children is 1.55 times higher than in women who did not consume alcohol during pregnancy (Han et al., 2015; Mick, Biederman, Faraone, Sayer, & Kleinman, 2002). In addition, if the mother smoked, ADHD development was 2.64 times higher than in women who did not smoke during pregnancy (Han et al., 2015; Mick et al., 2002). Understanding if there are external maternal factors in the development of ADHD can also help in future treatment options.

Nature of the Study

This study used a quantitative analysis where the variables used provide information about the degree of differences between the participants in terms of a characteristic(s) being measured (see Warner, 2013). The outcome values on the psychopathy and ADHD measurements were continuous and therefore appropriate to input into a quantitative analysis to see the effect one has on the other. This quantitative correlational analysis provided insight as to the relationship between the variables of ADHD scores as measured by the BADDS and psychopathy scores as measured by the CPS antisocial scale.

There were many advantages to using a correlational analysis for this study. Using this type of analysis allowed for a more natural, real-life setting and in turn increased the external validity of the study (see Frankfort-Nachmias & Leon-Guerrero, 2015). Additionally, this type of research allowed for a determination of both strength and direction of the relationship of the variables, which can help in narrowing down findings for future experimental research designs (see Filipowich, 2018). While adults with symptoms of ADHD were recruited, it is still important to conduct an ADHD assessment to show the level of ADHD among the sample.

Definition of Terms

Adult ADHD: The term ADHD is typically diagnosed in children and adolescents; however, the symptoms can continue into adulthood. Symptoms typical of adult ADHD include hyperactivity and restlessness, inattention and memory problems, impulsivity and emotional instability, and problems with self-concept (Conners, Erhardt, & Sparrow, 2018). For the purpose of this research, the participant needed to be an adult (ages 18 and older) and display symptoms of ADHD.

Antisocial personality disorder: This is a formal diagnosis in the DSM-5 of a person with numerous psychopathic traits. While there are some differences between antisocial personality and psychopathy, both are often characterized by a lack of long-term, realistic goals, behavioral issues that usually start in childhood, inability to control behaviors, delinquency, and criminality (Thompson, Ramos, & Willett, 2014). Both ADHD and psychopathy also share a common characteristic of antisocial behavior.

Attention deficit hyperactivity disorder (ADHD): The term ADHD refers to a common neurodevelopmental disorder that is commonly characterized by an inability to regulate attention, hyperactivity, and impulsivity (Machado et al., 2017).

Diagnosis: A diagnosis refers to a doctor, either medical or psychiatrist, stating to the individual or caregiver that they have the illness or disorder. In this case, it is important that the participants have symptoms of ADHD. The symptoms of ADHD are important to this study because it is looking at the relationship between ADHD and psychopathy. Studies have shown that in the criminal offenders, the rates of ADHD diagnosis in those who have psychopathic traits is higher than those who have not been diagnosed with ADHD (Allely & Cooke, 2016).

Impulsivity: This is characterized by a failure to impede a risky impulse for both the individual and those around the individual (Bakhshani, 2014). Additionally, impulsivity typically is a result of the individual being unable to inhibit both behavioral impulses and impulsive thoughts (Bakhshani, 2014). Both ADHD and psychopathy share a common characteristic of impulsivity.

Psychopathy: The term psychopathy refers to a group of characteristics such as "superficial charm, shallow emotions, lack of empathy, lack of guilt or remorse, irresponsibility, impulsivity, deceitfulness, and persistent antisocial behaviors" (Hare, 2006, p. 709).

Assumptions and Limitations

Because the study of this design utilized a survey distributed via social media (see Appendix B for social media advertisement), it was assumed that the participants who responded were truthful and answered with careful thought and evaluation. It was also assumed that the participants were all adults (ages 18 and older) and displayed symptoms of ADHD. It was also assumed that both the CPS and the BADDS were appropriate assessments for this research. Finally, it was assumed that the participants were able to answer accurately their mother's maternal behaviors.

The participants' knowledge was a limitation. It was unknown if the participants knew their mother's behavior during pregnancy. Additionally, it was a limitation that there is no access to medical, arrest, or psychological records, and, therefore, it was impossible to check the reliability of the participants' survey responses. Another limitation was participant truthfulness. While it was assumed that the participants truthfully answered the survey questions, it was unknown if they actually did. However, the most appropriate assessments were used for this research, ensuring the most suitable responses to analyze. Another limitation was that the survey was distributed online within social media. The participants had to have access to a computer, a social media account, and be able to use the internet.

Significance

This research was conducted to identify if there was an association between ADHD and psychopathy in the general adult population who endorse symptoms of ADHD. Additionally, this research sought to identify if maternal factors (such as nicotine consumption, alcohol consumption, or drug use prenatally) impacted the relationship between ADHD and psychopathy. This relationship would allow for a practical application to those treating individuals with ADHD who demonstrate behaviors associated with psychopathy. Currently, there is not a lot of research focused on the relationship between ADHD and psychopathy in the general population. It is important to expand the knowledge of these two disorders and the degree at which they intersect with one another so that more information is available to increase the understanding of the potential variables that contribute to the development of both disorders and possible future criminal behaviors (see Allely & Cooke, 2016).

While other researchers have found a relationship between ADHD and psychopathy, none of those diagnosed with ADHD have scored in the clinical range for psychopathy (Machado et al., 2017). Several studies have indicated that the total psychopathy and emotional dysfunction scores are higher in adolescents with ADHD (Machado et al., 2017). Previous studies have shown that ADHD and psychopathy share many similar characteristics, including poor social adaptation and antisocial behavior (Retz et al., 2013). It is plausible that there is a stronger association between neurodevelopmental disorders (in this case, ADHD) and psychopathy; results of this study could help with more focused intervention and treatment options among multiple populations (see Allely & Cooke, 2016; Machado et al., 2017).

By understanding if there is a relationship between ADHD and psychopathy, positive social change may be created by providing those individuals who are at an increased risk for psychopathy and subsequently help to improve their quality of life outcomes, saving the community money, with fewer individuals being incarcerated or repeat offenders, and providing resources for those at risk so they can get the help they need.

Summary

The number of children and adolescents diagnosed with ADHD is increasing as are the number of adults incarcerated with ADHD (Ginsberg et al., 2015). Those with ADHD in prison show common characteristics typical of both ADHD and psychopathy (Allely & Cooke, 2016). Due to these shared characteristics, the increased number of individuals in prison with ADHD and psychopathy, and the rise in childhood and adolescent ADHD diagnosis, it is important to establish if there is a link between ADHD and psychopathy in the general population. This information can assist in providing better interventions earlier on to help prevent future incarcerations and delinquent behaviors.

The following chapter is focused on existing literature and studies that imply a relationship between ADHD, psychopathy, and criminal behaviors. Chapter 2 also includes an explanation of how maternal behaviors impact the development of ADHD. Following this explanation will be a brief discussion about how these variables impact the development of ADHD and how the hunter-gatherer theory and biological theory of ADHD were used to guide the hypothesis. Chapter 2 will conclude with a discussion regarding the effects of past research and its impact on this study.

Chapter 3 will cover the methodology used to analyze the research questions posed by this study. It also discuss the survey design as well as justification for the use of the survey as a tool to collect data for this study. The population, research setting, and strategy of data collection are discussed as well as the instruments used and the validity and reliability of these tools. Lastly, ethical considerations are discussed.

Chapter 4 provides the results of the statistical analyses and addresses the data collected in depth. In Chapter 5, a discussion of the implications of the results of each research question. Additionally, suggestions for future actions and the possible impact to social change are reviewed. The chapter will conclude with implications for future research and review the significance of the present study.

Chapter 2: Literature Review

Introduction

Attention deficit hyperactivity disorder has shown a steady increase over the past 20 years (Centers for Disease Control and Prevention, 2018b). It is estimated that roughly 5 to 7% of adolescents are currently diagnosed with ADHD, and often these symptoms continue into adulthood (Allely & Cooke, 2016). When evaluating ADHD in criminal offenders, approximately 45% of youth offenders and 24% of male adult offenders have a childhood history of ADHD (Knecht et al., 2015). Researchers have found that the occurrence of ADHD in adult inmates to be as high as 20 to 30% (Moore et al., 2016). In fact, the percentage of inmates with ADHD is much greater than the percentage of the general population with ADHD (Knecht et al., 2015).

Psychopathy shows similarities to ADHD in both the incarcerated populations and general populations. It is estimated that at any given time, roughly 1% of the general population can be considerd psychopathic (Hare, 2006). However, in the prison system, while only 1 to 2% fall under the diagnosis of psychopathic, they are repsonsible for more than 30% of all violent crimes (Carre et al., 2013). These violent crimes, the incarceration for these crimes, and the treatment to prevent recidivism can cost up to $400 billion dollars each year (Carre et al., 2013).

Both ADHD and psychopathy share many similarities. In fact, a study conducted by Knecht et al. (2015) stated that the continuation of ADHD into adulthood is one of the most powerful predictors of violent crminal behavior. In addition, those individuals who were identified as psychopathic were also three times more likely to also be diagnosed with ADHD than their nonpsychopathic counterparts (Allely & Cooke, 2016). Due to the high rate of criminal

behavior in the ADHD population, it is possible that there is a greater link between ADHD and psychopathy (Cooke & Michie, 2001).

The research to date has supported this relationship in the criminal population; however, as it has been determined that there are both psychopathic individuals and individuals with ADHD in the general population, there has been little research addressing the relationship among the general adult population (Allely & Cooke, 2016). The purpose of this research was to explore to what degree a relationship exists between ADHD traits and pscyhoapthic traits for adults who have been diagnosed with ADHD in the general population.

The following sections of this chapter include information on the theoretical foundations for this research: The hunter-farmer theory of ADHD and genetic and environmental theory of ADHD. Additionally, this chapter will explore research on ADHD characteristics, diagnosis, and causes, as well as psychopathy characteristics, diagnosis, and causes. Finally, this chapter will explore research on criminal behavior and the relationship between ADHD, psychopathy, and criminality.

Literature Search Strategy

The focus of the literature review is on the concepts central to the research purpose, problem, and questions: psychopathy, ADHD, criminality, and the general adult population with ADHD. There was a focus on both psychopathy in the general population and ADHD in the general population, as well as ADHD in relation to psychopathy. Included in this review are the different definitions provided by different researchers, with an emphasis on Hare's (2006) definition of psychopathy.

The literature base selected for the current study consisted of studies published between 1950 and 2018 in journal articles and texts related to psychopathy, ADHD, and adults with ADHD. Several online search engines and databases were used, including Google Scholar, Science Direct, EBSCOhost, New England Journal of Medicine, APA PsychNET, PubMed, SAGE Journals, ResearchGate, and Springer. Some of the key words used in the search included Boolean combinations *of attention deficit hyperactivity disorder (ADHD)*, *psychopathy*, *impulsivity*, *adult ADHD*, *recidivism*, and *criminal activity*.

Theoretical Foundations

Hunter-Farmer Theory of ADHD (Evolutionary)

Researchers are interested in gaining a better understanding of what is contributing to the increased prevalence of ADHD. It is estimated that roughly 7.2% of children under the age of 18 and 3.4% of adults age 18 and older currently have ADHD (Children and Adults with Attention-Deficit/Hyperactivity Disorder, 2018). The prevalence of ADHD is greater in boys than in girls (13.3% versus 5.6%, respectively) and non-Hispanic White ethnicities more than non-Hispanic Black and Hispanic ethnicities (11.5% versus 8.9% and 6.3%, respectively; Children and Adults with Attention-Deficit/Hyperactivity Disorder, 2018). Many evolutionary theories exist regarding the increases in ADHD. However, one theory, in particular, provides a sound evolutionary perspective as to why we see this large increase in ADHD diagnoses; this theory is Hartmann's (2016) hunter-farmer theory of ADHD.

According to Hartmann (2106) and the development of his theory, ADHD is based on a set of symptoms that typically interfere in people's daily lives. The symptomology listed in the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) is often the deciding criteria for

ADHD diagnosis (American Psychiatric Association, 2013). For a positive diagnosis, children under 17 need to have at least six or more symptoms (Hartmann, 2016). Many of the diagnostic criterion apply to children and need to be present in the child before the age of 12 (National Resource Center on ADHD, 2017). This means that there is very little information focusing on adults with ADHD (Hartmann, 2016). However, more than three-quarters of children who were diagnosed with ADHD in childhood still experience symptoms in adulthood (Brown, 2013).

There are three different presentations ADHD. These typical presentations of ADHD include behaviors considered to be (a) inattentive, (b) hyperactive-impulsive, and (c) combined inattentive and hyperactive-impulsive (American Psychiatric Association, 2013). Each one of these presentations has a set of different symptoms or characteristics used for diagnosis (Hartmann, 2016). These presentations, according to Hartmann (2016), can change throughout life. For example, an individual can present as hyperactive-impulsive as a child, but as they age and mature, can move towards the inattentive presentation (Hartmann, 2016). Hartmann stated that when looking from an evolutionary perspective, the characteristics that are currently used to diagnose ADHD could be important survival skills for an individual in a hunting society.

For a hunter to be successful out in the wild, certain characteristics are needed. These characteristics include being easily distracted, constantly scanning the environment for threats or prey, juggling many tasks at once, and feeling unafraid of taking risks (Hartmann, 2016). The hunter must think quickly in all situations and make split-second decisions (Hartmann, 2016). The hunter thrives on the adrenaline rush of the hunt; however, if forced to do boring or mundane tasks, the hunter will typically procrastinate (Hartmann, 2016). When reviewing these characteristics, it would be easy to classify them in reference to ADHD symptoms. Most

individuals with ADHD are easily distracted, inattentive, impulsive, and enjoy taking risks, all characteristics of a successful hunter (Conrad & Potter, 2000; Hartmann, 2016).

As society has shifted from hunter to agricultural, the proportion of hunters within the population started to dwindle (Hartmann, 2016). Farmers required a completely different set of characteristics, which were the opposite of those necessary for the hunters (Hartmann, 2016). As the population of the farmers increased, so did the genetics necessary for the farmer characteristics, and subsequently the numbers of individuals with the hunter characteristics diminished (Hartmann, 2016). Hartmann (2016) stated that the 5 to 20% of the population who are currently diagnosed with ADHD are the remaining ancestors to the hunters. Because current society does not have a need for hunters, these characteristics become more obvious through a specific set of behaviors (inattention, impulsivity, hyperactivity). These behaviors can be disruptive, and, therefore are often much more evident and easily diagnosed as ADHD. Hartmann believed that this is why there is influx in ADHD diagnosis as these genetic predispositions for hunters create characteristics that the current society identifies as inappropriate and unruly.

Genetic and Environmental Theory of ADHD

The evolutionary theory of ADHD is important to understand; however, it is also necessary to look at possible genetic and environmental contributors to the development of ADHD. Amen (2018) was a proponent of the genetic theories of ADHD development. While Amen stated that maternal use of drugs or alcohol, trauma during birth, infection, and head trauma can all contribute to the development of ADHD, genetics also play a large role. In fact, several twin and family studies have shown the heritability of ADHD (Brikell, Kuja-Halkola, &

Larsson, 2015; Faraone & Larsson, 2018). The available data suggest that ADHD is has a genetic link, meaning that a parent often passes it to their child, and there is evidence to suggest that it often runs in families (Frye & Silver, 2017). Children with ADHD are four times more likely to have a family member who also has ADHD, and if the child's father had ADHD when he was a child, that child is three time more likely to also have ADHD (Frye & Silver, 2017).

Several genes have been implicated as being responsible for the common symptoms associated with ADHD (hyperactivity, impulsivity, and inattention). The genetic susceptibility is related to both common and rare variants of different genes related to neurotransmitters and neurodevelopmental pathways (Akutagava-Martins, Rohde, & Hutz, 2016). The most researched genes are the DRD_4, DRD_5, and dopamine transporter (DAT1; Faraone & Larsson, 2018; Qian et al., 2018). DRD_4 is the gene that regulates the efficiency of the dopamine pathways in the brain (Faraone & Larsson, 2018; Qian et al., 2018). This gene has been the most studied gene in relationship to ADHD (Banaschewski, Becker, Scherag, Franke, & Coghill, 2010). In fact, a meta-analysis conducted on more than 30 studies identified the DRD_4 gene as the most significant for increasing the risk of ADHD (Banaschewski et al., 2010).

Another dopamine receptor gene studied for its influence on ADHD is DRD_5 (Faraone & Larsson, 2018; Klein et al., 2016). While this gene is implicated in childhood and adolescent development of ADHD, it seems to be less identified in adult ADHD (Banaschewski et al., 2010; Klein et al., 2016). Studies of twins have also indicated that the DRD_5 gene contribution to ADHD symptoms differs by age (Pingault et al., 2015).

A third dopamine transporter associated with the development of ADHD is DAT1. There have been many studies identifying a positive association with DAT1 and ADHD (Faraone &

Larsson, 2018). This particular transporter is the direct target of the stimulant medications most commonly prescribed for the treatment of the symptoms of ADHD (Franke et al., 2010). Some data may also suggest that DAT1 had more of a modulatory effect rather than a causative role in ADHD development (Franke et al., 2010).

The reason these three specific genetic components are so important when looking at the development of ADHD and its symptoms all boils down to the neurotransmitter dopamine. Dopamine is an important neurotransmitter in the brain. Its main function is to control locomotion, learning, working memory, cognition, and emotion (Drozak & Bryla, 2005). Depending on what portion of the brain dopamine exerts its effects, different symptoms can be presented (Frye & Silver, 2017). For instance, a deficiency of dopamine in the frontal cortex of the brain results in inattention and problems with organization (Frye & Silver, 2017). However, a deficiency of dopamine in the deeper limbic system of the brain may also result in inattention, but also restlessness and emotional volatility (Frye & Silver, 2017). The basal ganglia and the reticular activating systems of the brain impact impulsivity and hyperactivity when dopamine is deficient (Frye & Silver, 2017).

In addition to genetic factors, the prenatal environment can also impact the development of ADHD. Some of the more common prenatal environmental factors include maternal use of drugs, alcohol, or nicotine during pregnancy (Marceau et al., 2018; Mick et al., 2002; Ware et al., 2013). Several studies indicate the relationship between prenatal nicotine exposure and an increase in hyperactivity in offspring (de Zeeuw et al., 2012; Marceau et al., 2018; Linnet et al., 2003). In fact, Marceau et al. (2018) found that smoking during pregnancy had an impact on both

hyperactivity and impulsivity. Interestingly enough, postpartum smoking did not affect ADHD development; only prenatal nicotine exposure (Linnet, et al., 2003).

