Perceived Gender Roles and ADHD: An Explanation for the Diagnosis Gap

By

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ABSTRACT

In pursuit of explaining the diagnosis gap, in which more boys are diagnosed with ADHD than girls, two broad schools of thought emerge throughout the literature—one suggests the gap is due to inherent sex differences, and the other attributes the gap to a gender bias in stakeholders' perception and identification of ADHD symptoms. Data supporting inherent sex differences are drawn from flawed and unrepresentative clinic-based studies. As such, discrepancies exist in community samples that suggest girls may be underdiagnosed with ADHD. Several promising studies highlight the validity of a gender bias in ADHD referrals and treatment; however, to date, no known studies explore the specific mechanisms behind this bias. The current study pulls from gender schema theory and social role theory in order to provide a novel interdisciplinary conceptual framework for understanding why stakeholders perceive and attribute the same behaviors differently according to gender. Results were generally inconclusive; however, girls with ADHD were perceived as less feminine by parents than girls without ADHD, and as displaying a narrower range of gender role expression, providing tentative support for the current theoretical framework. Implications call for greater attention and awareness to internal biases that contribute to the undervaluing of girl's and women's health in society.

Perceived Gender Roles and ADHD: An Explanation for the Diagnosis Gap

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CHAPTER I: INTRODUCTION AND LITERATURE REVIEW

Gender researchers, including social role theorists and gender schema theorists, argue that gender differences in behaviors, attitudes, traits, and characteristics are the result of socialization. This socialization process gives rise to gender roles and gender stereotypes. Gender schema theory posits that individuals develop advanced gender schemata based on the socialization of gender to quickly sort through social information, which guides our perceptions and understanding of the world around us (Bem, 1983; Martin & Dinella, 2002). The current paper applies assumptions of gender schema theory and social role theory to explain the mechanisms behind the gender bias that results in more boys being diagnosed with Attention Deficit Hyperactivity Disorder (ADHD) than girls, a finding commonly referred to as the *diagnosis gap*.

Data on ADHD prevalence rates show that the diagnosis gap is less prominent in community-derived samples than in studies conducted on clinic-referred samples (Thapar & Cooper, 2016). In addition, the diagnosis gap narrows when observing those diagnosed in adulthood and is most evident before the age of 18 years old (Meyer et al., 2017; Quinn & Madhoo, 2014). These discrepancies may be explained by the likelihood that children rely on stakeholders to initiate a diagnostic referral, whereas adults likely self-refer. Community-based samples reflecting a narrower diagnosis gap may be a more accurate estimation of ADHD in the population than clinic-based samples due to the fact the community samples do not rely on stakeholders to accurately identify ADHD symptoms and make a subsequent referral.

Several hypotheses exist to explain the gap; most hypotheses appear to fall under one of two different schools of thought. On the one hand, some hypotheses argue that the diagnosis gap is a function of pre-determined causes differentially affecting boys and girls, which I refer to as

essentialist hypotheses. On the other hand, other hypotheses suggest that the diagnosis gap is largely due to a gender bias in the referral process resulting in fewer girls being diagnosed with ADHD than boys, which I refer to as the *female false-negative hypothesis*.

Data exist to support both schools of thought, and, as such, both may be fair and valid explanations for a complex pattern such as the diagnosis gap. However, most data in support of essentialist hypotheses draw from clinic-referred studies, which may reflect gender bias in referrals more so than inherent differences between boys and girls (Mowlem et al., 2019). The narrower diagnosis gap in community-based samples points to the likelihood that more girls are affected by the disorder than are represented in clinic settings. Although prevalence estimates of ADHD are controversial, there does not appear to be sufficient data to support claims that ADHD is overdiagnosed (Sciutto & Eisenberg, 2007).

The diagnosis gap, specifically, through the lens of the female false-negative hypothesis, is critical to study given the historical context of ADHD. The literature on ADHD is fraught with bias; for example, historically, studies were conducted largely with only boys (Mowlem et al., 2019). The disorder was once thought to be a disorder prominently affecting boys, with little regard to empirically studying the disorder in girls (Babinski et al., 2011). The underrepresentation of girls with ADHD is consistent with the large-scale under-representation of girls and women throughout health-care systems and health-related research (Heise et al., 2019). For example, a series of National Health Interview Survey data sets showed that boys had higher rates of mental health treatment and use than did girls (Kataoka et al., 2002). Over time, the lack of research, awareness, and responsiveness to women's health concerns has become increasingly clear (Heise et al., 2019). Fortunately, efforts have since been taken to reduce gender-related health disparities (Heise et al., 2019).

But despite greater acknowledgement of girls with ADHD, the diagnosis gap persists (Mowlem et al., 2019). In addition, a district-wide study assessing the barriers of detection, treatment-seeking, and service use for children with ADHD symptoms found that boys had over five times the odds of having an evaluation, ADHD diagnosis, and subsequent treatment than girls (Bussing et al., 2003). Fortunately, data show that, once diagnosed, girls with ADHD receive similar treatment to boys; highlighting the need to narrow the diagnosis gap in clinic settings, thus allowing girls to gain access to treatment (Novik et al., 2006). Given the complex history of ADHD, the diagnosis gap is a key area in which researchers are interested in reducing gender-related health disparities.