When looking at prenatal alcohol consumption, the findings are quite similar to those of nicotine exposure. Several studies link prenatal alcohol consumption with an increase in ADHD (de Zeeuw et al., 2012; Linnet et al., 2003; Ware et al., 2013). One case study showed that children of mothers who used alcohol while pregnant were twice as likely to have ADHD regardless of the gender of the child (Linnet, et al., 2003). While the relationship between prenatal drug use and ADHD is a little more difficult to determine, there is evidence to suggest that illicit drug use during pregnancy does affect the development of ADHD (Mick et al., 2002). Understanding the role of genetics and the prenatal environment in the development of ADHD is important to understanding how ADHD symptoms can further impact psychopathy and criminality.

Key Variables/Concepts

Attention Deficit Hyperactivity Disorder (ADHD)

The prevalence of ADHD is increasing, and many statistical agencies report steady and consistent increases of ADHD over the past 20 years (Centers for Disease Control and Prevention, 2018a; Children and Adults with Attention-Deficit/Hyperactivity Disorder, 2018). The research on ADHD has steadily increased and this research has changed over time (Centers for Disease Control and Prevention, 2018a; Mahone & Denckla, 2017). A search of the Walden University library using the keyword ADHD, yielded over 145,00 results with more than half of those results dated 2013 to present.

When using the Walden University Library to investigate the earlier research on ADHD from years 1931-1980, the focus is on discrimination, diagnosis, characteristics, treatments, learning challenges, and possible genetic explanations. When looking at the research from the last five years (2013-2019), the focus has evolved to topics such as entrepreneurship, mindfulness, neuroscientific theories, and specific genetic markers of ADHD. Also notable is an increase in research focused on violence, attachments, and comorbid disorders (Crane, Hawes, Devine, & Easton, 2014; Moore et al., 2016; Storebo, Rasmussen, & Simonsen, 2016). Research now also includes adolescents and adults much more frequently than what was seen in the earlier research (Montejano et al., 2011). Additionally, more research is being done on the different assessments used to diagnose individuals in different age groups and changes to the criteria used to diagnose ADHD (Centers for Disease Control and Prevention, 2018a; Mahone & Denckla, 2017). This shift has shown an increased interest in the disorder and a greater need to understand the long-term implications it brings.

ADHD Characteristics and Diagnosis

When searching any of the literature dealing with ADHD, the information is consistent; ADHD has a set of characteristics that are very constant regardless of the assessment used (Hartmann, 2016). These characteristics are used to diagnose ADHD and can be found in the American Psychiatric Association's (2103) DSM-5. In making the diagnosis, children still should have six or more symptoms of the disorder. In people 17 and older the DSM-5 states they should have at least five symptoms (American Psychiatric Association, 2013).

The DSM-V (American Psychiatric Association, 2013) includes the following criteria of symptoms for a diagnosis of ADHD. The inattention presentation includes symptoms such as:

fails to give close attention to details or make careless mistakes, has difficulty sustaining attention, does not appear to listen, struggles to follow through on instructions, has difficulty with organization, avoids or dislikes tasks requiring a lot of thinking, loses things, is easily distracted, and is forgetful in daily activities (American Psychiatric Association, 2013). The hyperactive-impulsive presentation includes symptoms such as: fidgets with hand or feet or squirms in chair, has difficulty remaining seated, runs about or climbs excessively in children; extreme restlessness in adults, difficulty engaging in activities quietly, acts as if driven by a motor; adults will often feel inside like they were driven by a motor, and talks excessively (American Psychiatric Association, 2013). The combined inattentive and hyperactive-impulsive presentation has combined symptoms from both of the presentations (American Psychiatric Association, 2013, pp. 59-60).

These characteristics of ADHD in the DSM-V are what are currently being used to identify ADHD in children, adolescents, and adults and are important in understanding the depth of the disorder (Hartmann, 2016). Many researchers are also focused on what actually causes ADHD; however, there is not a consensus on one particular origin (Frye & Silver, 2017).

Causes of ADHD

Research has recently shown an increased focus on the causes of growth in ADHD diagnoses (Mahone & Denckla, 2017). There are a variety of different theories from specific genetic abnormalities and trends in ethnicities, to maternal prenatal lifestyle habits (Amen, 2018; Collins & Cleary, 2016; Frye & Silver, 2017; Qian et al., 2018). While it is difficult to pinpoint one exact cause, many researchers believe that a combination of both biological/genetic and

environmental factors converge to increase the likelihood of ADHD development (Brikell, Kuja-Halkola, & Larsson, 2015; Thapar, Cooper, Eyre, & Langley, 2013).

History of ADHD and the Genetic Causes

The first time ADHD was ever discussed in the literature was in 1798 by Sir Alexander Crichton (Lange et al., 2010). Crichton believed, from his observations, that ADHD was something children were born with; however, the disorder eventually diminishes with age (Lange et al., 2010). We now know, from expanding research on the subject of ADHD, that approximately 50% of children who were originally diagnosed with ADHD in childhood retain the symptoms of ADHD into adulthood (Lange et al., 2010). Notably, even back then, Crichton believed that ADHD stemmed from biological or genetic factors.

Current research has implicated several genes as the cause of ADHD (Banaschewski et al., 2010; Frye & Silver, 2017; Qian et al., 2018; Williams & Taylor, 2006). The most common genes studied with the most evidence linking them to ADHD are DRD_4, DRD_5, and DAT1 (Kollins & Adcock, 2014; Thapar, Cooper, Eyre, & Langley, 2013). As discussed prior, all of these genes are linked to the neurotransmitter dopamine (Qian et al., 2018). Doapmine controls movement, learning, working memory, cognition, emotion, self-regulation, and impulse control (Drozak & Bryla, 2005; Qian et al., 2018). These executive functions are often impaired in ADHD, which is why the link between ADHD and dopamine has been established (Qian et al., 2018).

This genetic link also relates back to parental DNA. When looking at multiple research studies, it has been determined that the heritability of ADHD is somewhere between 77-88% (Faraone & Larsson, 2018; Franke et al., 2012). Franke et al. (2012) were also able to show that

there are increased rates of ADHD (57%) among the children of adults with ADHD. In fact, what can be seen in these types of genetic research studies is that the risk for ADHD is much higher among immediate family members with ADHD if that individual had ADHD in childhood or adolescence (Franke et al., 2012). In particular, it has been shown that if the father has ADHD, it is much more likely that the child will also have ADHD as well (Grisolano, 2013).

Environmental (Maternal) Factors in ADHD

While it is recognized that paternal DNA can influence the development of ADHD, especially if the father also has ADHD, maternal prenatal lifestyle factors have also been shown to factor into the development of ADHD in children (Grisolano, 2013). There are several maternal lifestyle factors that have been shown to contribute to the development of ADHD in children (Linnet et al., 2003). Of those, this research focused on maternal smoking, maternal alcohol consumption, and maternal drug use during pregnancy.

Maternal smoking intensifies the risk for a variety of health issues including increases in infant death rates, preterm birth, low birth weight, and poor intrauterine growth and development (Wehby et al., 2011). In addition to affecting growth and birth weight, it has also been shown that smoking during pregnancy increases the risks for neurodevelopmental disorders, such as ADHD (Marceau et al., 2018; Wehby et al., 2011). Studies have reported that smoking while pregnant actually increases the risk of ADHD in the child by as much as 4.4 times and also decreases IQ by 5 points (Mick, Biederman, Faraone, Sayer, & Kleinman, 2002; Wehby et al., 2011). De Zeeuw et al. (2012) found that one of the reasons nicotine exposure is so detrimental to the developing fetus is that it impacts brain volume. Their study established that children with ADHD, whose mothers smoked during pregnancy, had smaller cerebellum volume compared to

the non-smoking counterparts (de Zeeuw et al., 2012; Krain & Castellanos, 2006). The cerebellum is implicated in ADHD as it works to coordinate movement, but also plays a role in attention (Krain & Castellanos, 2006).

While most people are familiar with fetal alcohol syndrome as being one of the major health consequences of alcohol consumption during pregnancy, maternal alcohol consumption also affects cerebellum volume and the development of ADHD (Mick, Biederman, Faraone, Sayer, & Kleinman, 2002). Alcohol is considered a teratogen, which is defined as an environmental substance known to cause malformations in a developing embryo (O'Neil, 2011). It is speculated that excessive alcohol consumption begins to negatively impact the developing fetus at roughly three weeks gestation, with the most detriment happening after week six of gestation when certain neurological and structural features are starting to develop (O'Neil, 2011). Due to this, it is common to see increases in hyperactivity, cognitive deficits, deficits in adaptive behaviors, and increased risk for psychiatric disorders in those children whose mother's consumed alcohol during the early stages of pregnancy (Mick et al., 2002; Ware et al., 2013). Ware et al. (2013) were also able to show that an astonishing 50-80% of individuals who were exposed to alcohol in utero are estimated to have ADHD. If a woman drinks alcohol while pregnant, the risk of her child having ADHD increased by 1.55 times (Han et al., 2015). Unfortunately, there is no point during pregnancy where alcohol consumption cannot negatively impact the development of the fetus (O'Neil, 2011).

While many studies have focused on maternal nicotine (or cigarette) and alcohol consumption and the relationship to ADHD, very few have looked into maternal drug consumption during pregnancy and its relation to ADHD. One of the difficulties researchers have

found when looking into the negative consequences of drug use during pregnancy, is that most often, when the mother uses illegal drugs, she also uses either alcohol or nicotine making it challenging to extrapolate what negative consequences come from the use of drugs alone (Linnet et al., 2003). What is agreed upon is the fact that substance abuse during pregnancy is a major public health issue (Konijnenberg, 2015). In a 2013 U.S. National Survey on Drug Use and Health, 5.4% of women questioned reported prohibited drug use during pregnancy (Substance Abuse and Mental Health Services Administration, 2014). However, it is speculated that the number of women using illicit drugs is much higher since they often underreport substance use (Konijnenberg, 2015).

Moreover, Hans (1996) concluded that 47% of drug-exposed children met the criteria for at least one neurological disorder including ADHD, conduct and oppositional defiant disorders, autism, and separation anxiety. Substances like opioids have been shown to have long-term central nervous system disruptions, where substances like marijuana have shown more impacts on cognitive functions such as concentration and attention (Konijnenberg, 2015; Noland et al., 2005). Noland et al. (2005) found that preschoolers, who were exposed to cocaine during prenatal development, showed deficits in attention and impulsivity. While it is difficult to pinpoint just one illicit drug and its relationship to ADHD, it is widely accepted that prenatal drug exposure can have severe and very negative neurological effects both on fetal development and long-term neurological functions (Konijnenberg, 2015).

Another drug to consider when investigating environmental causes of ADHD is methamphetamine. Methamphetamine use in the United States has increased over the years. According to the 2012 National Survey on Drug Use and Health, there were approximately 1.2

million people using methamphetamine (National Institute on Health, 2013). It has been reported that there are more methamphetamine users than both cocaine and opiate users combined (LaGasse et al., 2012). While little is known about the affects of prenatal methamphetamine use on the developing fetus and its future behavior, what is known is that women who use methamphetamines during pregnancy have babies who are smaller in weight and length, these babies have neurological and fine motor deficits, and they also have an increased stress level at birth (LaGasse et al., 2012). One study showed that children whose mothers used methamphetamines during pregnancy had increases in emotional reactivity and were both anxious and depressed at young ages (LaGasse et al., 2012). This study also showed that these children began to display ADHD symptoms by age 5 (LaGasse et al., 2012). Unfortunately, many of the women also concurrently were using tobacco and marijuana, and therefore it is difficult to extrapolate that the neurological issues are solely due to the methamphetamine use; although it is definitely a contributing factor (LaGasse et al., 2012).

Psychopathy

In psychiatry, psychopathy was the first recognized personality disorder (Hare, 2006). The term "psychopathic" appeared in German psychiatry around the year 1840 (Horley, 2014). However, its use was very broad. At that time, "psychopathic" was used to describe all types of psychological problems, especially those that were complex and involved many disturbances of mood and thought (Horley, 2014). When it comes to the roots of psychopathy, however, many researchers start with Philippe Pinel, a French psychiatrist from the early 19th-century (Horley, 2014; Perez, 2012).

In the early 1800s, Pinel was the medical director of two French mental institutions (Horley, 2014; Sab, 2001). In his writings, he often referred to a disorder that was characterized as "mania without delusion or psychological disturbance without thought" (Horley, 2014; Perez, 2012; Sab, 2001). These terms are what we would now refer to as "psychopathy" (Horley, 2014). The first individual to actually attribute psychopathy with a defect in morality was Dr. John P. Gray, in 1857 (Horley, 2014). However, Dr. Gray also believed that psychopathic behaviors were all a result of an unknown brain disease (Horley, 2014). These early definitions of psychopathy allow for better understanding of how, over the last few centuries and with more research conducted, the definition of psychopathy has evolved.

The development of modern-day psychopathy can be attributed to many different researchers throughout the world. In the 1930s and 1940s, Sir David Henderson identified three general types of psychopathic tendencies (Horley, 2014; Sab, 2001). He labeled them "predominantly aggressive; predominantly passive/inadequate; and predominantly creative" (Horley, 2014, p. 99). Henderson defined the aggressive type as those who "hurt or kill others or even themselves, with an understanding that suicide [is] an aggressive act" (Horley, 2014, p. 99). He felt the aggressive types often used drugs or alcohol, were more engaged in sexual offenses, and often showed unthinking, manipulative characteristics and were pathological liars (Horley, 2014). The passive (or inadequate) psychopaths were drifters who had no focus or ambitions and did not behave as violently as their aggressive counterparts (Horley, 2014). The passive types, however, possessed the same absent emotion and lack of concern for others, just like the aggressive psychopath (Horley, 2014). The passive types focused their criminal offenses on more petty crimes, such as property crimes or minor social offenses and could easily slip under the

radar of the criminal system (Horley, 2014). The creative psychopathy is the most controversial type. This type of psychopath could easily blend with society, but places great emphasis on their own importance and correctness (Horley, 2014). The creative types can be unstable but are often balancing between psychopath and genius (Horley, 2014).

These definitions intrigued an American psychiatrist, Hervey Cleckley, who took Henderson's types and expanded on their essential characteristics (Hickey, 2016; Horley, 2014; Paulhus & Jones, 2015). He presented 21 basic characteristics common to psychopaths, with many of them focusing on superficial charm, manipulative actions, and antisocial behaviors (Hickey, 2016; Horley, 2014; Perez, 2012). Oddly, Cleckley did not associate psychopathic behaviors with criminality; he felt that criminal behaviors were just a means to an end for those who demonstrate psychopathic characteristics and the punishment of the crime was inconsequential to the psychopathic individual (Horley, 2014; Paulhus & Jones, 2015). Cleckley's publications and explanations of psychopathy were known well beyond the US and caught the eye of a psychologist named Dr. Robert Hare (Horley, 2014). Hare adopted Cleckley's characteristics of psychopathy; however, Hare believed that psychopathy was also related to a neurological issue (Horley, 2014; Perez, 2012).

Dr. Robert Hare, who has studied psychopathy for over 50 years, is considered one of the most acclaimed researchers in the understanding of modern-day psychopathy (Hickey, 2016). Hare believed that approximately 1% of the population currently living in the United States could be classified as psychopaths (Babiak & Hare, 2009; Hickey, 2016). He stated that we can find them in all areas of life, from Wall Street and government to your next-door neighbors (Babiak & Hare, 2009). Regardless of their career choice, Hare stated that because they have no

conscience, they will be involved in things that allow them to control others (Babiak & Hare, 2009). Hare proposed that one of the main reasons why these individuals behave this way is due to a very different brain (Babiak & Hare, 2009). Hare stated, "the brain of a psychopath appears to be under-stimulated compared to that of a normal person" (Hickey, 2016, p. 95). Hare also asserted that psychopathy happens on a spectrum (Babiak & Hare, 2009). This spectrum was uncovered after Hare developed his diagnostic tool, the *Psychopathy Checklist - Revised* (or PCL-R; Hare, 2006; Hickey, 2016).

The PCL-R is a tool used to measure the clinical construct of psychopathy and identify the individual's "level" of psychopathy (Hare, 2006; Hickey, 2016; Perez, 2012). The tool uses a 40-point scale (Hare, 2006; Hickey, 2016). The severity of psychopathy is then determined by where an individual falls on the spectrum of the PCL-R (Hickey, 2016). Someone with a score of 20 on the PCL-R, for instance, is considered more sociopathic (Hickey, 2016; Perez, 2012). Sociopaths demonstrate very different characteristics than psychopaths (Hickey, 2016). A primary, or true psychopath, will score a 30 or higher on the PCL-R and demonstrates a specific set of characteristics (Hickey, 2016). A score of 30 is also what is necessary for a diagnosis of psychopathy (Hare, 2006).

Psychopathy Characteristics

True psychopaths demonstrate a specific group of characteristics that are very different from non-psychopathic criminals. According to Hare, "the psychopath tends to have average to above-average intelligence and is less obvious to the investigator and therapist because psychopaths are less prone to show their antisocial attitudes" (as cited in Hickey, 2016, p. 97).

The main focus of the psychopath is power and control over the victim through whatever means necessary to maintain or improve his or her status (Hickey, 2016).

While psychopaths enjoy controlling others, they also are very antisocial (Hickey, 2016). In relationships, the psychopath rarely feels remorse for any of his or her actions, even if the actions are heinous or cold, the psychopath will show no emotion towards anyone, including family (Perez, 2012). Additionally, the psychopath feeds off the thrill of the hunt, needing to find someone or something to control (Perez, 2012). The psychopath needs to be stimulated, enjoys manipulating others, and has no desire to conform to social norms (Perez, 2012).

The psychopath is extremely impulsive and does not like the mundane (Perez, 2012). They are very self-centered, often aggressive towards others, and will take advantages of opportunities (Perez, 2012). They constantly need to be stimulated, otherwise they become easily bored and they lack patience and often demand instant gratification (Perez, 2012). They would be easily described as thrill-seekers, enjoying the rush from one venture to the next, without regard of the consequences to others (Perez, 2012).

Babiak et al., (2012) describes several characteristics and traits common to psychopaths. Interpersonally, the psychopath is commonly glib with superficial charm, has a grandiose sense of self-worth, is a pathological liar, and is very manipulative (Babiak et al., 2012). The psychopath tends to have a lack of remorse and guilt for their behaviors, they are callous and lack empathy, and fail to accept responsibility for their actions (Babiak et al., 2012). Their lifestyles often include things that stimulate them, are impulsive, irresponsible, and lack realistic goals (Babiak et al., 2012). They often display antisocial behaviors, with behavior problems

demonstrated at a young age (Babiak et al., 2012). They are often juvenile delinquents and become more criminally versatile as they age (Babiak et al., 2012).

In recent literature, psychopathy is considered a personality disorder which presents with deficits in both personality and behavior (Thompson, Ramos, & Willett, 2014). This disorder can have intense effects on individuals, families, and society (Thompson et al., 2014). Since psychopathy is considered a disorder, the DSM provides the diagnostic criteria necessary for correctly identifying this disorder.

Psychopathy and Antisocial Diagnosis - DSM Criteria

The DSM-5 is the gold standard in the United States and in other countries for diagnosing and characterizing mental disorders (Thompson et al., 2014). Psychopathy is considered a personality disorder and the DSM-5 identifies different personality disorders through their characteristics and patterns of activity (Thompson et al., 2014). In the DSM-5, personality disorders are organized into clusters: Cluster A includes paranoid, schizoid, and schizotypal personality disorders; Cluster B includes antisocial, borderline, histrionic and narcissistic personality disorders; and Cluster C includes avoidant, dependent, and obsessive-compulsive personality disorders (American Psychiatric Association, 2013). Psychopathy falls under the umbrella of Cluster B disorders because it is often thought of as a type of antisocial personality disorder (American Psychiatric Association, 2013). Unfortunately, the DSM-5 does not have a specific designation for psychopathy, so most researchers use antisocial personality disorder constructs as the basis for diagnosis (Hickey, 2016). Notably, when psychopathic traits are identified in prisoners, those individuals would also meet the criteria for antisocial personality disorder (Widiger & Crego, 2018). However, in the same setting, only half of the prisoners who

meet the criteria for antisocial personality disorder would also display psychopathic traits (Widiger & Crego, 2018).

When the DSM-5 was in development, the intention was to shift the characteristics of antisocial personality disorder more towards psychopathy, which was evidenced by the fact that it was proposed to adjust the disorder's name from "antisocial personality disorder" to "antisocial/psychopathic personality disorder" (Widiger & Crego, 2018). However, there were some questions as to the reliability and validity of this shift, as it was not directly linked to Hare's PCL-R, and therefore the proposed shift was disregarded (Widiger & Crego, 2018). Instead, it was replaced with a model that hybridized both the traits of antisocial personality disorder with the traits of psychopathy (Widiger & Crego, 2018). These new criteria "consisted of four deficits in self and interpersonal functioning and seven maladaptive personality traits. The seven traits were manipulativeness, deceitfulness, callousness, and hostility from the domain of antagonism, and irresponsibility, impulsivity, and risk-taking form the domain of disinhibition" (Widiger & Crego, 2018, p. 284). The four deficits in self included: Impairments to identity, Self-direction, Empathy, and Intimacy (Crego & Widiger, 2015). A specific set of characteristics were added in to better identify psychopathy, which included boldness, meanness, and disinhibition (Widiger & Crego, 2018).

The American Psychiatric Association's DSM-5 include specific diagnostic criteria for antisocial personality disorder (ASPD). In order for one to be diagnosed with ASPD, they must have a persistent pattern of disregard for and violation of the rights of others, occurring since age 15 years (American Psychiatric Association, 2013). Additionally, the DSM-5 requires the individual to display three (or more) behaviors associated with ASPD. These behaviors include a

failure to conform to social norms with respect to lawful behaviors, as indicated by repeatedly performing acts that are ground for arrest, deceitfulness, as indicated by repeated lying, use of aliases, or conning others for personal profit or pleasure, impulsivity or failure to plan ahead, irritability and aggressiveness, as indicated by repeated physical fights or assaults, reckless disregard for safety or self or others, consistent irresponsibility, as indicated by repeated failure to sustain consistent work behavior or honor financial obligations, and/or a lack of remorse, as indicated by being indifferent to or rationalizing having hurt, mistreated, or stolen from another (American Psychiatric Association, 2013, p. 659). The DSM-5 also requires for diagnosis of ASPD that the occurrence of antisocial behavior is not being experienced only during the course of schizophrenia or bipolar disorder episodes (American Psychiatric Association, 2013).

Psychopathy and Genetic Links - Dopamine Receptors

While there is an awareness of specific traits that are common among diagnosed psychopaths, it is often questioned whether there are genetic factors that are responsible for this disorder (Glenn & Raine, 2014). Over the past several years, many studies have investigated the genetic traits specific to psychopathy (Glenn & Raine, 2014). The general consensus from these studies is that genetic factors account for roughly 40-60% of the difference in psychopathic traits (Glenn & Raine, 2014). It is also interesting to note that these studies have also recognized that the genetic factors are additive, meaning that the more genes a person has that contribute to the development of psychopathy, the more likely the person will develop the disorder (Glenn & Raine, 2014). Additionally, these genetic factors have also shown a contribution to the stability of the psychopathic traits over time, meaning that the psychopathic personality is extremely stable throughout the lifespan (Glenn & Raine, 2014; Loney, Taylor, Butler, & Iacono, 2007).

Many genes have been studied, but the ones that have the strongest implications toward psychopathy include three dopamine genes called DAT1, DRD_2, and DRD_4 (Wu & Barnes, 2013). Dopamine, as discussed in the above section on ADHD genetic causes, is responsible for reward and learning in an individual (Glenn & Raine, 2014). Dopamine exerts its effects primarily on the prefrontal cortex of the brain, which consequently is where the dysfunction is located in individuals who are diagnosed as psychopathic (Perez, 2012). Specific regions of the frontal cortex have shown significant impairment in psychopathic individuals and contributes to the antisocial behaviors of this group (Perez, 2012).

The dopamine receptors DRD_4 and DRD_2 have been shown to be linked to aggressive behavior and psychopathology (Wu & Barnes, 2013). Wu and Barnes (2013) showed that DRD_2 and DRD_4 have both significant and positive correlations with psychopathic personality traits. Since these genes are directly related to the effects of dopamine, it has been shown that they impact impulsivity in both human and non-human subjects (Wu & Barnes, 2013). Ironically, DRD_4 is also highly correlated to the development of ADHD (Banaschewski et al., 2010; Qian et al., 2018).

Studies that evaluate twins and the likelihood of developing psychopathy also confirm a genetic link (Beaver, Rowland, Schwartz, & Nedelec, 2011). However, findings from these studies imply that the significant and positive relationship only relates to the biological father (Beaver, Rowland, Schwartz, & Nedelec, 2011). If the individual has a biological father who is also a criminal the odds of scoring in the top 25% of the psychopathy scale are increased by a factor of about 4.3 (Beaver, Rowland, Schwartz, & Nedelec, 2011). Additionally, if the individual has a biological father who is also a criminal the odds of scoring in the top 10% of the

psychopathy scale were increased by a factor greater than 8.5 (Beaver, Rowland, Schwartz, & Nedelec, 2011).

When looking at the risk of psychopathy in relation to the biological mother, there were no statistically significant findings, eluding to the father being the carrier of the genetic components associated with psychopathy (Beaver, Rowland, Schwartz, & Nedelec, 2011). This also is something shared with ADHD, as the paternal genetic link is highly correlated to the development of ADHD in the child, just as it is with psychopathy (Grisolano, 2013).

Psychopathy and Maternal Links

Since there is such a strong relationship between psychopathy and the biological father's genetics, do prenatal factors (maternal nicotine, maternal alcohol, and maternal drug use) also contribute to the development of psychopathy? As it has been previously determined, roughly 40-60% of psychopathic traits are related to genetics, the remainder can be related back to environmental factors, including prenatal behaviors (Glenn & Raine, 2014).

Research indicates that maternal smoking, or nicotine exposure during pregnancy, is one of the more significant risk factors for delinquent behaviors and conduct disorders in children (Petkovsek, Boutwell, Beaver, & Barnes, 2014). Fowler et al. (2009) showed that, when adjusting for comorbid conduct disorders, total psychopathy scores were associated with maternal nicotine consumption during pregnancy. The researchers also controlled for the mother's own conduct disorder and possible ADHD and found the same result, that smoking during pregnancy increases the total psychopathy score of the child (Fowler et al., 2009). Moreover, mothers who smoked during pregnancy also seemed to demonstrate more antisocial

behaviors, which led investigators to wonder if the smoking interacts with the genetic components to increase the risk for psychopathy in the child (Glenn & Raine, 2014).

Prenatal alcohol exposure has also been linked to behavioral and conduct disorders in children (Petkovsek, Boutwell, Beaver, & Barnes, 2014). This is mostly due to the brain damage that occurs in fetal alcohol syndrome (FAS) and less attributed to psychopathy (Moore & Riley, 2015). Adults with FAS have executive function issues, as well as behavioral problems and conduct issues (Moore & Riley, 2015). When looking at children with conduct disorders, neuroimaging shows that the volume of the frontal and parietal cortex, the basal ganglia, corpus callosum, and cerebellum are all reduced (Moore & Riley, 2015). These same brain regions are also reduced in children with FAS, making is difficult to separate if the behavioral and conduct issues associated with maternal alcohol consumption is due to FAS or another neurological disorder (Moore & Riley, 2015). Fowler et al. (2009) found that maternal alcohol consumption was not significantly associated with psychopathy and emotional dysfunction scores. While alcohol may impact attention, behavior and executive functioning, it may not be directly related to psychopathy (Fowler et al., 2009). However, a study conducted by Glenn and Raine (2014) did indicate that maternal alcohol consumption predisposed individuals to increases in childhood aggression and violent offending in adulthood.

Maternal drug use is even more difficult to pinpoint as a causative factor for psychopathy. Fowler et al. (2009), in their study of psychopathy scores and prenatal factors, stated that illicit drug use was not associated with increases in psychopathy or emotional dysfunction. Even though it is challenging to determine if drug use by the mother can increase the risk for psychopathy in the child, it has been determined that drug use in adolescents does

increase the risk for antisocial personality disorder and other conduct disorders (Trezza, Baarendse, & Vanderschuren, 2014). These different illicit drugs can directly affect the neurotransmitters in the central nervous system, therefore increasing behaviors that are characteristic of both antisocial personality disorder and psychopathy (Trezza, Baarendse, & Vanderschuren, 2014).

Why Psychopathy Matters

From 2013-2017, the violent crime rate rose by 6.8% (Federal Bureau of Investigation, 2017a). Violent crimes include murder and nonnegligent manslaughter, rape, robbery, and aggravated assault (Federal Bureau of Investigation, 2017a). What makes these crimes violent is they involve force or the threat of force (Federal Bureau of Investigation, 2017a).

Identifying psychopathic characteristics in individuals at risk is important as psychopathy is an influential factor for future severe and chronic violent acts (Reidy et al., 2015). The violence that is often associated with a psychopathic individual has a large impact to society, public health, and the criminal justice system (Reidy et al., 2015). Kiehl and Hoffman (2011) estimated that the yearly monetary burden of psychopathy to the criminal justice system averages $460 billion. Since psychopathy has a direct correlation to aggression and violence, it has been shown that psychopathic individuals commit many of heinous and violent acts that result in severe injury or death to the victim (Reidy et al., 2015). Yet, psychopathic individuals also have been found to reenter the criminal justice system more frequently than non-psychopathic offenders (Reidy et al., 2015).

While psychopaths only make up approximately 1% of the total general male population, they disproportionately make up between 15-25% of the males in the North American prison

system (Kiehl & Hoffman, 2011). Kiehl and Hoffman (2011) suggested that "there is no other variable that is more highly correlated to being in prison than psychopathy" (p. 14), further stating that 78% of psychopaths currently in the prison system are there because of violent offenses. Most "career" criminals commit the majority of their crimes during adolescence and early adulthood (Hare, 2001). However, for the psychopathy, the desire to commit violent crimes does not decrease with age, as Hare (2001) suggests that psychopaths continue to engage in both sexual and nonsexual violent crimes despite aging. Hare (2001) also stated that in one study done by the Federal Bureau of Investigation showed that almost 50% of all police officers that are killed on duty are done so by individuals who matched the personality profile of a psychopath.

Unfortunately, the psychopath's initial violent act is just the beginning. It seems as though psychopaths are more likely to reenter the prison system than any other group (Kiehl & Hoffman, 2011; Reidy et al., 2015). A study done by Reidy et al., (2015) showed that more than half of the psychopaths that had been released from prison were rearrested within 9 months of their initial release. In comparison, it takes three years for 67% of the non-psychopathic criminals to return to prison after their release (National Institute of Justice, 2014). Sadly, the psychopath who has been convicted of a crime will be in and out of prison more than three times before the non-psychopath with the same sentence returns (Kiehl & Hoffman, 2011; Reidy et al., 2015). It has also been predicted that the average psychopath will commit at least four violent offenses before the age of 40 (Reidy et al., 2015).

It is evident that the impact of psychopathy on society is of major concern and identifying the risk factors and contributors to the development of psychopathy will only help to alleviate the total monetary burden as well as the impact to the prison system (Reidy et al., 2015). This

knowledge can help deter these at-risk individuals from future violent acts and allow for improvements in earlier interventions (Reidy et al., 2015).

Criminality

Crime can be defined as the conduct or failure to act in violation of the law and for which a range of possible penalties exist upon conviction of that violation (Lynch, Stretesky, & Long, 2015). In using this definition of crime, we can then deduce that criminal behavior is a continued violation of this law and if one is convicted of a crime, they have acted deliberately and without explanation for their behavior (Lynch, Stretesky, & Long, 2015). The question then becomes, are there any unique characteristics that can identify someone who is more likely to commit a crime and if so, what are these characteristics?

In 2018, the Federal Bureau of Investigation (FBI) released the crime statistics for 2017 which was gathered from more than 16,000 law enforcement agencies across the United States. The crimes evaluated include: burglary, larceny theft, motor vehicle theft, violent robbery, aggravated assault, rape, and murder (Federal Bureau of Investigation, 2018).

It is important to evaluate the characteristics of the individuals committing the crimes as well as the types of crimes they are committing in order to better gain a better understanding of criminal behavior. In 2017, throughout the entire United States, law enforcement made over 10,500,000 arrests (Federal Bureau of Investigation, 2017b). Of these, 518,617 were for violent crimes and 1,249,757 were for property crimes (Federal Bureau of Investigation, 2017b). The highest number of arrests in 2017 were for drug abuse violations, driving while intoxicated, and larceny-theft (Federal Bureau of Investigation, 2017b). The FBI also reports that violent crime arrests increased by 0.8% from 2015 to 2017 (Federal Bureau of Investigation, 2018).

When evaluating the demographics of the individuals arrested, 73% of people arrested were male and they committed 79.5% of the violent crimes and 64.2% of the property crimes in 2017 (Federal Bureau of Investigation, 2017b). Additionally, 68.9% of the people arrested were Caucasian, 27.2% were African-American, and the remaining 3.9% were other races (Federal Bureau of Investigation, 2017b). In comparison to the general population, the distribution of races is as follows: 76.6% Caucasian, 13.4% Black, and the remaining 10% are other races (United States Census Bureau, 2017). But, according to Schuessler and Cressley (1950), what people really want to understand is do the people who commit these crimes differ psychologically from those of us who abide by the law?

In 1950, Schuessler and Cressley conducted a study to see if there were differences in the personalities of those individuals who commit crimes versus those who do not. They evaluated 113 personality tests to see if there were some commonalities among those who are criminals, defined in this study as incarcerated persons (Schuessler & Cressley, 1950). While they concluded that using a personality test was not necessarily the best method to identify future criminal activity, they did identify a few characteristics that criminals in their study demonstrated (Schuessler & Cressley, 1950). First, they identified that criminals (and in this case individuals in prison) were more emotionally unstable than the non-criminal counterparts (Schuessler & Cressley, 1950) This could help explain why these individuals are more willing to take the risk of committing a crime and often commit more violent crimes due to the lack of emotional connection (Schuessler & Cressley, 1950). Secondly, they noticed that the temperament of criminals is often different than non-criminals (Schuessler & Cressley, 1950). For the purpose of

this study, temperament relates to carelessness, dependability, overconfidence, and impulsiveness (Schuessler & Cressley, 1950).

While Schuessler and Cressley in 1950 were able to begin the investigation into what personality characteristics are specific to criminals, a more recent study shows that their initial conclusions still remain consistent. Sinha (2016) evaluated the behaviors present in criminals, where criminal is defined as someone who "sees events as external forces and connections, not according to his/her or its own or another's feelings, thoughts, or inner forces. He/she sees people as entities pushed around by forces or who push one another around, in contrast to seeing people as driven to action by their thoughts, as expressing their feelings, or as internally directed" (2016, p. 41). As we evaluate criminals, we need to recognize that their behavior is a direct result of their crime-prone personalities (Sinha, 2016). Sinha (2016) agreed with Schuessler and Cressley's conclusions, stating that criminals tend to be more aggressive, egocentric, and impulsive.

Research suggests that criminals demonstrate specific personality traits (Longato-Stadler, von Knorring, & Hallman, 2009; Sinha, 2016). One study utilized the Karolinska Scales of Personality (KSP), the DSM-IV, and the ICD-10 Personality Disorder Questionnaire (DIP-Q) to conclude that 55% of the 130 male prisoners evaluated showed evidence of a personality disorder (Longato-Stadler et al., 2009). Additionally, the KSP showed high scores in the areas of impulsiveness, sensation-seeking, nervous tension and distress, cognitive-social anxiety, and hostility and aggression (Longato-Stadler et al., 2009). Moreover, researchers noticed very low scores on the socialization scale, which indicates a higher degree of psychopathic personality traits (Longato-Stadler et al., 2009).

While there is not a single personality assessment that can pinpoint criminal tendencies, what is agreed upon in the literature is that the personality characteristics of criminals differ from that of the general population (Sinha, 2016). By knowing and understanding what these traits are, there is a greater opportunity to predict criminal behavior before it happens and interfere in future recidivism (Sinha, 2016). While these studies were reviewing just general criminals and their behaviors, are there specific concerns with individuals who are diagnosed with ADHD?