Although studies suggesting a potential gender bias are backed by persuasive data (Meyer et al., 2017; Mowlem et al., 2019), to date, no known studies examine the specific mechanisms behind the gender bias resulting in fewer girls being diagnosed with ADHD than boys. Based on the assumptions outlined in social role theory and gender schema theory, I argue that the shared understanding of ADHD and associated features have a crucial overlap with the shared understanding of traditional male gender roles and stereotypes (i.e., male gender schemata), such that adults can quickly and readily identify ADHD symptoms in boys. But when presented with a girl who displays ADHD symptoms, an incongruence occurs that prevents accurate referrals and subsequent diagnosis. I argue that the resulting diagnosis gap is due to the influence of gender schemata on one's perceptions, memory, and recall of schemata-inconsistent information.

The purpose of the current study is to introduce a novel theoretical framework integrating the literature across disciplines to provide a unique contribution to the knowledge-base on girls and women with ADHD. To date, no known studies examine gender schemata as they relate to the gender bias in the referral process of ADHD. As such, the current study is a pilot study in

order to investigate the mechanisms behind the gender bias that may be the driving force behind the diagnosis gap.

Gender Research

Gender research in psychology boomed in the late 1960's through the 1970's. The turning point of gender as a subject of interest for psychologists was inspired by early researchers in feminist psychology, who called attention to the fact that the research predominately reflected the male perspective, particularly white, cisgender, and heterosexual men. With men leading the research in psychology, it was argued that many of the prominent research questions, findings, and interpretations had a deeply-ingrained male bias. In the early 1970's, pivotal works were published that highlighted the social construction of gender, the differentiation between sex and gender, and introduced key terminologies such as gender roles, gender stereotypes, and gender identity (Unger, 1979; Zosuls et al., 2011). Since that time, gender schema theory and social role theory are two major schools of thought driving psychological research on gender. These theories, which will be discussed in depth throughout this paper, argue that most gender differences in behaviors, attitudes, traits, and characteristics are the result of socialization and not due inherent sex differences, and as such, a distinction between the terms sex and gender is warranted (Unger, 1979).

With this distinction, *gender* refers to one's internalized self-concept of their gender identity and the characteristic traits and behaviors historically and traditionally considered typical and appropriate for a particular gender—with an emphasis on the socially-identified and socially-constructed differences (Muehlenhard & Peterson, 2011; Zosuls et al., 2011). *Sex* refers to the biological classification between sex groups as distinguished by biological sex characteristics (i.e., chromosomes, reproductive organs, hormones) (Heise et al., 2019;

Muehlenhard & Peterson, 2011). As such, throughout this paper, any discussion of gender and gender differences refer to specifically the socialized differences in behaviors, attitudes, traits, and characteristics that emerge through the theories posited by gender schema theory and social role theory (Eagly & Wood, 2012). These differences should not be confused with sex differences. Sex differences relate to biological and evolutionary capabilities, such as child-rearing ability, production of sperm or eggs, and production of hormones specific to these capabilities (Heise et al., 2019). Although sex differences have some influence on how gender has been socialized, the reduction of gender differences to sex differences is overly simplistic (Eagly & Wood, 2012).

Historically, research on gender-related constructs, such as stereotypes and roles, have identified two fundamental social motives: a sense of agency and a sense of community (Spence & Helmreich, 1978). These social motives were observed differentially in the behaviors, values, and perceptions of men and women (Locke, 2015). Agency is related to the prioritization of the self, and is manifested through self-assertion, self-protection, and self-expansion (Locke, 2015). Gender researchers often relate a sense of agency, or agentic behaviors, to the term *instrumental*, which is used to refer to similar traits and behaviors (Hentschel et al., 2019; Spence & Helmreich, 1978). Agentic and instrumental traits and behaviors encompass what is traditionally considered masculine, or boy-related, stereotypes and gender roles, including competitive, active, independent, and aggressive behaviors (Doey et al., 2014; Kollmayer et al., 2018; Weinstein & Dannon, 2015). In contrast, community or communion, is related to selflessness and is manifested through displaying a concern for others and a desire to be at one with others (Locke, 2015). Communion is related to *expressive* traits and behaviors, which encompass traditionally feminine stereotypes and gender roles, such as being emotional, sensitive, and

nurturing (Doey et al., 2014; Eagly & Wood, 2012; Spence & Helmreich, 1978). Expressive and instrumental traits have frequently been used throughout scale development when aiming to measure gender-related constructs.

Measurement of Gender-Related Constructs

To measure and quantify gender differences as they relate to gender roles, stereotypes, behavior, and expression, researchers have clung to the expressive and instrumental split to reflect differences in masculine and feminine behaviors across individuals (Haines et al., 2016; Hentschel et al., 2019; Matud, 2019). Measurement of gender roles and gender-related constructs is complicated. Several competing theories driving measurement development exist; for example, one theory is that gender-related traits are dispersed across a unidimensional, or bipolar, axis (Zosuls et al., 2011). According to this theory, masculine and feminine traits are two opposite ends of the same spectrum, such that an individual who is high in femininity is likely to be low in masculinity, and vice versa. In contrast, a multidimensional, or dualistic, approach to gender roles suggests that masculinity and femininity are separate constructs, and their respective traits can coexist within an individual (Spence & Helmreich, 1978). The dualistic approach suggests that although gender roles refer to separate principles (e.g., expressive vs. instrumental), they may co-exist to some degree and are core features of human behavior shown through social motives and social judgements (Locke, 2015; Matud, 2019; Spence & Helmreich, 1978). That is, the dualistic approach suggests that gender-related traits can vary independently of one another. Current understanding of gender-related attributes reflect the multidimensionality of most psychological traits; however, research tends to confirm the bipolar theory, perhaps because most measurement instruments were designed through this perspective. For example, two of the most commonly used measures of gender role traits and behaviors are the Bem Sex Role Inventory

(BSRI; Bem, 1974) and the Personality Attributes Questionnaire (PAQ; Spence et al., 1974). The BSRI is a popular self-report instrument that is designed to measure the gender-specific traits of individuals; it yields results mapping onto four domains of masculine, feminine, neutral, and androgynous gender roles and traits (Bem, 1974). The PAQ is a self-report measure intended to measure instrumentality and expressiveness that map onto traditional gender role attributes for boys and girls (Spence et al., 1974).

It is not only the theory behind these psychological correlates that make measurement of gender-related constructs difficult, but it is also the social nature of the topic that can interfere with the accuracy of data collection. Because gender stereotypes reflect the idealized and simplified beliefs of how an individual "should" behave, oftentimes the gender constructs being measured are considered socially desirable and expected for a given gender (Eagly & Wood, 2012; Haines et al., 2016). As such, results are likely influenced by the gender of the individual taking the survey as a form of response bias in order to appear consistent with the idealized self-concept of their gender identity (Eagly & Wood, 2012). Further, response biases can arise when observers or raters are tasked with responding about the gender-related constructs for a given individual. The observers or raters are likely to have their own bias interfere with the accuracy of results if not blind to the gender of the subject; this results in a form of correspondence bias in which the rater assumes the subject has certain dispositions due to an identity variable (e.g., gender) (Eagly & Wood, 2012).

Despite the flaws in the measurement of gender-related constructs, the characteristics related to instrumental (i.e., agentic, masculine) and expressive (i.e., communal, feminine) have generally persisted throughout the literature (Hentschel et al., 2019; Kollmayer et al., 2018; Matud, 2019). There is some evidence, however, that suggests a changing social landscape.

Some recent data show that women participants in Western societies have begun increasingly attributing to themselves (e.g., according to their own self-report ratings) greater variability in agentic/instrumental traits (Hentschel et al., 2019; Moore, 2007). In other words, contemporary women are endorsing traits consistent with both expressive and instrumental features, a finding that is likely influenced by the increase of women in the workforce (Eagly & Wood, 2012). A potential confound to this trend is the finding that self-attribution of instrumental traits has been associated with more effective coping behaviors and competency than self-attribution of expressive traits, implying that there may be a desirability bias for women to self-attribute instrumental traits to be perceived as competent in a wider array of workplace roles (Moore, 2007).

Despite some evidence of progressive changes in the way modern women rate themselves, other studies show that men and women consistently self-identify with stereotypical traits and that others consistently attribute these traits to men and women in a gender-typed manner. For example, in a study of adult men and women, men scored higher on a scale of masculinity and women scored higher on a scale of femininity (Matud et al., 2014). Children were also found to show higher interest in gender-stereotyped toys that corresponded to their gender than gender-stereotyped toys of the opposite gender (e.g., boys were more interested in toys like trucks and girls were more interested in toys like dolls) (Weisgram, 2016). Stereotypes are still present in attributions to others as well. For example, studies show that others still largely perceive and attribute stereotypical differences between men and women, rating women as higher in feminine gender roles, and men as higher in masculine gender roles (Haines et al., 2016). That is, although women may attribute greater variability to *themselves* (Hentschel et al., 2019; Moore, 2007), *other* women and men still generally perceive one another in a stereotypical

manner. Further, instrumentality continues to be more socially acceptable for men than women, and traits consistent with expressiveness are viewed as more socially acceptable for women than men (Haines et al., 2016; Matud, 2019). These studies show that gender stereotypes have remained generally stable over time, since their early construction in gender research from the 1960's (Eagly & Wood, 2012; Hentschel et al., 2019; Kollmayer et al., 2018; Matud, 2019). The stability and longevity of these traits can be explained by the theories and processes outlined in social role theory and gender schema theory, discussed below.

Social Role Theory

Social role theory posits that gender differences in behaviors, traits, and attributes arise from a societal understanding of the *social roles* that men and women have traditionally held, and thus, are expected to hold. Social roles are theorized to arise from the various factors accounted for in a given economic, social, ecological, and technological context of a particular society, as well as the inherent differences between sex assigned at birth, such as child rearing capabilities (Eagly & Wood, 2012). For example, in the history of the United States, men historically dominated the labor force, which was a division of labor likely influenced by physical differences between the sexes (e.g., men having large stature, upper-body strength). This division left women with the task of childcare and home-making. The division of labor led to the shared understanding of *specific roles*, which are the occupations and family responsibilities commonly held by each gender (Eagly, 2001). As such, gender expectations for a given society arise from the specific roles that men and women hold in that society.

Gender roles are the set of shared expectations about behaviors, traits, and attributes applied to individuals according to their socially identified gender (Eagly, 2001). It is through the understanding and adoption of social roles that women and men learn and acquire skills,

behaviors, and attitudes that facilitate the roles they are expected to hold. These skills and attitudes enable an individual to behave in a manner appropriate and consistent with their specific role or occupation and contribute to the functional behavioral differences observed in social science research between men and women (Eagly, 2001).

The differences observed in behaviors, attitudes, beliefs, and attributes across genders are commonly attributed to *gender stereotypes.* Gender stereotypes can be conceptualized as the shared beliefs regarding the appropriate behaviors, occupations, and activities for males or females (Weisgram, 2016). Stereotypes reflect the simplistic and reduced differences between groups (Kollmayer et al., 2018). Oftentimes, gender stereotypes reflect the ideologies and gender roles of each gender respectively; thus, individuals are likely to view gender stereotypes as a handbook in guiding their own behaviors (Eagly & Wood, 2012). As such, researchers conclude that the socially-constructed nature of gender roles and gender stereotypes does not make them entirely arbitrary or inaccurate. In fact, gender stereotypes are often used to guide one's own behavior and drive the interpretation of the behaviors of others through cognitive processes known as schemata.