ADHD and Criminality

It is estimated that roughly 7.2% of children under the age of 18 and 3.4% of adults age 18 and older currently have ADHD (Children and Adults with Attention-Deficit/Hyperactivity Disorder, 2018). However, this number is disproportionately elevated in the prison population. In a meta-analysis of 42 studies done in 15 countries, it was determined that approximately 30.1% of the youth prison population and 26.2% of the adult prison population has ADHD (Cahill et al., 2012; Knecht, de Alvaro, Martinez-Raga, & Balanza-Martinez, 2015; Young et al., 2015). When focused on gender, the prevalence of ADHD is 4:1 in favor of males (Cahill et al., 2012; Young et al., 2015). Another study of 198 prisoners showed that those individuals who were diagnosed with ADHD either as a child or as an adult were more likely to commit violent crimes, use drugs, or be dependent on alcohol (Ginsberg et al. , 2014; Knecht et al., 2015). Compared with control groups, males with ADHD had higher rates of adult arrests (44%), convictions (29%), and incarcerations (26%) (Satterfield et al., 2007).

Regardless of the type of ADHD (hyperactive-impulsive, inattentive, or combined), individuals with ADHD are much more likely to participate in criminal activities than other individuals (Cahill et al., 2012; Dalsgaard, Mortensen, Frydenberg, & Thomsen, 2013; Fletcher

& Wolfe, 2009; Machado et al., 2017). However, when the type of ADHD is accounted for, the individual with the inattentive type of ADHD is more likely to commit every type of crime with the exception of robbery (Fletcher & Wolfe, 2009; Knecht et al., 2015). The inattentive type shows a greater propensity to commit crime, however, this types tends to avoid crimes that take some time and planning, such as selling drugs or burglary (Fletcher & Wolfe, 2009). Individuals who are diagnosed with the hyperactive-impulsive type of ADHD were actually more likely to be arrested and convicted of a crime and they were more likely to participate in impulsive crimes, such as robbery or theft (Fletcher & Wolfe, 2009).

Research has established a clear link between ADHD and criminal behaviors (Dalsgaard et al., 2013; Machado et al., 2017; Lundstrom et al., 2014). A child that is diagnosed with ADHD is at an increased risk for violent criminal behavior as an adolescent or an adult (Lundstrom et al., 2014). Moreover, many of those with ADHD experience their first criminal act at a young age (Machado et al., 2017). It is agreed upon by researchers that the focus for any individual diagnosed with ADHD should be varying intervention strategies to reduce ADHD-related criminal behavior (Knecht et al., 2015; Machado et al., 2017). Not only will this help in future prevention of criminal acts, but will also help decrease recidivism among this group as well (Machado et al., 2017).

Psychopathy and Criminality

Is has been estimated, that at any given time, roughly 1% of the general population fits the criteria for a psychopath (Allely & Cooke, 2016; Hare, 2001; Kiehl & Hoffman, 2011). However, when evaluating the prison population, that number jumps to between 15-25% (Allely & Cooke, 2016; Hare, 2001). Psychopaths are liable for more than 50% of all serious crimes

committed, including embezzlement, assault, extortion, armed robbery, kidnapping, murder, terrorism, and sexual assault (Allely & Cooke, 2016; Hare, 1993). Additionally, psychopaths are approximately 15-25 times more likely to commit a crime that will eventually lead to prison (Kiehl & Hoffman, 2011). Many researches believe that the reasons these numbers are so disproportionately high is due to the characteristics of a psychopath (Hare, 2001). The hallmark features of the disorder include callousness, impulsivity, egocentricity, grandiosity, irresponsibility, as well as lack of empathy, guilt, or remorse (Hare, 2001). These characteristics are ones of individuals who feel capable of committing a criminal act and getting away with it; a common belief of the psychopath (Hare, 2001).

When comparing a psychopathic criminal to a "regular" criminal, there are stark differences (Hare, 2001). The typical "regular" criminal has a short-lived criminal career and often declines in criminal activity as they age (Hare, 2001). However, the psychopathic criminal begins his/her criminal career during adolescence and does not seem to let up as they move through adulthood (Hare, 2001). By the time a psychopathic criminal has reached 35 or 40 years old, their criminal behavior now closely resembles that of the average offender; however, their need to commit violence does not decrease with age and they will still engage in violent and aggressive criminal activities (Hare, 2001; Hare, 1993).

Obviously, this continued violent criminal behavior has a large impact on the criminal justice system (Kiehl & Hoffman, 2011; Olver & Wong, 2015). Approximately 78% of incarcerated psychopaths are there because of a violent offense (Kiehl & Hoffman, 2011). However, there is an interesting twist. Psychopaths are 2.5 times more likely to be conditionally released than their non-psychopathic counterparts (Babiak et al., 2012; Kiehl & Hoffman, 2011).

Many believe that this is due to the charismatic and manipulative nature of the psychopath, that he/she can convince prison officials to release them early due to exemplary behavior (Kiehl & Hoffman, 2011). Unfortunately, this does not mean that the psychopath will not return to prison (Kiehl & Hoffman, 2011). Psychopaths are more likely to recidivate than non-psychopaths (Kiehl & Hoffman, 2011; Laurell & Daderman, 2005).

Nine months after release, more than half of the high scoring psychopaths had been rearrested and reconvicted (Kiehl & Hoffman, 2011; Laurell & Daderman, 2005; Reidy et al., 2015). In comparison, in the general offender population, it takes roughly two years for half of the offenders to be rearrested (United States Sentencing Commission, 2016). Additionally, only one-quarter of the general offenders were reconvicted in comparison to half of the psychopathic offenders (Kiehl & Hoffman, 2011; United States Sentencing Commission, 2016). Unfortunately, the recidivism rates for violent sexual crimes are even more alarming. A study looking at 288 convicted sex offenders found that within the first year of release, approximately 25% of the violent high scoring psychopaths were rearrested, and after seven years 75% of violent high scoring psychopaths had been rearrested for new violent crimes (Kiehl & Hoffman, 2011; Reidy et al., 2015).

It is estimated that the yearly monetary burden of psychopathy to the criminal justice system is close to $460 billion (Kiehl & Hoffman, 2011; Reidy et al., 2015). This estimate includes direct economic costs due to the psychopath's criminal behavior, including lost property, police officers, courtrooms, prosecutors, public defenders, jurors, jails and prisons (Kiehl & Hoffman, 2011). This number, however, does not include hospitalizations and treatment for victims due to emotional suffering (Kiehl & Hoffman, 2011). In comparison, the

annual costs of other conditions (including hospitalization and treatment which is not accounted for in psychopathy) are much less than that of psychopathy; for example, the cost of alcohol and substance abuse is estimated at $329 billion, the cost of obesity is estimated at $200 billion, and the cost of schizophrenia is estimated at $76 billion (Kiehl & Hoffman, 2011; The Economist, 2009; Wu et al., 2005).

This cost and subsequent recidivism rates make psychopathy an important focus in research (Reidy et al., 2015). Researchers agree that one focus needs to be on treatment, as well as early intervention programs, to help alleviate the burden on the prison systems as well as society (Kiehl & Hoffman, 2011; Laurell & Daderman, 2005; Olver & Wong, 2015; Reidy et al., 2015).

The Intersection of ADHD, Psychopathy, and Criminality

Psychopathy and ADHD share many similarities (Allely & Cooke, 2016). Frick, Bodin, and Barry (2000) showed that of samples of children displaying psychopathic traits, more than 80% of them also had ADHD. Eisenbarth et al. (2008) found that in adults with ADHD, the emotional features of psychopathy are not impaired; however, they did find that the behavioral features of psychopathy are present in individuals with ADHD. Colledge and Blair (2001) agreed with Eisenbarth and colleagues, finding that individuals with ADHD and psychopathy share both impulsivity and antisocial traits.

When the research looks at criminal offenders, there is a similar result. Allely and Cooke (2016) stated that “offenders who were psychopathic were three times more likely to receive a diagnosis of ADHD (57%) compared to the non-psychopathic group” (p. 382). One study which evaluated the risk factors for psychopathy among incarcerated adolescents found that ADHD

individually contributed to higher psychopathy scores (Knecht et al., 2015). In a 2007 study conducted by Cooke, Michie and Skeem, they concluded that ADHD was found to have a greater association with the behavioral and affective elements of the PCL-R, which they argue is more in line with true psychopathy.

The subtypes of ADHD also have unique relationships to psychopathy. The hyperactive and impulsive types are more related to antisocial behaviors (Allely & Cooke, 2016). This leads to the conclusion that the hyperactive/impulsive and combination types of ADHD have greater overlap with psychopathy than the inattentive types (Allely & Cooke, 2016). Semiz et al. (2008) agreed with this finding, stating that in their review the combined type of ADHD showed the highest scores for psychopathy. Additionally, Soderstrom et al. (2004) found that ADHD, including hyperactive/impulsive types, were at greater risk for violent recidivism.

Most research to date has focused on the relationship between criminals with both ADHD and psychopathy (Allely & Cooke, 2016; Kiehl & Hoffman, 2011; Machado et al., 2017). While this relationship is important in understanding how the intersection between ADHD and psychopathy drives criminal behavior, the research gap still exists evaluating the relationship between ADHD and psychopathy in the general population (Allely & Cooke, 2016; Machado et al., 2017). Increasing the knowledge of this relationship between ADHD and psychopathy in the general population will help create earlier interventions for individuals who are starting to show features of psychopathy (Allely & Cooke, 2016). It is important to expand the knowledge of how both disorders intersect with one another to help increase the understanding of the developmental processes and environmental exposures that potentially lead to the development of these neurological disorders and potential future criminal behavior (Allely & Cooke, 2016).

Summary

Throughout this literature review the research showed that ADHD and psychopathy share many parallels; from commonalities in diagnostic characteristics, to shared dopamine receptor genes, to comparable prenatal maternal and environmental influences (American Psychiatric Association, 2013; Marceau et al., 2018; Petkovsek et al., 2014; Qian et al., 2018; Wu & Barnes, 2013). The research also showed that these individuals are over-represented in the criminal population (Allely & Cooke, 2016; Reidy et al., 2015; Satterfield et al., 2007; Young et al., 2015). While much is known about the relationship between ADHD and psychopathy in the criminal population, there is a dearth of literature regarding the degree of the relationship within the general population.

Research on the degree of the relationship between ADHD and psychopathy in the general population can be a valuable contribution to the field. This information can help in creating earlier intervention strategies for at risk individuals and recognition of the characteristics reflective of both disorders. Guided by the literature presented within this chapter, Chapter 3 will provide details of the participant sampling, research design, and data collection tools. It will also describe the methodology used to analyze the research questions and ethical considerations to protect the rights of the participants.

Chapter 3: Research Method

Introduction

The purpose of this quantitative correlational research was to evaluate to what degree a relationship exists between ADHD and psychopathic traits for adults who endure significant symptoms of ADHD in the general population. Through a review of the literature on ADHD and psychopathy, a connection between ADHD and psychopathy was established (Allely & Cooke, 2016; Cooke & Michie, 2001; Knecht et al., 2015; Machado et al., 2017). However, the literature has primarily addressed the criminal population (Allely & Cooke, 2016; Machado et al., 2017). Therefore, future research should focus on ADHD and psychopathy in the general (noncriminal) population, which could help to encourage earlier intervention strategies and assist in recognizing the characteristics common to both ADHD and psychopathy.

In this chapter, there will be a discussion of the research design used by this research as well as a thorough description of the population from which the data were gathered. Additionally, this chapter will focus on the methodology used to assess the research questions guiding this study. The instruments utilized to gather data and the data collection and analysis strategies will also be discussed. Finally, this chapter will conclude with a discussion on any threats to validity, as well as ethical considerations.

Research Design and Rationale

This research utilized a quantitative research design. This design is appropriate to see to what degree a relationship exists between ADHD and psychopathic traits for adults who display symptoms of ADHD in the general population. Using a quantitative analysis provided information about the degree of differences between the participants in terms of the

characteristics being measured (herein ADHD, psychopathy, and the maternal variables; Warner, 2013).

A post was distributed to members of three closed, member-only Facebook groups for ADHD and one group for ADHD on Reddit asking for participants to access a link to the survey questionnaire. The survey provided questions from both the BADDS and the CPS assessments. Demographic questions were also added to the survey questionnaire asking the participants their current age, education level, age at diagnosis of ADHD, and whether either of the participant's parents were ever diagnosed with ADHD. A post to the Facebook and Reddit social media groups was used for data collection explained the research. The surveys were self-administered questionnaires accessed via a link to be completed after reviewing a written explanation of the research by the researcher. Both the outcome values of the ADHD scores as measured by the BADDS and the psychopathy scores as measured by the CPS antisocial scale are continuous, making these variables appropriate to see if one has an effect on the other.

The advantage of using this type of design for this study is that because it is not experimental and the research is taking place on real people who endorse symptoms of ADHD, the results can be more applicable to everyday life (see Filipowich, 2018). Additionally, this type of research allows for a determination of both strength and direction of the relationship of the variables, which can help in narrowing down findings for future experimental research designs (Filipowich, 2018). The disadvantage to this type of design is that it can only provide a relationship but cannot show causation or a conclusive reason for the relationship (Filipowich, 2018).

Population

The population for this research was individuals 18 and older who endorse symptoms of ADHD. In general, the number of adults in the United States currently diagnosed with ADHD is approximately 4.4% of the population (National Institute of Mental Health, 2017). The target population from which this sample was drawn was three closed member-only social media groups on Facebook and one group on Reddit specifically targeted to individuals with ADHD. Combined, all four groups had approximately 60,000 members as of May 2019. However, it is important to note that some of these individuals could be members of both social media groups, and, therefore, this might not represent 60,000 unique individuals.

Sampling and Sampling Procedures

A convenience sample was used from the three closed member-only social media groups on Facebook and one group on Reddit. The survey was open to everyone in the group over the age of 18; however, participation was completely voluntary, and no incentive was provided to encourage participation. Facebook and Reddit were appropriate for this because the four groups that were used were rather large (60,000 members combined as of May 2019), which provided a larger sample to be pulled from. Facebook is one of the largest and most popular online social networks, with over 1.4 billion users worldwide (Kosinski, Matz, Gosling, Popov, & Stillwell, 2015). In one more recent report, Hutchinson (2018) stated that Facebook has closer to 2.13 billion users and Reddit has roughly 330 million users. The large amount of traffic daily from its users makes it a superior tool for online survey distribution.

In this research, a correlational analysis was used for RQ1 and a multiple regression analysis for RQ2. To calculate the appropriate sample size for this survey, a multiple regression

sample size calculator was used (see Soper, 2018). Using an anticipated effect size (f^2) of 0.15, a statistical power level of 0.8, a probability level (p) of 0.05, and four predictors, it was estimated that the minimum number of participants should be 84 (see Soper, 2018). The survey remained open until this number was exceeded.

Procedures for Recruitment, Participation, and Data Collection

Three social media groups from Facebook and one group from Reddit were used to recruit participants. The first closed, member-only group on Facebook was titled "Inattentive ADHD/ADD Adult – Info and Support Group" and had approximately 8,900 members as of April 2019. The second closed, member-only group on Facebook was titled "Women with ADD/ADHD," and it had approximately 31,000 members as of April 2019. The third closed, member-only group on Facebook was titled "Adult ADHD/ADD Support Group... By Reach2Change," and it had approximately 5,000 members as of April 2019. The fourth group on Reddit was titled "adhd_anxiety" and had approximately 15,000 members as of May 2019. Approval was received by the group administrators. After gaining this approval, a posting including information about the study and a link to the survey was posted within the groups to recruit potential participants.

Informed consent was provided on the first page of the survey instrument detailing the goal of the research and authorizing consent for gathering information. Informed consent also included contact information for me if the participants had further questions or would like to see the outcome of the research.

Data were collected using a cross-sectional, online, self-administered survey design delivered through Qualtrics. The survey included questions from both the BADDS and CPS

questionnaires as well as the aforementioned demographic questions. If participants decided to exit the survey prior to completion, partial data were not kept nor included in the research. Due to the anonymous nature of the survey provided, if the participant decided after completion of the survey that they wished to no longer be included, it would be impossible to identify that specific individual. No follow up procedures with the participants were necessary after the survey is completed in totality.

Instrumentation

The instruments used were combined into one survey. The published instruments included the BADDS and the CPS. The researcher added additional demographic information.

The first assessment used for this research was the BADDS. The BADDS is a self-report rating scale that measures the symptoms of ADHD (Davenport & Davis, 2011). The scale has been normed for four different age groups: primary/preschool (ages 3-7), school-age children (ages 8-12), adolescents (ages 12-18), and adults (ages 18 and older; Davenport & Davis, 2011).

The BADDS was developed by Brown (Davenport & Davis, 2011). This assessment is a 40-item scale designed for both adolescents and adults that focuses on a range of symptoms for ADHD (Brown, 1996). The items on this assessment are scored on a 4-point scale (0 = *never*, 1 = *once a week or less*, 2= *twice a week*, 3 = *almost daily*; Brown, 1996). The questions are grouped into five clusters: (a) organizing and activating to work, (b) sustaining attention and concentration, (c) sustaining energy and effort, (d) managing affective interference, and (e) using working memory and accessing recall (Brown, 1996). A total score of 55 or greater is considered clinically significant for ADHD symptoms (Brown, 1996).

The reliability and validity of the BADDS has been reviewed. Jennings (2014) reported that the internal consistency of the scale was strong for the clusters, the inattention scores, and total combined scores (range .73-.91). Test-retest reliability, with a time interval of 1 to 4 weeks, was relatively strong (range .45-.69; Jennings, 2014). The BADDS assessment was correlated against the Conners' Adult ADHD Rating Scale (CAARS) assessment for ADHD (Jennings, 2014). It was shown that the BADDS monitoring and self-regulation cluster showed a moderately high correlation to the CAARS inattention and combined totals (coefficients ranged from .68-.82: Jennings, 2014). Additionally, a correlation study conducted by Kooij et al. (2008) showed that the reliabilities of both the CAARS and BADDS were very high. In comparing multiple assessments for ADHD, Kooij et al. (2008) concluded that the CAARS and BADDS were the best assessments to evaluate ADHD symptoms.

The second assessment used for this research was the CPS. This assessment was developed by Carlson in 1982. This assessment is a personality inventory that has shown useful for anyone with behavioral or substance abuse problems (Carlson, 2018). The CPS included four content scales: chemical abuse, thought disturbance, antisocial tendencies, and self-depreciation (Carlson, 2018). These constructs were developed after review of common descriptive phrases and adjectives used to describe incarcerated individuals (Carlson, 1981). Each question in the CPS has a gradation of five levels of applicability of that question to the subject (*never, once in a while, some of the time, most of the time*, and *all of the time*; Carlson, 1981). This allows the respondent to have a variety of responses but does not create difficulty in choosing the most appropriate level (Carlson, 1981).