Gender Schema Theory

A schema is defined as a cognitive structure consisting of various associated networks that serve to guide perceptions and organize information (Martin & Dinella, 2001). Gender schema theory borrows from theories of social learning and cognitive development to explain how concepts of gender are developed and maintained (Bem, 1983). Starting in infancy, children have the capacity to develop advanced cognitive schemata, according to cognitive development theory (Martin & Dinella, 2001). Simultaneously, theories of social learning suggest that children are part of a larger societal context, defined by culture, norms, historical context, and

more, that enforce and transmit information about gender to the individual (Bem, 1983). Children are thus able to take the information transmitted through their cultural environment and interact with it through their own cognitive processing in order to form various schemata, and particularly of interest to the current paper, gender schemata.

Gender schemata are the cognitive short-cut for perceiving, interpreting, sorting, and storing information related to gender (Bem, 1983; Martin & Dinella, 2001). With their gender schemata, children organize and store new information through the process of assimilation (Bem, 1983; Zosuls et al., 2008). Gender schemata provide the foundation for the interpretation of our sensations, enabling one's readiness to quickly and spontaneously sort information into various categories. It is argued that the existence and use of gender schemata provide an explanation for the way individuals attend to, learn, and remember information, as well as influence one's beliefs and attitudes, and even how they behave (Martin & Dinella, 2001).

Research on schematic-processing points to a pattern in which schemata-inconsistent information is likely to be overlooked, and information consistent with gender schemata are likely to be noticed (Bigler & Liben 1990; Martin & Dinella, 2001). Specifically, a phenomenon akin to the misattribution effect (i.e., a phenomenon in which memories are distorted due to some external factor, such as the origin, source, or cause of the original event) emerges. That is, studies show that gender schemata appear to be resistant to novel or inconsistent information to such a degree that schemata can influence and distort the perception, memory, and recall of inconsistent information to fit within a current schematic framework (Bigler & Liben, 1990; Martin & Dinella, 2001). For example, one study presented elementary school children a picture book and asked the children to retell the story and answer questions related to gender consistent and gender inconsistent information. Results showed that the children's recall of the story

included gender-stereotypical interpretations about the main characters that were not present in the actual story. The researcher concluded that children were likely to distort or misremember gender-inconsistent information to make it fit within their schematic frameworks of gender (Frawley, 2008). Another study demonstrated this same phenomenon with adult participants by having the participants view a video of a man and a woman engaging in stereotype-consistent and stereotype-inconsistent behaviors, and then testing their recall of the videos immediately and with a time delay. Results showed that participants misremembered the stereotype-inconsistent behaviors as being performed by the stereotype-consistent actor, an error which increased in frequency as the time delay increased from when the clip was first viewed. The researchers concluded that as memory fades with time, individuals are likely to rely on their schemata to recall information, which results in an increase in memory errors that are influenced, or biased, by one's stereotypic gender schemata (Kleider et al., 2008).

Gender schemata not only influence the memory and interpretation of events, but also the stereotypic assumptions behind interactions with others and the ways in which our environments are organized. Gender-typing and gender polarization emerge from gender schemata (Liben & Bigler, 2017). *Gender-typing* is a form of socialization by which the assumption of gender identity and subsequent gender roles are applied to children, and as such, children are anticipated and expected to develop gender-specific beliefs, personality attributes, skills, and behaviors that influence children to inhabit either masculine or feminine traits (Matud et al., 2014). *Gender polarization* is defined as the organization of social life through the male to female distinction in which information is split into two distinct categories (Bem, 1983, 1995; Liben & Bigler, 2017).

Gender polarization is theoretically the result of both the functional categorization of gender and gendered language, which tend to occur simultaneously. The functional

categorization of gender involves the separation of groups based on gender, such as a teacher seating girls next to other girls and boys next to other boys. Gendered language involves the word choices used to give meaning to a given category, such as a child stating that blue is for boys and pink is for girls (Liben & Bigler, 2017; Zosuls et al., 2008). By separating and organizing the world into gender-specific categories, it makes sense to then use gender-specific labels when identifying and referring to such categories. The environmental cues that point to gendered categories are a form of socialization. Social role theory argues that socialization is the primary force behind most gender differences observed in social science research (Eagly & Wood, 2012; Pahlke & Goble, 2015).

Socialization of Gender. The socialization of gender occurs before children are even born when parents design nurseries in preparation for their child's birth, with either pink or blue color-schemes. After birth, parents provide toys and clothing to children that, more often than not, match the traditional associations with sex through color, function, or perceived interest. Parents' own beliefs and attitudes can also serve to initiate and maintain gender stereotypes through various interactions, including modeling behaviors and implicit prejudices (Weisgram, 2016; Pahlke & Goble, 2015). For example, parents who display and endorse traditional gender roles have children who endorse more gender stereotypes than children whose parents engage in and endorse nontraditional gender and specific roles (e.g., a mother or father, or both, who endorse gender roles inconsistent to their socially identified gender, and/or engage in specific roles that would be typically expected for the opposite gender) (Weisgram, 2016).

It is not only parents who enforce and maintain gender roles, the educational environment does as well. For example, gender-typing continues throughout a child's education via their teachers' behaviors and interactions, as well as their choices in the organization of the classroom

environments (e.g., gender polarization through lining children up according to gender, boy/girl symbols to assist with organization) (Bigler, 1995). Researchers found that when teachers used gender to label students and organize classroom activities, the students had elevated rates of gender stereotyping as compared to students in a control condition whose teachers were instructed to ignore student gender (Liben & Bigler, 2017).

The influence others have on the socialization of gender continues through peer groups, beginning in childhood and extending into adulthood. An assumption of social role theory is that any behavioral deviation from one's gender role is met with a negative consequence or penalty (Eagly, 2001; O'Leary & Flanagan, 2001). Behavior deemed inconsistent from gender roles is perceived negatively, responded to with negative consequences, and in turn disrupts social interactions (Heise et al., 2019). The negative consequences of gender role incongruence can be overt, such as being fired from a job, or can be subtle, such as condescending looks and remarks (Eagly & Wood, 2012; Heise et al., 2019). Research has supported these negative evaluations starting as early as preschool, where children who violated their gender role stereotypes were deemed less likable by their gender-conforming peers (Sullivan et al., 2018). The pattern continues into adulthood where women leaders are rated more negatively than men in terms of their competence, despite equal effectiveness (O'Leary & Flanagan, 2001). An experiment also showed that when presented with lecture videos of gender-nonconforming individuals, raters reported significantly more discomfort and gave lower evaluation ratings than raters who were presented with videos of gender-conforming individuals (Drill, 2013). This negative perception from others, or anticipated fear of it, reinforces the socialization and internalization of gender roles in children and adults.

The shared understanding of behaviors and traits deemed consistent with a given gender arise from gender schemata; these gender schemata thus enable individuals to quickly identify when behaviors are inconsistent with the shared expectations of gender roles. The gender-appropriateness hypothesis arises from this process, in which gender-appropriate traits and behaviors are hypothesized to be more stable over time than gender-incongruent traits and behaviors, due to the socialization process, including social rewards and punishments for the expression of certain behaviors (Eagly & Wood, 2012; Kerr et al., 1994).

The desire to conform to and confirm the expectations of others is in part due to the strong negative responses that others show when faced with expectancy violations. Cognitive dissonance is the emotional tension or cognitive discomfort associated with having two or more inconsistent but related thoughts. Cognitive dissonance can arise from a variety of situations such as when an individual encounters an environment that is inconsistent with their internal belief system, or when encountering another person whose behaviors and actions are inconsistent with one's own attitudes and beliefs (Drill, 2013). In order to resolve cognitive dissonance, individuals thus often desire to confirm others', as well as their own, gender role expectations (Eagly, 2001; O'Leary & Flanagan, 2001).

Although the socialization of gender plays an important role in how children learn to behave, think, and feel, gender roles are also internalized and maintained by the child themselves (Gareth & Mullin, 2018; Liben & Bigler, 2017). Research suggests that children internalize and endorse gender stereotypes as early as 3-years old. In the preschool ages, children begin to prefer play interactions with those of their same gender, reduce play with the opposite gender, and split their conceptualization of the world into boy and girl things (Weisgram, 2016). Around the ages

of 5- through 7-years old, children begin to loosen their attachment with gender stereotypes, and their cognitive schemata become flexible (Weisgram, 2016).

According to social role theory the internalization and maintenance of gender roles is in part influenced by one's own concept of their gender, also known as their *gender identity* (Eagly & Wood, 2012). The extent to which an individual incorporates gender roles into their identity varies person to person, and each individual may incorporate different aspects of gender roles (Eagly & Wood, 2012). For example, a person born with female reproductive characteristics who identifies as a woman may grow up in an environment which demands her to be nurturing to care for her siblings, but also to be assertive to stand up for her family. As such, this woman would be incorporating aspects of gender roles for both men (i.e., assertive) and women (i.e., nurturing). Further, once a gender identity is established, a self-regulatory process begins in which individuals use their gender identity and the associated gender roles to guide their behavior. Typically, the more aligned one is with their gender identity, the greater their self-esteem (Eagly & Wood, 2012). In this way, internalized gender stereotypes result in a form of a self-fulfilling prophecy in which individuals act in a manner consistent with their gender-role expectations (Bigler, 1995; Eagly & Wood, 2012). In this way, gender is socialized through early adult models and caregivers, reinforced by other children, and actively maintained by the individual.

Gender-Related Traits and Behaviors.

Due to the specific roles that women have historically held, primarily related to child-care, women are expected to be nurturing, compassionate, emotionally responsive, kind, gentle, and relationship-oriented to succeed at this specific role (Eagly & Wood, 2012). Girls are expected to be submissive and shy in their interactions, as well as behave democratically and egalitarian in leadership positions (Doey et al., 2014; Eagly & Wood, 2012).

Historically, men in the United States are expected to present themselves as independent, whereas women are socialized to present themselves as interdependent. As such, stereotypical characteristics for men include features such as leadership, assertiveness, decision-making, independence, and being analytical (Matud et al., 2014; Moore, 2007). Men are also attributed as being impulsive, risk-taking, active, competitive, aggressive, assertive, dominant, as well as being quick to make decisions and forceful (Doey et al., 2014; Kollmayer et al., 2018; Weinstein & Dannon, 2015). Boys are consistently regarded by Western societies as better at mathematics, science, and overall academics than girls (Furnham et al., 2002; Ohan & Visser, 2009; Tenenbaum & Leaper, 2003).