When developing the CPS, Carlson chose items that had correlations of less than .20 with items from other scales as well as correlations of .50 with other items from this scale (Carlson, 1981). This was done intentionally to maximize internal consistency (Carlson, 1981). More recent data reflect that the internal consistency of the four content scales range from .67 to .82, taken from 206 male respondents (Carlson, 2018). Additionally, the test-retest reliability over 2 weeks ranged from .87 to .92 (Carlson, 2018).

The final component of the survey included demographic information. The demographic information included current age, age at diagnosis of ADHD, education level, and whether the participant's mother or father were ever diagnosed with ADHD. Additionally, the participants were asked if their biological mother used nicotine, alcohol, or illicit drugs while pregnant with them. These questions were added based on the review of the literature and the factors found in the literature that associate with the purpose of the research.

Operationalization of Constructs

There were several variables that were being measured for this research. They included ADHD level (which is gathered using the BADDS), psychopathy level (which is gathered using the CPS Anti-social scale), and whether the participant's mother used nicotine, alcohol, or illicit drugs while pregnant with them. Additional demographic information was gathered. The definition of the variables follows below.

ADHD: ADHD is defined as a disorder of brain development (Moore, Sunjic, Kaye, Archer, & Indig, 2016). Many of the symptoms of ADHD include inattention, hyperactivity, and impulsive behaviors (Moore et al., 2016). This is continuous variable and is measured using the BADDS assessment.

Maternal nicotine usage: This is defined as during the period of pregnancy (approximately 40 weeks), did the mother use nicotine of any kind. Nicotine is defined as use of cigarettes, e-cigarettes, hookah, cigars, nicotine gum, chewing tobacco, and nicotine patches. This is a dichotomous variable. The question will state: Did your mother use nicotine while pregnant with you? 1 = Yes; 2 = No

Mother alcohol usage: This is defined as during the period of pregnancy (approximately 40 weeks), did the mother use alcohol of any kind. Alcohol is defined as any beverage that contains any type of alcohol (beer, wine, spirits, and other drinks). This is a dichotomous variable. The question will state: Did your mother use alcohol while pregnant with you? 1 = Yes; 2 = No

Mother illicit drug usage: This is defined as during the period of pregnancy (approximately 40 weeks), did the mother use illicit drugs of any kind. An illicit drug is defined as cocaine, opioids, heroin, and methamphetamine (Dasgupta, 2017). This is a dichotomous variable. The question will state: Did your mother use any illicit drugs while pregnant with you? 1 = Yes; 2 = No

Psychopathy: Psychopathy is defined by having characteristics of superficial charm, a lack of empathy, a lack of guilt or remorse, being irresponsible and impulsive, being deceitful, and displaying antisocial behaviors (Hare, 2006). This is a continuous variable and is measured using the CPS Anti-social scale.

Data Analysis Plan

The software that was used to conduct the statistical analysis was the Statistical Package for the Social Sciences (SPSS). Once the data were collected, the cleaning and screening

procedures began. This included removing incomplete surveys. An incomplete survey was defined as one where a participant submits data that does not validate (such as an invalid answer), a participant skipped a mandatory field and then does not complete the survey, or the participant abandoned the survey before they complete it. Demographic items were also coded appropriately. For example, gender was coded as 1 = male; 2 = female. The data was also checked for internal consistency using Cronbach's alpha. The aim was for a reliability coefficient of .70 or higher to indicate a high internal consistency.

This study sought to answer the following questions:

RQ1: Do participants who endorse more symptoms of ADHD as measured on the BADDS also endorse more symptoms of psychopathy as measured on the CPS antisocial scale in the general adult population who endure significant symptoms of ADHD?

H_0: Having more symptoms of ADHD as measured on the BADDS does not influence psychopathy scores as measured on the CPS antisocial scale among the general adult population who endures significant symptoms of ADHD.

H_a: Having more symptoms of ADHD as measured on the BADDS does influence psychopathy scores as measured on the CPS antisocial scale among the general adult population.

RQ2: Do participants who endorse significant symptoms of ADHD as measured on the BADDS endorse more symptoms of psychopathy as measured on the CPS antisocial scale when controlling for maternal drug, maternal alcohol, and maternal nicotine exposure?

H_0: Participants who endorse significant symptoms of ADHD as measured on the BADDS endorse less psychopathy as measured on the CPS antisocial scale when controlling for maternal drug, maternal alcohol, and maternal nicotine exposure.

H_a: Participants who endorse significant symptoms of ADHD as measured on the BADDS endorse more psychopathy as measured on the CPS antisocial scale when controlling for maternal drug, maternal alcohol, and maternal nicotine exposure.

The continuous dependent variable was psychopathy, where ADHD degree was the independent variable and maternal drug, maternal alcohol, and maternal nicotine use were the three control variables.

This study utilized a quantitative analysis to explore the relationships between the variables being studied. Due to multiple variables being evaluated, the use of multivariate regression analysis allowed for a greater examination of the multiple types of relationships among these variables (Frankfort-Nachmias & Leon-Guerrero, 2015).

The first research question (RQ1) was addressed using a correlation analysis as there are two continuous variables being evaluated and we are looking at the relationship between the two variables (ADHD and psychopathy). When conducting a correlation, it was important to evaluate the Pearson correlation coefficient (r), as well as the associated p-value. A correlation can take on any value in the range of -1.0 – 1.0 (Kent State University, 2018). The sign on the correlation coefficient will provide information on whether the relationship is positive or negative, as well as how close the coefficient is to (1) will provide the strength of the relationship (Kent State University, 2018). Additionally, the p-value will be reviewed to indicated statistical significance of the variables ($p < .05$).

The second research question (RQ2) was addressed using a multivariate regression analysis with psychopathy being the continuous dependent variable, ADHD degree the independent variable, and three controlled variables (maternal drug, maternal alcohol, or

maternal nicotine exposure). When evaluating the significance of the model, it was important to look at the r^2 and the p-value of the overall model for significance. If it was shown that there is significance of the model ($p < .05$), then it was important to look at the p-value of the main independent variable. In order to determine if the variables have a statistically significant relationship, the p-value should be less than .05 ($p < .05$).

Threats to Validity

External validity was important when conducting quantitative research, as we would like to be able to say that the conclusion made in our research can be generalized to a wider population (Laerd Dissertation, 2012a). Threats to the external validity can greatly reduce the generality of the results (Laerd Dissertation, 2012a). One of the more significant threats to external validity is selection bias (Laerd Dissertation, 2012a). When the population sample does not fully represent the population that the researcher hopes to generalize too, there can be selection bias (Laerd Dissertation, 2012a). Since this research was using people from three Facebook and one Reddit social media groups specifically for ADHD, this selection bias was minimized.

Another threat to external validity has to deal with the individuals who are taking part in the research. Often, if people know that they are taking part in research, the way they answer questions can be different than if they were just being observed in a natural setting (Laerd Dissertation, 2012a). There was a possibility that because the participant knows they are part of a research study, they will answer differently and therefor have a possible impact on the external validity and generalizability of the results (Laerd Dissertation, 2012a). Since it is difficult to

know if the participant is being influenced just by being in a study, this threat to external validity was difficult to address.

A third concern was with pro-social bias. Studies have observed that on social media sites (such as Facebook and Reddit) there is a bias towards posting and reflecting positive emotions and successes (Spottswood & Hancock, 2016). Often people will focus on more positive posts and reflections as opposed to negative in order to preserve relationships and uphold social norms (Spottswood & Hancock, 2016). This may impact the ability of the participant to provide truthful answers in that they fear being judged by the researcher and want to appear "normal".

Internal validity is also important when conducting quantitative research because we want to be able to say that the conclusions made through the research accurately reflect what we are studying (Laerd Dissertation, 2012b). One threat to internal validity was the instrumentation used. In this research, we are utilizing a survey design. While it was intended for the entire survey to take less than 20 minutes, this time frame may be too long for some participants. If this timeframe is too long, participants might just start clicking through and randomly answering questions instead of choosing the most appropriate answer for them. In doing so, the data is not as accurately reflecting the participant's true responses, which in turn can impact internal validity.

Another threat to internal validity is selection bias (Laerd Dissertation, 2012b). The research is utilizing a survey design that was posted within three Facebook social media closed member-only groups and one group on Reddit. The post called for individuals willing to take part in research. Since the participants chose to be a part of the research themselves, this is referred to a self-selection sample (Laerd Dissertation, 2012c). This selection strategy can be a

threat as the individuals choosing to take place in the research are making the actual choice to do so. This eliminated other participants who are not interested in doing research and could skew the results.

Ethical Procedures

Before recruiting began for this research, IRB approval was sought from Walden University. The Walden University IRB approval number was 04-04-19-0573515. This research utilized a survey design. Due to this design, ethical considerations were minimal. It is important however, that there was anonymity and an informed consent (Kelley, Clark, Brown, & Sitzia, 2003). In order to maintain anonymity, no identifying information was gathered with the survey (such as email addresses, IP addresses, or names). All participants had their responses coded and input into SPSS with no identifying information recorded. Additionally, the survey began with a full explanation of the research study as well as an informed consent acceptance box. If the participants chose to not participate in the study, they exited from the survey at any time and no information was kept. The informed consent provided contact information to the principle researcher in the event the participants wished to contact the researcher with further questions or concerns.

Once data was collected, it was input into SPSS for analysis. No identifying information was gathered. The principle researcher has primary access to the data and the data is stored securely. Data was analyzed and discussed solely in this research.

Summary

The purpose of this quantitative research study was to evaluate to what degree a relationship existed between ADHD and psychopathic traits for adults who endure significant

symptoms of ADHD in the general population. This research sought to answer two research questions. The first research question asked: Do participants who endorse more symptoms of ADHD as measured on the BADDS also endorse more symptoms of psychopathy as measured on the CPS Anti-social scale in the general adult population that endure significant symptoms of ADHD? This question was evaluated using Pearson's correlation. The second research question asked: Do participants who endorse significant symptoms of ADHD as measured on the BADDS endorse more symptoms of psychopathy as measured on the CPS Anti-social scale when controlling for maternal drug, maternal alcohol, and maternal nicotine exposure? This question was evaluated using a multivariate regression analysis.

Chapter 4 outlines the analysis of the data collected using both correlation for research question one and multiple regression analysis for research question two. Chapter 5 discusses the interpretation and implications of the results of this analysis.

Chapter 4: Results

Introduction

The purpose of this quantitative correlational research was to evaluate to what degree a relationship exists between ADHD and psychopathic traits for adults who endure significant symptoms of ADHD in the general population. Additionally, this research looked at if maternal prenatal nicotine, alcohol, or drug use influenced the relationship between ADHD and psychopathy. The review of the literature on ADHD and psychopathy showed that a connection between ADHD and psychopathy was established; however, this research was primarily focused on the criminal populations (see Allely & Cooke, 2016; Cooke & Michie, 2001; Knecht et al., 2015; Machado et al., 2017). Therefore, it was concluded that future research should focus on ADHD and psychopathy in the general (noncriminal) population, which could help to encourage earlier intervention strategies and assist in recognizing the characteristics common to both ADHD and psychopathy.

This study sought to answer the following questions:

RQ1: Do participants who endorse more symptoms of ADHD as measured on the BADDS also endorse more symptoms of psychopathy as measured on the CPS antisocial scale in the general adult population who endure significant symptoms of ADHD?

H_0: Having more symptoms of ADHD as measured on the BADDS does not influence psychopathy scores as measured on the CPS antisocial scale among the general adult population who endures significant symptoms of ADHD.

H_a: Having more symptoms of ADHD as measured on the BADDS does influence psychopathy scores as measured on the CPS antisocial scale among the general adult population.

RQ2: Do participants who endorse significant symptoms of ADHD as measured on the BADDS endorse more symptoms of psychopathy as measured on the CPS antisocial scale when controlling for maternal drug, maternal alcohol, and maternal nicotine exposure?

H_0: Participants who endorse significant symptoms of ADHD as measured on the BADDS endorse less psychopathy as measured on the CPS antisocial scale when controlling for maternal drug, maternal alcohol, and maternal nicotine exposure.

H_a: Participants who endorse significant symptoms of ADHD as measured on the BADDS endorse more psychopathy as measured on the CPS antisocial scale when controlling for maternal drug, maternal alcohol, and maternal nicotine exposure.

Data Collection

Three social media groups from Facebook and one group from Reddit were used to recruit participants. The first closed, member-only group on Facebook was titled "Inattentive ADHD/ADD Adult – Info and Support Group" and had approximately 8,900 members as of April 2019. The second closed, member-only group on Facebook was titled "Women with ADD/ADHD," and it had approximately 31,000 members as of April 2019. The third closed, member-only group on Facebook was titled "Adult ADHD/ADD Support Group... By Reach2Change," and it had approximately 5,000 members as of April 2019. The fourth group on Reddit was the subreddit titled "adhd_anxiety," and this group had approximately 15,000 members as of May 2019. Permission was sought by the group administrators or moderators of each group, and once it was granted, the survey link was posted to the group. The survey was active from April 6, 2019 through May 9, 2019, at which point 89 responses were received, and the survey was closed. The survey included both the BADDS and CPS assessment questions and

additional demographic questions, including age, gender, age at ADHD diagnosis, parental ADHD diagnosis, and maternal prenatal nicotine, alcohol, and drug usage.

Sample Demographics

The original sample size for this research using a multiple regression calculator was determined to be a minimum of 84 respondents. The survey was closed after 89 survey responses; however, one survey was found to be incomplete. The total completed number of surveys used for this research was 88. Analysis of the demographic questions revealed that the mean age of the research participants was 32.9 years old (M = 32.9, SD = 10.59), with the ages ranging from 18 to 70 years old (see Table 1). Eight-seven respondents provided a gender; of those, 70 were female (80.5%), 17 were male (19.5%), and one chose to not provide a gender (see Table 2). Of the 88 respondents, 36.4% had some college education, 26.1% had a college degree, 18.2% had a graduate degree, 14.8% had a high school diploma (or equivalent), and 4.5% had a doctoral degree (see Table 2).

When reviewing the descriptive statistics for specific ADHD demographic questions, 85 respondents provided an age at diagnosis. Of those 85, the mean age of ADHD diagnosis was 25.4 years old (M = 25.39, SD = 12.54; see Table 1). Additionally, it was asked if the biological parents were diagnosed with ADHD. Of the 88 responses, 9.1% said their mother was diagnosed with ADHD, 8.0% said their father was diagnosed with ADHD, 2.3% said both biological parents were diagnosed with ADHD, and 80.7% said neither biological parent was diagnosed with ADHD (see Table 2).

The descriptive statistics also provide some basic information about the variables being researched. The independent variable for this research was the level of ADHD as measured by

the BADDS. The BADDS assessment interprets a score of 55 to 120 as highly probably for ADHD (Brown, 1996). Of the 88 respondents, the mean BADDS score was 87.9 (*M* = 87.91, *SD* = 19.32), with a minimum score of 27 and a maximum score of 120 (Table 1). Of all the respondents, roughly 90.9% scored highly probable for ADHD by the BADDS (a score between 55-120). The skewness statistic for the level of ADHD scored by the BADDS was also run, and it was found to be -.789, which indicated that very few people scored low on the ADHD scale, and the scores were not very normally distributed (see Table 1). This lack of normal distribution was anticipated due to the fact that the inclusion criteria required the participants to have symptoms of ADHD.

The dependent variable for this research was psychopathy as measured by the antisocial tendency score on the CPS. The CPS raw scores range from 18 to 59, with any score over 37 representing the 60th percentile and higher for antisocial tendencies (Carlson, 2018). Of the 88 respondents, the mean CPS antisocial score was 28.9 (*M* = 28.98, *SD* = 6.44), with a minimum score of 18 and a maximum score of 53 (see Table 1). Only 9.1% of the respondents fell above the CPS antisocial score of 37, and only one person (1.1%) scored at the high end of the scale (53). This is not uncharacteristic of those who might have psychopathy, as only 1% of the population is thought to score high enough on the scale to be considered psychopathic (see Hare, 2006). The skewness statistic (1.501) also reinforced this trend for lower levels of potential psychopathy (see Table 1). This level of skewness indicated that most people scored very low on this scale, with a few people scoring in the higher ranges.

Table 1

Descriptive Statistics

	Mean	*SD*	Minimum	Maximum	Skewness
Age	32.9	10.59	18	70	.944
Age at diagnosis of ADHD	25.4	12.54	3	50	.140
BADDS level of ADHD	87.9	19.32	27	120	-.798
CPS antisocial score	28.98	6.44	18	53	1.501

The control variables of maternal prenatal nicotine use, alcohol use, and drug use statistics showed that 26.1% of the respondent's mothers used nicotine while pregnant (n = 23 of 88), 9.1% of the respondent's mothers used alcohol while pregnant (n = 8 of 88), and 2.3% of the respondent's mothers used illicit drugs while pregnant n = 2 of 87; see Table 2). Crosstabulations, including Phi values, were run to investigate how related these three control variables are to each other. The crosstabulations showed that there is a relationship among the control variables, but they are not overlapping.

To test for linearity, histograms of all the variables and scatterplots of the independent and dependent variables were conducted and evaluated to ensure that the variables were not overly correlated and that the variables had a linear relationship. The histograms confirmed that there was skewness in the variables with a small number of outliers and the variables were not normally distributed. The scatterplot showed linearity of the two variables.

Table 2
Descriptive Statistics for Gender, Level of Education, Parental Diagnosis of ADHD, and Maternal Use of Drugs, Alcohol, or Nicotine While Pregnant

	Frequency	Valid percent
Gender		
Male	17	19.5
Female	70	80.5
Current level of education		
High school	13	14.8
Some college	32	36.4
College degree	23	26.1
Graduate degree	16	18.2
Doctoral degree	4	4.5
Parental diagnosis of ADHD		
Mother was diagnosed	8	9.1
Father was diagnosed	7	8.0
Both were diagnosed	2	2.3
Neither were diagnosed	71	80.7
Mother used nicotine during pregnancy		
Yes	23	26.1
No	65	73.9
Mother used alcohol during pregnancy		
Yes	8	9.1
No	80	90.9
Mother used drugs during pregnancy		
Yes	2	2.3
No	85	97.7

Results

The first hypothesis for this research was that participants who endorse more symptoms of ADHD as measured on the BADDS also endorse more symptoms of psychopathy as measured on the CPS anti-social scale in the general adult population that endure significant symptoms of ADHD. This initial research question was analyzed using bivariate correlation. Using the Pearson correlation, $r(86) = .117$, $p = .277$ (Table 3). While it is noticeable that there is a weak positive relationship, due to the p-value being greater than .050 the relationship is not statistically significant and therefore we fail to reject the null hypothesis. Therefore, it can be concluded that there is not a statistically significant relationship between having more symptoms of ADHD as measured on the BADDS and psychopathy scores as measured on the CPS anti-social scale among the general adult population that endures significant symptoms of ADHD. It should be noted that there was one noticeable outlier (ID= 12) when the scatterplot was created (Figure 1). The Pearson correlation was rerun excluding this outlier (ID=12); however, the results were still not significant ($r(85) = .167$, $p = .122$) at the $p<.05$ level.