Despite increasing awareness and social acceptance of the sexual and gender minority community, research shows that the gender binary (e.g., the categorization of gender and gender-related information into male and female categories) remains commonplace in the United States. As such, gender roles, norms, and stereotypes remain relatively unchanged from the traditional roles and stereotypes of the past (Hentschel et al., 2019; Kollmayer et al., 2018). Stereotypes largely remain present across self-attributions and attributions to others (Haines et al., 2016; Matud et al., 2014; Weisgram, 2016). These attributions suggest that traditional gender roles and stereotypes continue to drive the perceptions and interpretations of others and highlight the influence that gender schemata likely have on that process. Gender expectations are also likely to influence the processes used to diagnose psychological and psychiatric health conditions.

Attention Deficit Hyperactivity Disorder

ADHD is a neurodevelopmental disorder that begins in childhood. Key characteristics of ADHD include developmentally inappropriate levels of inattention, hyperactivity, and impulsivity—all of which are both persistent and impairing across settings and time. According

to the fifth edition of the *Diagnostic and Statistical Manual* (DSM-5; American Psychiatric Association [APA], 2013) there are three presentations of ADHD: predominantly inattentive (ADHD-I), predominantly hyperactive/impulsive (ADHD-HI), and combined presentation (ADHD-C). The combined presentation is the most commonly observed form of the disorder (APA, 2013; Leung & Hon, 2016). Symptoms for ADHD predominantly inattentive presentation include being easily distracted, making careless mistakes, being forgetful in daily activities, and struggling to follow through with instructions. The criteria for ADHD predominantly hyperactive/impulsive presentation include symptoms such as fidgeting, difficulty remaining seating, interrupting others, and butting into conversations. A diagnosis of the combined type implies that the individual meets criteria for both the inattentive type and the hyperactive/impulsive type (APA, 2013). ADHD has a set of symptoms required for a diagnosis, and as with most clinical disorders, there are also a set of commonly associated features, often thought to be manifestations or implications of the core symptoms. Associated features of ADHD include high risk-taking behaviors, impulsivity, aggression, and low pro-social behaviors (Thapar & Cooper, 2016).

ADHD is a neurodevelopmental disorder with overwhelming evidence that symptoms and related impairments and symptoms persist into adulthood (Babinski et al., 2011; Biederman, et al., 2006). In general, children with ADHD are at a greater risk for academic, social, and behavioral problems, as well as an increased risk for teen pregnancy, substance abuse, car accidents, and school dropouts (Langberg et al., 2008). The associated impairments, risks, and outcomes of ADHD highlight the critical need for early identification and intervention in order to prevent or mitigate adverse outcomes.

Diagnosis Gap

As mentioned, there is a documented gap between boys and girls in terms of diagnosis rates of ADHD, with more boys being diagnosed than girls (Mowlem et al., 2019). The diagnosis gap refers to the consistent finding that more boys are referred for and thus subsequently diagnosed with ADHD than girls. The result of this diagnosis gap is that boys are then more likely to receive the appropriate services and interventions than girls are (Bussing et al., 2003; Meyer et al., 2017). The prevalence of ADHD is estimated to be about 3.4% to 5% of the general population, with estimates as high of 11-16% in school-aged children. Epidemiologic surveys reveal a 3:1 to 4:1 ratio of boys to girls with an ADHD diagnosis (Leung & Hon, 2016; Thapar & Cooper, 2016; Young et al., 2020). Controversy exists surrounding the potential overdiagnosis of ADHD; however, there does not appear to be sufficient data to support conclusions that ADHD is over-diagnosed (Sciutto & Eisenberg, 2007). As such, it is unlikely that the diagnosis gap is a direct result of an overdiagnosis of boys.

Updated prevalence estimates show an increasing trend, with adults and children being diagnosed with ADHD at a higher rate than they were in 1991-1992. Included in this increase are girls and women, who have been diagnosed and receiving treatment at higher rates than ever before (Fairman et al., 2020). Specifically, in adults, the diagnosis gap has narrowed by 31.1% since 2012 (London & Landes, 2021). The rate of increase for girls and women has been attributed by researchers to the diagnostic changes in the current edition of the DSM, which provides broader behavioral symptom examples that may be more applicable to girls, teenagers, and adults. Despite this promising increase, there is still a diagnosis gap, especially in young girls, and in the clinic setting (London & Landes, 2021; Young et al., 2020).

Although the diagnosis gap is well documented, interesting discrepancies emerge depending on the age and population studied. For example, the diagnosis gap differs if the study sample is derived from a community sample or from a clinic-referred sample. In clinic-referred samples (e.g., study participants with an existing ADHD diagnosis, as identified by or referred by a clinic), stark differences are consistently reported between the diagnosis rates of boys and girls with ADHD, with prevalence ratios around 7-8:1 (Biederman et al., 2002, 2005; Thapar & Cooper, 2016). In contrast, studies conducted with non-referred, community-based participants, reveal a substantially smaller diagnosis gap between boys and girls, with prevalence estimates around 3-4:1 (Biederman et al., 2002, 2005; Thapar & Cooper, 2016).

Another interesting finding is that the diagnosis gap tends to be most prominent before the age of 18 years old (Meyer et al., 2017; Quinn & Madhoo, 2014). In adults, the diagnosis gap narrows to around a 1.5:1 male to female ratio (Biederman et al., 2005). Adults are more likely to self-refer for an ADHD evaluation and diagnosis, thus eliminating any outside bias in terms of referrals. In contrast, children with ADHD often rely on parents and teachers to identify and refer them for an evaluation and diagnosis. It can be implied that, at least for children and adolescents, a diagnosis often relies on a stakeholder to identify symptomatic behaviors and thus make a diagnostic referral (Meyer et al., 2017). A longitudinal study across 10 European countries found that once diagnosed, girls with ADHD received similar treatment to boys with ADHD (Novik et al., 2006). Because a diagnosis is often the most reliable avenue for treatment, there is a critical need to explore the mechanisms behind the referral process that results in more boys being diagnosed with ADHD than girls in order to ensure girls receive adequate treatment.

Hypotheses Behind the Diagnosis Gap

In general, two broad schools of thought emerge in the literature to explain the diagnosis gap. The first school of thought implies that the diagnosis gap exists between boys and girls because of some deterministic factor (e.g., genetics, sex, culture, brain structure) such that girls and boys experience different and distinct versions of the disorder. Under this assumption, the diagnosis gap is both predictable and acceptable because it reflects inherent differences between how the disorder manifests in girls and boys. Accordingly, gender bias might still occur in diagnosis but is secondary (i.e., less important as an explanation) to an essential difference between the sexes. Throughout this section, I will refer to this school of thought as the *essentialist hypotheses*.

The second school of thought implies that girls and boys experience ADHD in similar ways, and the diagnosis gap is primarily attributable to under-diagnosis among girls. Under this assumption, adults who refer children for treatment (e.g., parents, teachers) act on explicit or implicit gender biases that prevent recognition of many ADHD cases among girls, resulting in false-negatives of girls who likely have ADHD but are not being identified as such. I will refer to this school of thought as the *female false-negative hypothesis*.

Essentialist Hypotheses. Essentialist hypotheses that explain the diagnosis gap point to pre-determined causes inherent to boys and girls that differentially affect the manifestation, impairment, and expression of the disorder. These hypotheses imply that ADHD is to some degree sex-specific and thus presents differently for girls and boys. For example, researchers have hypothesized that boys and girls present with different manifestations, or phenotypic expressions of the disorder, which explains differences in the diagnosis rates. Gaub and Carlson's (1997) widely cited meta-analysis is often referred to in support of this explanation,

with findings suggesting that behavioral differences exist between boys and girls with ADHD, which ostensibly explains the diagnosis gap, with girls showing lower levels of hyperactivity, conduct problems, and externalizing behaviors.

Gaub and Carlson's (1997) findings influenced researchers to test another, related, explanation for the diagnosis gap. This latter hypothesis suggests that girls may not be significantly impaired by ADHD symptomology, resulting in a "sub-threshold" presentation of the disorder that may not elicit referrals from stakeholders (Bauermeister et al., 2007). In other words, girls with ADHD may be less impaired than boys with ADHD, which would then explain why differential prevalence estimates exist.

Relatedly, ADHD subtype is frequently highlighted throughout the literature as a specific explanation for the diagnosis gap. Researchers hypothesize that due to fundamental differences between boys and girls, boys are more likely to present with the hyperactive subtype and girls are more likely to present with the inattentive subtype (Beiderman et al., 2002, 2005; Ohan & Visser, 2009). It is presumed that inattentive symptoms are less disruptive, or externalized, than hyperactive symptoms, which may result in less urgency for a diagnostic referral (Coles et al., 2012). This explanation complements another popular hypothesis, known as the *disruptive behavior hypothesis.* The disruptive behavior hypothesis is applied to all disruptive behavior disorders, including oppositional defiant disorder, and is a popular hypothesis used to explain the diagnosis gap in ADHD as well (Coles et al., 2012; Pelham, Evans, et al., 1992). The disruptive behavior hypothesis suggests that boys exhibit disruptive behaviors at a higher rate than girls, a finding that is consistent with results from clinic-referred samples (Biederman et al., 2002; Gaub & Carlson, 1997), and as such, boys with ADHD are likely to be more disruptive than girls with

ADHD, resulting in a greater likelihood of receiving a referral and/or treatment than less obvious behaviors like inattention (Pelham, Evans, et al., 1992).

Clinic-referred samples tend to confirm the above hypotheses, with results showing that more boys are diagnosed with ADHD than girls, and that they display greater levels of hyperactivity and disruptive behavior than girls (Biederman et al., 2002, 2005; Gaub & Carlson, 1997); however, a *gender paradox* has also been documented in clinic-based studies. That is, findings showed that girls who present with severe and extreme cases are those most likely to receive a clinical diagnosis. As a result, the sex less frequently afflicted by a disorder is more likely to present with severe cases of the disorder, presumably due to genetic thresholds and predispositions between the sexes (Waschbusch, 2002).

Although these findings appear to support essentialist hypotheses and imply that the diagnosis gap is the result of something inherent to the way boys and girls manifest the disorder, the results do not consistently hold up in community-based samples. For example, in a community-based sample of children with ADHD aged 4- through 17-years old, data were collected on parent-rated ADHD symptoms and impairment, as well as data on family relationships, psychiatric comorbidity, and treatments, from a community sample of children. Contrary to expectations, the results did not show significant differences between boys and girls (Bauermeister et al., 2007). In addition, a population-based sample of preschoolers and school-aged children were directly observed for ADHD-related behaviors and symptoms; results showed no sex differences in directly observed behaviors (Meyer et al., 2017).

In a unique study of non-referred siblings of children with ADHD, girls and boys did not differ on key variables related to ADHD subtypes, psychiatric comorbidity, treatment history, or cognitive, social, school, and family functioning. These data also suggest that girls may not be

more prone to the inattentive diagnosis than boys, with results showing no gender differences in ADHD subtypes between boys and girls (Biederman et al., 2005).