Table 3

Pearson Correlations

	BADDS ADHD score	CPS antisocial score
BADDS ADHD score	1	.117
CPS antisocial score	.117	1

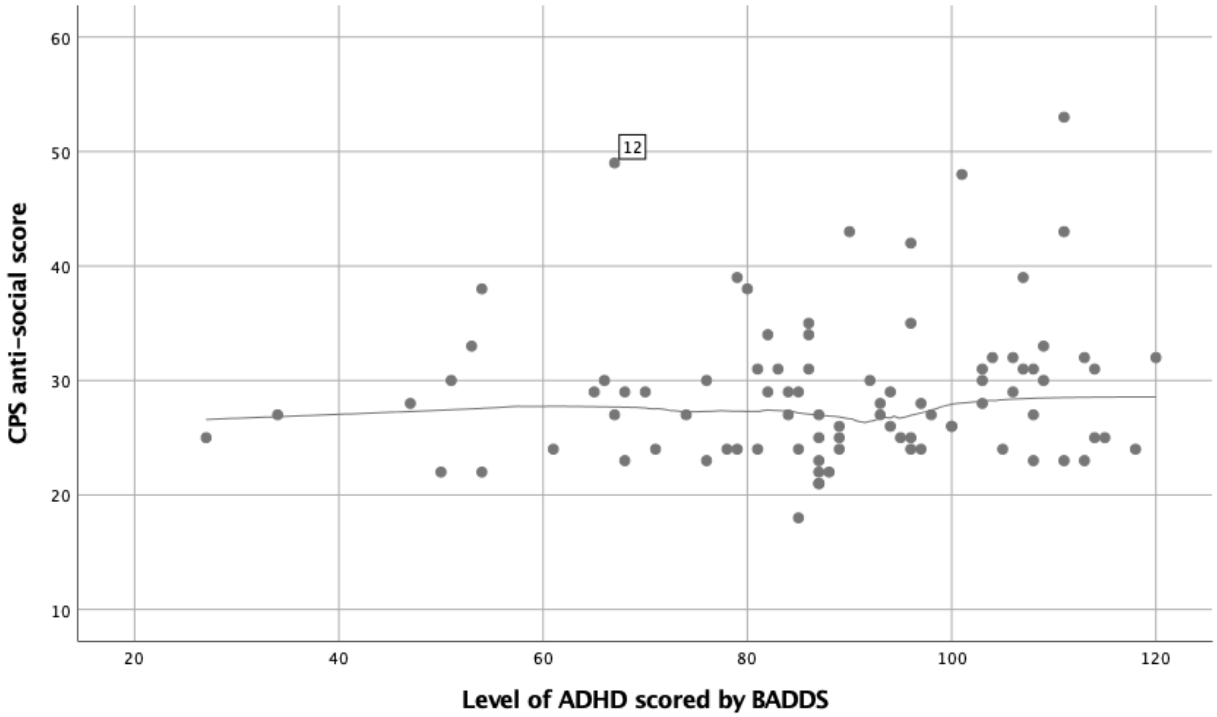

Figure 1. Scatterplot of CPS antisocial score and level of ADHD as measured by BADDS

The second hypothesis for this research was that participants who endorse significant symptoms of ADHD as measured on the BADDS endorse more symptoms of psychopathy as measured on the CPS anti-social scale when controlling for maternal drug, maternal alcohol, and maternal nicotine exposure. The second research question was analyzed using multiple linear regression analysis. The continuous dependent variable was psychopathy as measured by the CPS anti-social score, the independent variable was ADHD level as measured by the BADDS, and the three control variables were maternal nicotine (1 = yes, 2 = no), maternal alcohol (1 = yes, 2 = no), and maternal illicit drug use (1 = yes, 2 = no) during pregnancy. The maternal nicotine, alcohol and illicit drug use variables were re-coded in binary form for the analysis (1= yes, 0=no) and the multiple regression analysis was run.

Multiple regression yields a coefficient of determination (R^2). This variable is used to explain the proportion of variation reflected in the dependent variable that can be explained by two or more independent variables (Frankfort-Nachmias & Leon-Guerrero, 2015). The summary of the regression model shows $R^2 = .035$ (Table 4). Essentially this means that roughly 3.5% of the variability of the respondent's CPS anti-social scores can be explained by the combination of their ADHD scores and if their mother used drugs, alcohol, or nicotine while pregnant. The ANOVA table is analyzed for this model, $F(4, 82) = .743$, $p = .565$, $R^2 = .035$ and it showed that Level of ADHD and mother's use of drugs, alcohol, or nicotine while pregnant are not significantly predictive of psychopathy from CPS anti-social scores (Table 4). Additionally, by looking at the coefficients table (Table 5), it is evident that none of the predictors showed significance and therefore cannot predict level of psychopathy as measured by CPS anti-social scores.

Table 4

Summary of Regression Model

Model	*R*	*R*2	SE of Estimate	*df*	*SS*	*MS*	*F*	*p*
1	0.187	0.035	6.512	4	126.08	31.52	0.743	0.565

Note. Predictors: (Constant), level of ADHD scored by BADDS, Momnicotineyes, Momdrugyes, Momalcoyes

Assumptions were tested to ensure that multicollinearity was not a concern among the variables. Collinearity statistics (VIF) were run to test assumptions for this model (Table 5). VIF is the variance inflation factors and this tells us if there is multicollinearity in the model (O'brien, 2007). Most commonly, VIF levels that are greater than ten indicate severe multicollinearity

(O'brien, 2007). VIF levels for all of the variables are low and therefore there is not a concern with multicollinearity among the variables tested. Additional assumptions were also evaluated. When looking at the casewise diagnostics for this model, there are two outliers who had residuals larger than a value of 3 SD. Case number 12 and case number 37 were the two outliers. Case number 12 had been accounted for in the original correlation and it was shown that by excluding case 12 from the model, the significance was not impacted. Due to these outliers, linearity and homoscedasticity were tested. When this was conducted, there was linearity among the variables; however, the variables failed to meet the assumption of homoscedasticity.

Table 5

Coefficients Summary of Regression

	Unstandardized Coefficients				95% *CI* for B		Collinearity statistics	
Variable	B	*SE*	*t*	*Sig.*	Lower Bound	Upper Bound	Tolerance	VIF
(Constant)	26.190							
Level of ADHD scored by BADDS	0.032	0.037	0.875	0.384	-0.041	0.105	0.979	1.021
Mom used nicotine	-1.054	1.725	-0.611	0.543	-4.486	2.377	0.842	1.188
Mom used alcohol	1.006	2.605	0.386	0.700	-4.176	6.189	0.860	1.163
Mom used drugs	5.979	4.918	1.216	0.228	-3.804	15.762	0.897	1.115

Note. Dependent variable CPS antisocial score; $F(4, 82) = .743$, $p = .565$, $R^2 = .035$

Summary

The results from this analysis showed that neither null hypothesis could be rejected. Essentially, there was not a significant relationship between the variables of ADHD level

measured by BADDS and psychopathy level measured by CPS anti-social scores. Additionally, when the control variables of maternal drug, alcohol, or nicotine use were added, there was still not a significant relationship between the variables.

A discussion of the possible reasons for the results and further identification of limitation to the study that may have contributed to these results is discussed in Chapter 5. The chapter will also provide recommendations for future research and any implications to social change this research may provide.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

The main objective of this research was to determine whether a relationship exists between the level of ADHD as measured by the BAADS assessment and the level of psychopathy as measured by the CPS antisocial scale in the general population. Throughout the literature, there is an abundance of evidence that suggests these ADHD and psychopathy share similar characteristics (Allely & Cooke, 2016; Becker et al., 2013; Retz et al., 2013). Attention deficit hyperactivity disorder is one of the fastest growing mental disorders in the United States and is often accompanied by other disorders and conditions (George Washington University Milken Institute School of Public Health, 2015). Many children who are diagnosed with ADHD also have a behavioral or conduct problem (Centers for Disease Control and Prevention, 2018a).

Not only are the increases of ADHD seen in the general population, they are also being seen in the incarcerated populations. Individuals with ADHD are getting arrested more often, are more frequently convicted of a crime, and are more often incarcerated (Mohr-Jensen & Steinhausen, 2016). In addition to coexisting conduct and behavioral issues, it has also been shown that individuals with ADHD also have poor social adaption, impulsivity, and antisocial behavior (Retz et al., 2013). These characteristics are also seen in psychopathy (Retz et al., 2013).

Previous studies have implicated the similarities between ADHD and psychopathy (Retz et al., 2013). Psychopathic inmates are four times more likely to have a childhood history of hyperactivity-impulsivity-attention problems as well as conduct issues than their nonpsychopathic counterparts (Allely & Cooke, 2016). Because of the increases of ADHD in the

general population, as well as the increases of ADHD in the prison populations, combined with the shared symptomologies, it was hypothesized that these two disorders are related. For these reasons, the purpose of this current study was to establish if a relationship existed between these two variables in the general population and additionally determine if maternal prenatal behaviors (such as smoking, drinking alcohol, or doing drugs) strengthened this relationship. The research findings did not confirm what has been seen in the prison populations and instead suggests that there is not a significant relationship between these two variables, even when including maternal prenatal behaviors. In this chapter, an interpretation of the results as well as limitations to this specific study will be discussed. Recommendations for future research are also discussed, along with implications for social change.

Interpretation of the Findings

A correlational analysis was used to evaluate the relationship between ADHD as scored by the BADDS and psychopathy as scored by the CPS anti-social scale. The results were not in alignment with the results reported in the literature in the prison population. A multiple linear regression was used to evaluate if the mother's use of nicotine, alcohol, or illicit drugs during pregnancy impacted the relationship between ADHD and psychopathy. The results of this analysis were also not in alignment with what is reported in the literature among the prison populations.

Interpretation of Hypothesis 1

RQ1: Do participants who endorse more symptoms of ADHD as measured on the BADDS also endorse more symptoms of psychopathy as measured on the CPS antisocial scale in the general adult population who endure significant symptoms of ADHD?

The results of this analysis showed that there was a weak positive relationship between the variables of ADHD and psychopathy; however, this relationship was not statistically significant. Individuals who endorsed more symptoms of ADHD as measured on the BADDS did not endorse more symptoms of psychopathy as measured on the CPS antisocial scale in the general population studied. These findings were contrary to what the literature suggests regarding ADHD and psychopathy in individuals in the prison population.

The divergence of the findings of this study from the extant literature may be attributed to this study seeking to expand the study population beyond that in which the relationship between ADHD and psychopathy have been previously studied. Allely and Cooke (2016) found that those "offenders who were psychopathic were three times more likely to receive a diagnosis of ADHD (57%) compared to the non-psychopathic group" (p. 382). Knecht et al. (2015) found that incarcerated adolescents who had ADHD were at higher risk for psychopathy. Additionally, researchers have found that hyperactive and impulsive behaviors had a much greater relationship with antisocial behaviors and that the hyperactive/impulsive type of ADHD has greater correlation to psychopathy (Allely & Cooke, 2016). Furthermore, those with ADHD, and hyperactive/impulsive types, specifically, were at greater risk for violent recidivism (Soderstrom et al., 2004). This study was unable to show that this relationship between ADHD and psychopathy could be extrapolated to the general population that was studied.

Interpretation of Hypothesis 2

RQ2: Do participants who endorse significant symptoms of ADHD as measured on the BADDS endorse more symptoms of psychopathy as measured on the CPS antisocial scale when controlling for maternal drug, maternal alcohol, and maternal nicotine exposure?

The results of this analysis showed that a very small percentage of the variability of the score can be explained by the combination of ADHD scores and the mother's use of drugs, alcohol, or nicotine while pregnant. However, this percentage was not statistically significant, and, therefore, the conclusion is that individuals who endorsed more symptoms of ADHD as measured on the BADDS did not endorse more symptoms of psychopathy as measured on the CPS antisocial scale in the general population studied when controlling for maternal nicotine, drug, and alcohol use. The previous literature review showed that maternal prenatal nicotine, alcohol, and drug use does impact levels of ADHD and psychopathy.

The literature suggested that maternal smoking, or nicotine exposure during pregnancy, is one of the more significant contributors of delinquent behaviors and conduct disorders in children (Petkovsek et al., 2014). Fowler et al. (2009) also found that when adjusting for other comorbid disorders, total psychopathy scores were also higher in children of women who smoked while pregnant. Nicotine is not the only substance implicated in increases in these behaviors. Glenn and Raine (2014) showed that women who drank alcohol while pregnant predisposed their children to more aggressive behaviors and violent offending in adulthood. Trezza et al. (2014) showed that illicit drugs can directly impact the neurotransmitters of the developing child and increase the behaviors seen in both antisocial personality disorder and psychopathy. While the literature showed that these maternal behaviors can contribute to higher levels of both ADHD and psychopathy, this was not seen in this analysis.

Limitations of the Study

Several limitations exist within this research and are important to emphasize when attempting to interpret the results. Previously, it was assumed the participants would be truthful

with their answers, specifically in regard to the questions about their parent's history with ADHD and their mother's prenatal behavior. The participants' reports regarding their mother and father were cognitive, and they may not know if either parent had ADHD (unless this was discussed among the family). The participants may also not know exactly what their mother was doing during the prenatal timeframe and may not feel comfortable asking her for the context of this study (or she may not be around to ask). There is no way to validate this information, and, therefore, the information gained from these questions may not be completely accurate.

The questions about the mother's prenatal behaviors only provided a *yes* or *no* answer (there was no *unknown*), and, therefore, this could also have skewed results towards more *no* answers if the actual behavior of the mother was unknown. The results showed only 23 answered *yes* to mother used nicotine while pregnant, eight answered *yes* to mother used alcohol while pregnant, and two answered *yes* to mother used drugs while pregnant. Due to some of these values being very low (alcohol and drugs), it is difficult to confirm that there was a relationship with these values to psychopathy as measured by the CPS antisocial score. A larger sample size might have generated additional examples of positive substance use, therefore increasing the power of the analysis to identify significance. Also, the types of drugs used were not listed out. Researchers have suggested that methamphetamines, cocaine, and marijuana can all impact the developing fetus's brain and impact long-term neurological functioning (Hans, 1996; Konijnenberg, 2015; LaGasse et al., 2012). It would have been beneficial to list out the types of drugs to see if this would have yielded more *yes* answers.

Another limitation to this study was the length of the survey. Combining both the BADDS and the CPS assessments plus the additional demographic questions created a survey

that was roughly 98 questions long and had an estimated completion timeframe of 20 minutes. There are many conversations throughout the literature about what the optimal length of a survey should be, although there is not one consensus. However, most agree that the questionnaire should be as short as possible because the longer the questionnaire is, the more likely people drop out or just not participate (Worthington & Whittaker, 2006).

The length of this study's questionnaire was long for the average person, but factor in that inclusion criteria required the participant must have symptoms of ADHD, and the length of this survey became much too long. Hallmark characteristics of ADHD include a failure to pay close attention to detail, difficulty maintaining attention, struggle to follow through with instructions, being easily distracted, avoidance of tasks that require a lot of thinking, and extreme restlessness (American Psychiatric Association, 2013). All of these common characteristics of someone with ADHD make taking a long survey quite difficult. The length of the survey was mentioned in the recruitment post, which may have deterred participation. Additionally, a concern was that due to the length of the survey, participants may just click through answers to complete it. While there were only a small number of surveys that might be suspicious of this activity, it still could impact how the survey questions were answered.

Using social media was also a limitation to this study. In order to participate, the participants needed to have a computer, a social media account (either Facebook or Reddit), and Internet access. These factors prevented participation from those who did not have these access options. Using social media provided a convenience sample; however, for the future, it might be beneficial to work with a random sample for less bias.

It was difficult to obtain participants for this study. Permission was sought from more than 10 closed Facebook groups specifically for ADHD, with only three groups granting permission to post the study. After 1 month of the survey open on these groups, only half of the required number of participants needed was received. At that time, the IRB application was modified to include posting on Reddit to gain more participation. Two different groups on Reddit were approached for permission, with only one group granting permission to post.

Because the survey was posted in groups specifically for individuals with ADHD, the study was also restricting the range in the analysis. When the range is restricted to people who score higher in ADHD, the degree of the correlation becomes much smaller than if we included people who were not diagnosed with ADHD. Additionally, the participants were disproportionately female. However, when focused on gender, the prevalence of ADHD is 4:1 in favor of males (Cahill et al., 2012; Young et al., 2015). Research suggests that often women are more likely to participate in research than men (Moore & Tarnai, 2002). This skew could also impact results. Additionally, one of the closed Facebook groups that the survey was posted in was titled "Women with ADD/ADHD" which may have increased the number of female participants. Future research may want to look at weighting the data by demographics to see if this impacts the relatioship between the variables.

One of the other limitations is that there were no questions on the survey regarding current medications. Most inividuals who are dealing with ADHD, espeically a long-term diagnosis, are often medicated. Knowing if the participants were medicated may have also provided some insight as to why the scores on the CPS anti-social scale were lower among the group. It is also speculated that those participating within online groups specifically for ADHD

may have had more recent diagnoses and therefore are in these groups to gather more knowledge and information about the disorder. The mean age of diagnosis of ADHD for this group was 25.4, with the mean age of the participant at 32.9, which indicated that these individuals were older when diagnosed and possibly reaching out via social media to better understand their diagnosis and potential options.

A final limitation were the assessments used. While the BADDS provided appropriate information about ADHD level, it was comprised of 40 questions. It was also positioned as the last 40 questions on the survey, which may have impacted results as participants may have just started clicking through to complete the survey. Additionally, while the CPS anti-social tendency score was infomative, it would be interesting to see if using the PCL-R, which is often considered the gold standard psychopathy assessment, would yield a different outcome. Additionally, the entire CPS assessment, including self-depreciation questions, thought disturbance questions, and chemical abuse questions were included in the survey. For the complete CPS assessment, there were 50 questions, which also could have been shortened by including just the anti-social section.

Recommendations

While the research indicates a relationship between ADHD and psychopathy in the prison population, this study did not find the same relationship in the general population. It is important to consider other factors when conducting future research on this topic. Future research should look at using a more random sample and not solely focus on gathering participants from social media. Future research should also look at if there is a more distinct relationship between ADHD and psychopathy when using the PCL-R assessment instead of the CPS. Additionally, it would

be beneficial to get participants who do not have symptoms of ADHD, to see how these different values correlate and if there is more of a pronounced relationship between ADHD and psychopathy. Questions should be added to the demographic information inquiring about current medication use, as well as what types of drugs the mother used while pregnant to gain further clarity on these variables.

Implications

Because of the noted limitations and due to the lack of statistical significance of the findings, the implications are for researchers to continue to explore this relationship utilizing the recommendations for future research directions. However, one of the possible takeaways from this research is that the stereotyping of individuals with ADHD is inappropriate. While there are a percentage of individuals in the prison population with ADHD and psychopathy, this study could not extrapolate this finding to the general population. This indicates that only a small subset of individuals with ADHD are criminals and a much smaller subset of those individuals also would be considered psychopathic. However, often those with ADHD are met with existing stigma about the disease. One of the biggest misconceptions about ADHD is the fact that everyone with it misbehaves (Mueller, Fuermaier, Koerts, & Tucha, 2012). This research shows that this is not necessarily the case, and that while there are those with the disorder that may be inclined towards delinquency, the majority of the general population with ADHD will most likely not commit a crime or end up in prison. This research was important to help change this social stigma and prevent discrimination of this group.

Conclusion

Throughout the literature, it was noted that ADHD and psychopathy share similar characteristics. Additionally, these disorders commonly share neurotransmitter deficits as well as maternal prenatal contributors. When looking at the prison population, those with ADHD often show a tendency towards psychopathy. Both maternal prenatal behaviors and neurotransmitter deficits can exacerbate these tendencies. This study was not able to confirm this relationship in people who endorsed symptoms of ADHD in the general population. In fact, there was not a statistically significant relationship between ADHD and psychopathy, nor a statistically significant relationship between maternal nicotine, alcohol, or drug use and ADHD and psychopathy among the general population. This information can be helpful not only in future research projects, but also to the general population and those that are currently treating individuals with ADHD. Understanding that those with ADHD are not inclined towards anti-social behavior can improve upon the existing stereotypes. However, there is a need for future research with a wider participant pool and inclusion of those not diagnosed with ADHD to better understand the degree of the relationship between these two disorders.

References

Akutagava-Martins, G. C., Rohde, L. A., & Hutz, M. H. (2016). Genetics of attention-deficit/hyperactivity disorder: an update. *Expert Review of Neurotherapeutics, 16*(2), 145-156. doi:10.1586/14737175.2016.1130626

Allely, C. S., & Cooke, D. J. (2016). The relationship between psychopathy traits, attention-deficit/hyperactivity disorder and autism spectrum disorder in forensic populations: A systematic PRISMA review. *Sociology and Anthropology, 4*(5), 380-407. doi:10.13189/sa.2016.040511

Amen, D. (2018). ADD / ADHD. Retrieved from Amen Clinics: https://www.amenclinics.com/conditions/adhd-add/

American Psychiatric Association. (2013). *Diagnostic and Statistical Manual of Mental Disorders (DSM-5)* (Fifth Edition ed.). Arlington, VA: American Psychiatric Association.

Babiak, P., Folino, J., Hancock, J., Hare, R. D., Logan, M., Mayer, E. L., . . . Woodworth, M. (2012). *Psychopathy An Important Forensic Concept for the 21st Century*. Retrieved from FBI: https://leb.fbi.gov/articles/featured-articles/psychopathy-an-important-forensic-concept-for-the-21st-century

Babiak, P., & Hare, R. D. (2009). Snakes in Suits: When Psychopaths Go to Work. New York, NY: HarperCollins Publishers.

Bakhshani, N.-M. (2014). Impulsivity: A Predisposition Toward Risky Behaviors. *International Journal of High Risk Behaviors and Addiction, 3*(2), 1-3. doi:10.5812/ijhrba.20428

Banaschewski, T., Becker, K., Scherag, S., Franke, B., & Coghill, D. (2010). Molecular genetics of attention-deficit/hyperactivity disorder: an overview. *Eur Child Adolesc Psychiatry, 19*, 237-257. doi:10.5812/ijhrba.20428

Beaver, K. M., Rowland, M. W., Schwartz, J. A., & Nedelec, J. L. (2011). The genetic origins of psychopathic personality traits in adult males and females: Results from an adoption-based study. *Journal of Criminal Justice, 39*, 426-432. doi:10.1016/j.jcrimjus.2011.07.002

Becker, S. P., Luebbe, A. M., Fite, P. J., Greening, L., & Stoppelbein, L. (2013). Oppositional defiant disorder symptoms in relation to psychopathic traits and aggression among psychiatrically hospitalized children: ADHD symptoms as a potential moderator. *Aggressive Behavior, 39*, 201-211. doi:10.1002/ab.21471

Brikell, I., Kuja-Halkola, R., & Larsson, H. (2015). Heritability of Attention-Deficit Hyperactivity Disorder in Adults. *American Journal of Medical Genetics, 168*(6), 406-413. doi:10.1002/ajmg.b.32335

Brown, T. (2013). *A New Understanding of ADHD in Children and Adults.* New York, NY: Routledge.

Brown, T. E. (1996). *Brown Attention-Deficit Disorder Scales (Manual).* San Antonio, TX: The Psychological Corporation.

Cahill, B. S., Coolidge, F. L., Segal, D. L., Klebe, K. J., Marle, P. D., & Overmann, K. A. (2012). Prevalence ofADHD and Its Subtypes in Male and Female Adult Prison Inmates. *Behavioral Sciences and the Law, 30*, 154-166. doi:10.1002/bsl.2004

Carlson, K. (1982). *Carlson Psychological Survey*. Retrieved from https://www.ncjrs.gov/App/Publications/abstract.aspx?ID=93489

Carlson, K. A. (1981). A Modern Personality Test for Offenders. *Criminal Justice and Behavior, 8*(2), 182-200. doi:10.1177/009385488100800205

Carlson, K. A. (2018). *Carlson Psychological Survey*. Retrieved from Sigma Assessment Systems: http://www.sigmaassessmentsystems.com/assessments/carlson-psychological-survey/

Carre, J. M., Hyde, L. W., Neumann, C. S., Viding, E., & Hariri, A. R. (2013). The neural signatures of distinct psychopathic traits. *Soial Neuroscience, 8*(2), 122-135. doi: 10.1080/17470919.2012.703623

Centers for Disease Control and Prevention. (2017). Attention-Deficit/Hyperactivity Disorder (ADHD). Retrieved from CDC: https://www.cdc.gov/ncbddd/adhd/data.html

Centers for Disease Control and Prevention. (2018a). *ADHD Data and Statistice*. Retrieved from Centers for Disease Control: https://www.cdc.gov/ncbddd/adhd/data.html

Centers for Disease Control and Prevention. (2018b). *ADHD Throughout the Years*. Retrieved from Centers for Disease Control and Prevention: https://www.cdc.gov/ncbddd/adhd/timeline.html

Children and Adults with Attention-Deficit/Hyperactivity Disorder. (2018). *National Resource Center on ADHD General Prevalence*. Retrieved from CHADD: http://www.chadd.org/understanding-adhd/about-adhd/data-and-statistics/general-prevalence.aspx

Colledge, E., & Blair, R. (2001). The relationship in children between the inattention and impulsivity components of attention deficit hyperactivity disorder and psycopathic tendencies. *Personality and Individual Difference, 30*, 1175-1187. doi:10.1016/S0191-8869(00)00101-X

Collins, K. P., & Cleary, S. D. (2016). Racial and Ethnic Disparities in Parent-Reported Diagnosis of ADHD: National Survey of Children's Health (2003, 2007, and 2011). *The Journal of Clinical Psychiatry, 77*(1), 52-59. doi:10.4088/JCP.14m09364

Conners, C. K., Erhardt, D., & Sparrow, E. (2018). *CAARS Conners' Adult ADHD Rating Scales*. Retrieved from MHS Assessments: https://www.mhs.com/MHS-Assessment?prodname=caars

Conrad, P., & Potter, D. (2000). From Hyperactive Children to ADHD Adults: Observations on the Expansion of Medical Categories. *Society for the Study of Social Problems From, 47*(4), 559-582. doi:10.2307/3097135

Cooke, D., Michie, C., & Skeem, J. (2007). Understanding the structure of the Psychopathy Checklist–Revised An exploration of methodological confusion. *The British Journal of Psychiatry, 190*(49), 39-50. doi:10.1192/bjp.190.5.s39

Cooke, D. J., & Michie, C. (2001). Refining the Construct of Psychopathy: Towards a Hierarchical Model. Psychological Assessment, 13(2), 171-188. doi:0.1037//1040-3590.13.2.171

Crane, C. A., Hawes, S. W., Devine, S., & Easton, C. J. (2014). Axis I Psychopathology and the Perpetration of Intimate Partner Violence. *Journal of Clinical Psychology, 70*(3), 238-247. doi:10.1002/jclp.22013

Crego, C., & Widiger, T. A. (2015). Psychopathy and the DSM. *Journal of Personality, 83*(6), 665-677. doi:10.1111/jopy.12115

Dalsgaard, S., Mortensen, P. B., Frydenberg, M., & Thomsen, P. H. (2013). Long-term criminal outcome of children with attention deficit hyperactivity disorder. *Criminal Behavior and Mental Health, 23*(2), 86-98. doi:10.1002/cbm.1860

Dasgupta, A. (2017). Combined alcohol and drug abuse: A potentially deadly mix. *Alcohol, Drugs, Genes, and the Clinical Laboratory*, 75-88. doi:0.1016/B978-0-12-805455-0.00004-X

Davenport, L., & Davis, A. S. (2011). Brown Attention-Deficit Disorder Scales. In S. Goldstein, & J. A. Naglieri, *Encyclopedia of Child Behavior and Development.* Boston, MA: Springer.

de Zeeuw, P., Zwart, F., Schrama, R., van England, H., & Durston, S. (2012). Prenatal exposure to cigarette smoke or alcohol and cerebellum volume in attention-deficit/hyperactivity disorder and typical development. *Translational Psychiatry*, 1-9. doi:10.1038/tp.2012.12

Drozak, J., & Bryla, J. (2005). Dopamine: not just a neurotransmitter. *Postepy Hig Med Dosw., 59*, 405-420. PMID:16106242

Eisenbarth, H., Alpers, G. W., Conzelmann, A., Jacob, C. P., Weyers, P., & Pauli, P. (2008). Psycopathic traits in adult ADHD patients. *Personality and Individual Differences, 45*, 468-472. doi:10.1016/j.paid.2008.05.022

Faraone, S. V., & Larsson, H. (2018). Genetics of attention deficit hyperactivity disorder. *Molecular Psychiatry*. doi:10.1038/s41380-018-0070-0

Federal Bureau of Investigation. (2017a). *2017 Crime in the United States: Violent Crime*. Retrieved from Federal Bureau of Investigation Uniform Crime Reporting Program: https://ucr.fbi.gov/crime-in-the-u.s/2017/crime-in-the-u.s.-2017/topic-pages/violent-crime

Federal Bureau of Investigation. (2017b). *Persons Arrested*. Retrieved from 2017 Crime in the United States: https://ucr.fbi.gov/crime-in-the-u.s/2017/crime-in-the-u.s.-2017/topic-pages/persons-arrested

Federal Bureau of Investigation. (2018). *2017 Crime Statistics Released*. Retrieved from Ferderal Bureau of Investigation: https://www.fbi.gov/news/stories/2017-crime-statistics-released-092418

Filipowich, M. (2018, June). *What Are the Advantages & Disadvantages of Correlation Research?* Retrieved from Classroom: https://classroom.synonym.com/advantages-disadvantages-correlation-research-8359597.html

Fletcher, J., & Wolfe, B. (2009). Long-term Consequences of Childhood ADHD on Criminal Activities. *The Journal of Metnal Health Policy and Economics*, *12*(3), 119-138. PMID:19996475

Fowler, T., Langley, K., Rice, F., Whittinger, N., Ross, K., van Goozen, S., . . . Thapar, A. (2009). Psychopathy traits in adolescents with childhood attention-deficit hyperactivity disorder. *The British Journal of Psychiatry, 194*, 62-67. doi:10.1192/bjp.bp.107.046870

Franke, B., Vasquez, A. A., Johansson, S., Hoogman, M., Romanos, J., Boreatti-Hummer, A., . . . Gomez-Bar. (2010). Multicenter Analysis of the SLC6A3/DAT1 VNTR Haplotype in Persistent ADHD Suggests Differential Involvement of the Gene in Childhood and Persistent ADHD. *Nueropsychopharmacology, 35*, 656-664. doi:10.1038/npp.2009

Franke, B., Faraone, S. V., Asherson, P., Buitelaar, J., Bau, C. H., Ramos-Quiroga, J. A., . . . Reif, A. (2012). The genetics of attention deficit/hyperactivity disorder in adults, a review. Molecular Psychiatry, 17, 960-987.doi: 10.1038/mp.2011.138

Frankfort-Nachmias, C., & Leon-Guerrero, A. (2015). *Social Statistics for a Diverse Society.* Thousand Oaks, CA: Sage Publications, Inc.

Frick, P., Bodin, S., & Barry, C. (2000). Psychopathic traits and conduct problems in community and clinic-referred samples of children: further development of the psychopathy screening device. *Psychological Assessment., 12*(4), 382-393. doi:10.1037/1040-3590.12.4.382

Frye, D., & Silver, L. (2017). *Is Attention Deficit Disorder (ADHD / ADD) Hereditary? Yes and No*. Retrieved from ADDitude Inside the ADHD Mind: https://www.additudemag.com/is-adhd-hereditary-yes-and-no/

George Washington University Milken Institute School of Public Health. (2015). *New report finds 43 percent increase in ADHD diagnosis for US schoolchildren: Girls showed a sharp rise in ADHD diagnosis during eight-year study period.* Retrieved from George Washington University: https://publichealth.gwu.edu/content/new-report-finds-43-percent-increase-adhd-diagnosis-us-schoolchildren-0

Ginsberg, Y., Langstrom, N., Larsson, H., & Lindefors, N. (2015). Long-Term Treatment Outcome in Adult Male Prisoners With Attention-Deficit/Hyperactivity Disorder: Three-Year Naturalistic Follow-Up of a 52-Week Methylphenidate Trial. *Journal of Clinical Psychopharmacology, 35*(5), 535-543. doi:10.1097/JCP.0000000000000395

Ginsberg, Y., Quintero, J., Anand, E., Asillas, M., & Upadhyaya, H. P. (2014). Underdiagnosis of Attention-Deficit/Hyperactivity Disorder in Adult Patients: A Review of the Literature. *The Primary Care Companion for CNS Disorders, 16*(3). doi:10.4088/PCC.13r01600

Glenn, A. L., & Raine, A. (2014). *Psycopathy An Introduction to Biological Findings and Their Implications.* New York, NY: New York University Press.

Grisolano, L. A. (2013). *It's in the genes:The ADHD connection between father & son*. Retrieved from Transforming Health: http://www.transforminghealth.org/stories/2013/06/its-in-the-genes-the-adhd-connection-between-father-son.php

Han, J.-Y., Kwon, H.-J., Ha, M., Paik, K.-C., Lim, M.-H., Lee, S., . . . Kim, E.-J. (2015). The effects of prenatal exposure to alcohol and environmental tobacco smoke on risk for ADHD: A large population-based study. *Psychiatry Research, 225*(1-2), 164-168. doi:10.1016/j.psychres.2014.11.009

Hans, S. L. (1996). *Prenatal Drug Exposure: Behavioral Functioning in Late Childhood and Adolescence.* Retrieved from Drug Abuse Database: https://archives.drugabuse.gov/sites/default/files/261-276_Hans.pdf

Hare, R. D. (1993). *Without Conscience The Disturbing World of the Psychopaths Among Us.* New York, NY: The Guilford Press.

Hare, R. D. (2001). Psychopaths and their Nature. In A. Raine, & J. Sanmartin (Eds.), *Violence and Psychopathy.* Boston, MA: Springer.

Hare, R. D. (2006). Psychopathy: A clinical and forensic overview. *Psychiatric Clinics of North America, 29,* 709-724. doi:10.1016/j.psc.2006.04.007

Hartmann, T. (2016). *Adult ADHD How to Succeed as a Hunter in a Farmer's World.* Rochester, VT: Park Street Press.

Hickey, E. W. (2016). *Serial Murderes and Thier Victime* (7th ed.). Boston, MA: Cengagae Learning.

Horley, J. (2014). The emergence and development of psychopathy. *History of the Human Sciences, 27*(5), 91-110. doi:10.1177/0952695114541864

Hutchinson, A. (2018). *Reddit Now Has as Many Users as Twitter, and Far Higher Engagement Rates*. Retrieved from Social Media Today: https://www.socialmediatoday.com/news/reddit-now-has-as-many-users-as-twitter-and-far-higher-engagement-rates/521789/

Jennings, K. E. (2014). *Review of the Brown Attention Deficit Disorder Scales for Children and Adolescents.* Mental Measurements Yearbook with Tests in Print.

Kelley, K., Clark, B., Brown, V., & Sitzia, J. (2003). Good practice in the conduct and reporting of survey research. *International Journal for Quality in Health Care, 15*(3), 261-266. doi:10.1093/intqhc/mzg031

Kent State University. (2018). *Pearson Correlation*. Retrieved from SPSS Tutorials: https://libguides.library.kent.edu/SPSS/PearsonCorr

Kiehl, K. A., & Hoffman, M. B. (2011). THE CRIMINAL PSYCHOPATH: HISTORY, NEUROSCIENCE, TREATMENT, AND ECONOMICS. *Jurimetrics, 51*, 355-397. PMID:24944437

Klein, M., Berfer, S., Hoogman, M., Dammers, J., Makkinje, R., Heister, A. J., . . . Ribases, M. (2016). Meta-analysis of the DRD5 VNTR in persistent ADHD. *European Neuropsychopharmacology, 26*, 1527-1532. doi:10.1016/j.euroneuro.2016.06.012

Knecht, C., de Alvaro, R., Martinez-Raga, J., & Balanza-Martinez, V. (2015). Attention-deficit hyperactivity disorder (ADHD), substance use disorders, and criminality: a difficult problem with complex solutions. *International Journal of Adolescent Medicine and Health, 27*(2), 163-175. doi:10.1515/ijamh-2015-5007

Kollins, S. H., & Adcock, R. A. (2014). ADHD, Altered Dopamine Neurotransmission, and Disrupted Reinforcement Processes: Implications for Smoking and Nicotine Dependence. *Prog Neuropsychopharmacol Biol Psychiatry, 3*, 70-78. doi:10.1016/j.pnpbp.2014.02.002

Konijnenberg, C. (2015). Methodological Issues in Assessing the Impact of Prenatal Drug Exposure. *Substance Abuse: Research and Treatment, 9*(S2), 39-44. doi:10.4137/SART.S23544

Kooij, J. S., Boonstra, A. M., 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. Journal of Attention Disorders, 11(4), 445-458.doi: 10.1177/1087054707299367

Kosinski, M., Matz, S. C., Gosling, S. D., Popov, V., & Stillwell, D. (2015). Facebook as a Research Tool for the Social Sciences. *American Psychologist, 70*(6), 543-556. doi:10.1037/a0039210

Krain, A. L., & Castellanos, F. X. (2006). Brain Development and ADHD. *Clinical Psychology Review, 26*, 433-444. doi:10.1016/j.cpr.2006.01.005

Laerd Dissertation. (2012a). *External Validity*. Retrieved from Laerd Dissertation: http://dissertation.laerd.com/external-validity.php

Laerd Dissertation. (2012b). *Internal Validity*. Retrieved from Laerd Dissertation: http://dissertation.laerd.com/internal-validity.php

Laerd Dissertation. (2012c). *Self-selection sampling*. Retrieved from Laerd Dissertation: http://dissertation.laerd.com/self-selection-sampling.php

LaGasse, L. L., Derauf, C., Smith, L. M., Newman, E., Shah, R., Neal, C., . . . Lester, B. M. (2012). Prenatal Methamphetamine Exposure and Childhood Behavior Problems at 3 and 5 Years of Age. *Pediatrics, 129*(4), 681-688. doi:10.1542/peds.2011-2209

Lange, K. W., Riechl, S., Lange, K. M., Tucha, L., & Tucha, O. (2010). The history of attention deficit hyperactivity disorder. *ADHD Atten Def Hyp Disord, 2*, 241-255. doi:10.1007/s12402-010-0045-8

Laurell, J., & Daderman, A. M. (2005). Recidivism is related to psychopathy (PCL-R) in a group of men convicted of homicide. *International Journal of Law and Psychiatry, 28*, 255-268. doi:10.1016/j.ijlp.2004.08.008

Linnet, K. M., Dalsgaard, S., Obel, C., Wisborg, K., Henriksen, T. B., Rodriguez, A., . . . Jarvelin, M.-R. (2003). Maternal Lifestyle Factors in Pregnancy Risk of Attention Deficit Hyperactivity Disorder and Associated Behaviors: Review of the Current Evidence. *Am J Psychiatry, 160*, 1028-1040. doi:10.1176/appi.ajp.160.6.1028

Loney, B. R., Taylor, J., Butler, M. A., & Iacono, W. G. (2007). Adolescent psychopathy features: 6-year temporal stability adn the prediction of externalizing symptoms during the transition to adulthood. *Aggressive Behavior*, 242-252. doi:10.1002/ab.20184

Longato-Stadler, E., von Knorring, L., & Hallman, J. (2009). Mental and personality disorders as well as personality traits in a Swedish male criminal population. *Nordic Journal of Psychiatry*, 137-144. doi:10.1080/08039480275361796

Lundstrom, S., Forsman, M., Larsson, H., Kerekes, N., Serlachius, E., Langstrom, N., & Lichtenstein, P. (2014). Childhood neurodevelopmental disorders and violent criminality: A sibling control study. *Journal of Autism and Developmental Disorders, 44*, 2707-2716. doi:10.1007/s10803-013-1873-0

Lynch, M. J., Stretesky, P. B., & Long, M. A. (2015). Concerning the Definition of Crime . *Defining Crime*, 1-20. doi:10.1057/9781137479358_1

Machado, A., Rafaela, D., Silva, T., Veigas, T., & Cerejeira, J. (2017). ADHD among offenders: Prevalence and relationship with psychopathic traits. *Journal of Attention Disorders*, 1-9. doi:10.1177/1087054717744880

Mahone, E. M., & Denckla, M. B. (2017). Attention-Deficit/Hyperactivity Disorder: A Historical Neuropsychological Perspective. *Journal of the International Neuropsychological Society, 23*, 916-929. doi:10.1017/S1355617717000807

Marceau, K., Bidwell, L. C., Karoly, H. C., Evans, A. S., Todorov, A. A., Palmer, R. H., . . . Knopik, V. S. (2018). Within-Family Effects of Smoking during Pregnancy on ADHD: the Importance of Phenotype. *Journal of Abnormal Child Psychology, 46*(4), 685-699. doi:10.1007/s10802-017-0320-7

Meier, N. M., Perrig, W., & Koenig, T. (2012). Neurophysiological correlates of deliquent behavior in adult subjects with ADHD. *International Journal of Psychophysiology, 84*, 1-16. doi:10.1016/j.ijpsycho.2011.12.011

Mick, E., Biederman, J., Faraone, S., Sayer, J., & Kleinman, S. (2002). Case-control study of attention-deficit hyperactivity disorder and maternal smoking, alcohol use, and drug use during pregnancy. *Journal of the American Academy of Child and Adolescent Psychiatry, 41*(4), 378-385. doi:10.1097/00004583-200204000-00009

Mohr-Jensen, C., & Steinhausen, H.-C. (2016). A meta-analysis and systematic review of the risks associated with childhood attention-deficit hyperactivity disorder on long-term outcome of arrests, convictions, and incarcerations. *Clinical Psychology Review, 48*, 32-42. doi:10.1016/j.cpr.2016.05.002

Montejano, L., Sasane, R., Hodgkins, P., Russo, L., & Huse, D. (2011). Adult ADHD: prevalence of diagnosis in a US population with employer health insurance. *Current Medical Research and Opinion, 27*(sup2), 5-11. doi:10.1185/03007995.2011.603302

Moore, D. L., & Tarnai, J. (2002). Evaluating nonresponse error in mail surveys. In R. M. Groves, D. A. Dillman, J. L. Eltinge, & R. J. Little, *Survey Nonresponse* (pp. 197-211). New York, NY: John Wiley & Sons.

Moore, E. M., & Riley, E. P. (2015). What Happens When Children with Fetal Alcohol Spectrum Disorders Become Adults? *Curr Dev Disord Rep, 2*(3), 219-227. doi:10.1007/s40474-015-0053-7

Moore, E., Sunjic, S., Kaye, S., Archer, V., & Indig, D. (2016). Adult ADHD among NSW prisoners: Prevelance and psychiatric comorbidity. *Journal of Attention Disorders, 20*(11), 958-967. doi:10.1177/1087054713506263

Mueller, A. K., Fuermaier, A. B., Koerts, J., & Tucha, L. (2012). Stigma in attention deficit hyperactivity disorder. *Attention Deficit and Hyperactivity Disorders, 4*(3), 101-114. doi:10.1007/s12402-012-0085-3

National Institute of Justice. (2014). *Recidivism*. Retrieved from National Institute of J Justice: https://www.nij.gov/topics/corrections/recidivism/Pages/welcome.aspx

National Institute of Mental Health. (2017, November). *Attention-Deficit/Hyperactivity Disorder (ADHD)*. Retrieved from National Institute of Mental Health: https://www.nimh.nih.gov/health/statistics/attention-deficit-hyperactivity-disorder-adhd.shtml#part_154905

National Institute on Health. (2013). *Methamphetamine*. Retrieved from National Institiute on Drug Abuse: https://www.drugabuse.gov/publications/research-reports/methamphetamine/what-scope-methamphetamine-abuse-in-united-states

National Resource Center on ADHD. (2017). *About ADHD*. Retrieved from CHADD: http://www.chadd.org/Portals/0/Content/CHADD/NRC/Factsheets/aboutADHD.pdf

Noland, J. S., Singer, L. T., Short, E. J., Minnes, S., Arendt, R. E., Kirchner, H. L., & Bearer, C. (2005). Prenatal drug exposure and selective attention in preschoolers. *Neurotoxicology and Teratology, 27*(3), 429-428. doi:10.1016/j.ntt.2005.02.001

O'brien, R. (2007). A Caution Regarding Rules of Thumb for Variance Inflation Factors. *Quality & Quantity, 41*(5), 673-690. doi:10.1007/s11135-006-9018-6

Olver, M. E., & Wong, S. C. (2015). Short- and Long-Term Recidivism Prediction of the PCL-R and the Effects of Age: A 24-Year Follow-Up. *Personality Disorder: Theory, Research, and Treatment, 6*(1), 97-105. doi:10.1037/per0000095

O'Neil, E. (2011). *Developmental Timeline of Alcohol-Induced Birth Defects* . Retrieved from The Embryo Project Encycopedia: https://embryo.asu.edu/pages/developmental-timeline-alcohol-induced-birth-defects

Paulhus, D. L., & Jones, D. N. (2015). Chapter 20 - Measures of Dark Personalities. In G. J. Boyle, D. H. Saklofske, & G. Matthews (Eds.), *Measures of Personality and Social Psychological Constructs.* San Diego, CA: Elsevier Inc.

Perez, P. R. (2012). The etiology of psychopathy: A neuropsychological perspective. *Aggression and Violent Behavior, 17,* 519-522. doi:10.1016/j.avb.2012.07.006

Petkovsek, M. A., Boutwell, B. B., Beaver, K. M., & Barnes, J. C. (2014). Prenatal smoking and genetic risk: Examining the childhood origins of externalizing behavioral problems. *Social Science & Medicine, 111*, 17-24. doi:10.1016/j.socscimed.2014.03.028

Pingault, J.-B., Viding, E., Galera, C., Greven, C. U., Zheng, Y., Plomin, R., & Rijsdijk, F. (2015). Genetic and Environmental Influences on the Developmental Course of Attention-Deficit/Hyperactivity Disorder Symptoms From Childhood to Adolescence. *JAMA Psychiatry, 72*(7), 651-658. doi:10.1001/jamapsychiatry.2015.0469

Qian, A., Tao, J., Wang, X., Lui, H., Ji, L., Yang, C., . . . Zhao, K. (2018). Effects of the 2-Repeat Allele of the DRD4 Gene on Neural Networks Associated With the Prefrontal Cortex in Children With ADHD. *Frontiers in Human Neuroscience, 12*, 1-12. doi:10.3389/fnhum.2018.00279

Reidy, D. E., Kearns, M. C., DeGue, S., Lilienfeld, S. O., Massetti, G., & Kiehl, K. A. (2015). Why psychopathy matters: Implications for public health and violence prevention. *Aggression and Violent Behavior, 24*, 214-225. doi:10.1016/j.avb.2015.05.018

Retz, W., Boureghda, S. S., Retz-Junginger, P., Philipp-Wiegmann, F., & Rosler, M. (2013). Clinical symptoms of ADHD and psychopathy in perpetrators. *ADHD Attention Deficit and Hyperactivity Disorders, 5*(1), 47-57. doi:10.1007/s12402-012-0095-1

Sab, H. (2001). A History of the Concepts of Abnormal Personality. *International Encyclopedia of the Social and Behavioral Sciences*, 11301-11308.

Satterfield, J. H., Faller, K. J., Crinella, F. M., Schell, A. M., Swanson, J. M., & Homer, L. D. (2007). A 30-year prospective follow-up study of hyperactive boys with conduct problems: Adult ciminality. *Journal of the American Academy of Child & Adolescent Psychiatry, 46*(5), 601-610. doi:10.1097/chi.0b013e318033ff59

Schuessler, K. F., & Cressley, D. R. (1950). Personality Characteristics of Criminal. *American Journal of Sociology, 55*(5), 476-484.

Semiz, U. B., Basoglu, C., Oner, O., Munir, K. M., Ates, A., Algul, A., . . . Cetin, M. (2008). Effects of Diagnostic Comorbidity and Dimensional Symptoms of Attention-Deficit–Hyperactivity Disorder in Men with Antisocial Personality Disorder. *Australian & New Zealand Journal of Psychiatry, 42*(1), 405-413. doi:10.1080/00048670801961099

Sinha, S. (2016). Personality correlates of criminals: A comparative study between normal controls and criminals. *Industrial Psychiatry Journal, 25*(1), 41-46. doi:10.4103/0972-6748.196058

Soderstrom, H., Sjodin, A.-K., Carlstedt, A., & Forsman, A. (2004). Adult psychopathic personality with childhood-onset hyperactivity and conduct disorder: A central problem constellation in forensice psychiatry. *Psychiatry Research, 121,* 271-280. doi:10.1016/S0165-1781(03)00270-1

Soper, D. (2018). *A-priori Sample Size Calculator for Multiple Regression*. Retrieved from Free Statistics Calculator: https://www.danielsoper.com/statcalc/calculator.aspx?id=1

Spottswood, E. L., & Hancock, J. T. (2016). The positivity bias and prosocial deception on facebook. *Computers in Human Behavior, 65*, 252-259. doi:10.1016/j.chb.2016.08.019

Storebo, O. J., Rasmussen, P. D., & Simonsen, E. (2016). Association Between Insecure Attachment and ADHD: Environmental Mediating Factors. *Journal of Attention Disorders, 20*(2), 187-196. doi:10.1177/1087054713501079

Substance Abuse and Mental Health Services Administration. (2014). *Results from the 2013 National Survey on Drug Use and Health: Summary of National Findings.* Rockville, MD: Substance Abuse and Mental Health Services Administration.

Thapar, A., Cooper, M., Eyre, O., & Langley, K. (2013). Practitioner Review: What have we learnt about the causes of ADHD? *Journal of Child Psychology and Psychiatry, 54*(1), 3-16. doi:10.1111/j.1469-7610.2012.02611.x

The Economist. (2009). *Waist Banned*. Retrieved from The Economist: https://www.economist.com/finance-and-economics/2009/07/30/waist-banned

Thomas, E. B. (2018). *Brown ADD Rating Scales for Children, Adolecents and Adults*. Retrieved from Brown ADHD Clinic: http://www.brownadhdclinic.com/assessment-tools/

Thompson, D. F., Ramos, C. L., & Willett, J. K. (2014). Psychopathy: clinical features, developmental basis and therapeutic challenges. *Journal of Clinical Pharmacy and Therapeutics,, 39*, 485-495. doi:10.1111/jcpt.12182

Trezza, V., Baarendse, P. J., & Vanderschuren, L. J. (2014). On the interaction between drugs of abuse and adolescent social behavior. *Psychopharmacology, 231*, 1715-1729. doi:10.1007/s00213-014-3471-z

United States Census Bureau. (2017). *Quick Facts, US Demographics*. Retrieved from United States Census Bureau: https://www.census.gov/quickfacts/fact/table/US/PST045217

United States Sentencing Commission. (2016). *Recidivism Among Federal Offenders: A Comprehensive Overview*. Retrieved from United States Sentencing Commission: https://www.ussc.gov/research/research-reports/recidivism-among-federal-offenders-comprehensive-overview

Ware, A. L., O'Brien, J. W., Crocker , N., Deweese, B. N., Roesch, S. C., Coles, C. D., . . . Mattson, S. N. (2013). The Effects of Prenatal Alcohol Exposure and Attention-Deficit/Hyperactivity Disorder on Psychopathology and Behavior. *Alcoholism: Clinical and Experimental Research, 37*(3), 507-516. doi:10.1111/j.1530-0277.2012.01953.x

Warner, R. M. (2013). *Applied Statistics From Bivariate Through Multivariate Techniques* (2nd ed.). Thousand Oaks, CA: SAGE Publications.

Wehby, G. L., Prater, K., McCarthy, A. M., Castilla, E. E., & Murray, J. C. (2011). The Impact of Maternal Smoking during Pregnancy on Early Child Neurodevelopment. *J Hum Cap, 5*(2), 207-254. doi:10.1086/660885

Widiger, T. A., & Crego, C. (2018). Chapter 12: Pychoapthy and DSM-5 Psychopathology. In C. J. Patrick (Ed.), *Handbook of Psychopathy* (Second ed.). New York, NY: The Guilford Press.

Williams, J., & Taylor, E. (2006). The evolution of hyperactivity, impulsivity and cognitive diversity. *Journal of the Royal Society Interface, 3*, 399-413. doi:10.1098/rsif.2005.0102.

Worthington, R. L., & Whittaker, T. A. (2006). Scale development research: a content analysis and recommendations for best practices. *The Counseling Psychologist, 6*, 806-838. doi: 10.1177/0011000006288127

Wu, E., Bimbaum, H., Shi, L., Ball, D., Kessler, R., Moulis, M., & Aggarwal, J. (2005). The economic burden of schizophrenia in the United States in 2002. *Journal of Clinical Pyschiatry*, 66(9), 1122-1129. PMID:16187769

Wu, T., & Barnes, J. (2013). Two dopamine receptor genes (DRD2 and DRD4) predict psychopathic personality traits in a sample of American adults. *Journal of Criminal Justice, 41,* 188-195. doi:10.1016/j.jcrimjus.2013.02.001

Young, S., Moss, D., Sedgwick, O., Fridman, M., & Hodgkins, P. (2015). A meta-analysis of the prevalence of attention deficit hyperactivity disorder in incarcerated populations. *Psychological Medicine, 45*, 247-258. doi:10.1017/S0033291714000762

Appendix A: Demographic Questions

1. What is your current age?
2. What gender do you identify with?
3. What is your current level of education?
4. At what age were you diagnosed with ADHD?
5. Were either of your biological parents (mother and/or father) diagnosed with ADHD?
6. Did your biological mother use nicotine while she was pregnant with you? (Nicotine is defined as cigarettes, e-cigarettes, hookah, cigars, nicotine gum, chewing tobacco, nicotine patches).
7. Did your biological mother use alcohol while she was pregnant with you? (Alcohol is defined as any beverage that contains any type of alcohol (beer, wine, spirits, and other drinks)).
8. Did your biological mother use illicit drugs while she was pregnant with you? (An illicit drug is defined as cocaine, opioids, heroin, and methamphetamine).

Appendix B: Invitation Posting on Social Media

I am conducting research for my doctoral dissertation that explores the relationship between ADHD and antisocial behaviors. In order to participate, you need to be at least 18 years old and have symptoms of ADHD.

If you would be interested in participating in this research, I would greatly appreciate your response to the following survey. It takes roughly 20 minutes to complete the survey. The link is included below.

Thank you very much!