Several studies since have highlighted that there are more similarities than there are differences in the symptoms and associated impairments observed in boys and girls with ADHD, and that ADHD profiles are not sex-specific (Rucklidge, 2010). These studies show that gender does not moderate the association between ADHD and comorbid psychiatric disorders, that no gender differences in community samples emerge for clinical correlates related to school, family, social, and cognitive functioning, as well as psychiatric comorbidity, and that the risks and comorbid psychopathology are similar for boys and girls with ADHD (Bauermeister et al., 2007; Biederman et al., 2004, 2005).

Due to the differential patterns that emerge from clinic versus community samples, researchers have hypothesized that perhaps clinic-based samples are not generalizable or representative of the broader population of those with ADHD, and particularly not of young girls (Mowlem et al., 2019). First, and most compelling, is the fact that clinic-referred samples are conducted on those with an existing diagnosis, which means that those who are not diagnosed (but who would be, should be, or will eventually be) are not represented in these samples. Second, the narrower diagnosis gap in community samples suggests that there are likely more girls affected by the disorder than are being represented in clinic settings, and as such, those girls who are represented in clinic-based samples may not be representative of the girls whose cases have been missed or misidentified (Mowlem et al, 2019). Finally, a referral bias may influence who is included in clinic samples; given ADHD's male-dominated history (Babinski et al., 2011; Mowlem et al., 2019), it is possible that the public understanding of ADHD allows for more boys

to be identified than girls. The likelihood of a referral bias, particularly a gender bias, is discussed in the section length below.

In sum, all essentialist hypotheses point to pre-determined, fixed, or inherent differences between boys and girls that result in the diagnosis gap. Although elements of *essentialist* explanations may account for some portion of the diagnosis gap, most explanations lack generalizable support because they are drawn from clinic-based samples. As such, the findings appearing to support essentialist hypotheses, such as the gender paradox hypothesis or the disruptive behavior hypothesis, may actually represent a bias in the referral process and identification of ADHD than inherent sex differences (Mowlem et al., 2019).

Female False-Negative Hypothesis. In contrast to essentialist hypotheses, it has been argued that the same behaviors displayed by girls and boys are perceived and conceptualized differently than when they are displayed by boys—a phenomenon consistent with a gender bias. The explanations under this second school of thought imply that a gender bias is the primary concern and explanation for the diagnosis gap. Specifically, stakeholders (e.g., teachers, parents) are the source of diagnostic referrals, and that a gender bias within stakeholders' perceptions and conceptualization of ADHD symptoms may explain the diagnosis gap between boys and girls.

To account for the possible referral bias reflected in clinic-referred samples and a potential gender bias in stakeholders' perception of ADHD symptoms, a novel population-based twin study collected data from parents through an ADHD symptom rating scale, an impairment index, structured clinical interviews, and comorbid emotional and behavioral problems (Mowlem et al., 2019). In order to examine the mechanisms that led some children to meet diagnostic criteria and others to not, data were split into two distinct groups—those that met diagnostic criteria and those who showed high symptoms but did not meet full diagnostic criteria. This

study is innovative because the population-level data reduced interference of a referral bias seen in clinic samples, and further, splitting data into high symptom and diagnosed groups allowed for researchers to compare whether a gender bias emerged in parent-report of ADHD symptoms that prevented those with high symptoms from meeting full diagnostic criteria (Mowlem et al., 2019).

Results showed that the girls who met diagnostic criteria, in comparison to the high symptom girls, had more comorbid emotional/behavioral problems, and that the relationship between meeting diagnostic criteria and comorbidity was less strong for boys. This result implies that for girls, experiencing just ADHD symptoms may not be enough to be rated by parents as meeting full diagnostic criteria. Results also showed that parents underrated overall impairment, as well as hyperactive and inattentive symptoms for girls when comparing the rating scale to the objective clinical interview, a pattern that did not emerge for boys (Mowlem et al., 2019). The finding suggesting that girls with greater comorbidity are more likely to receive a diagnosis is consistent with the gender paradox (Waschbusch, 2002); but given parents' underreporting of girls' symptoms, it may not be that girls genetically require greater comorbidity to meet clinical thresholds, instead it may be due to a bias in parent perception of symptoms and impairment.

The gender bias in the perception of ADHD symptoms for girls was tested in another study that compared parent and teacher ratings of the same children to direct observation records of trained observers in order to determine if the differences in diagnosis rates can be attributed to variability in teacher and parent reports on common ADHD rating scales (Meyer et al., 2017). That is, parents and teachers were asked to provide ratings of a child's behaviors and symptoms on a diagnostic measure of ADHD while blind observers independently observed the same students. Results showed no differences between boys and girls on directly-observed behaviors (i.e., the direct observations), but girls were found to be underrated by both parents and teachers

relative to the observed behaviors (Meyer et al., 2017). The conclusions suggest that the differences in stakeholders' ratings for boys and girls may help explain the under-recognition of ADHD in girls—this conclusion may be explained by research on schematic-processing showing that biases emerge in the perception and memory of events, such that gender schemata influence and distort the perception, memory, and recall of information to fit within their stereotypic schemata (Frawley, 2008; Kleider et al., 2008; Liben & Bigler, 1990; Martin & Dinella, 2001). It may be that behaviors that are inconsistent with traditional female gender roles (e.g., disorganization, impulsivity) are misremembered or misperceived by stakeholders, or that those behaviors are potentially attributed to causes other than ADHD.

For example, researchers were interested in exploring the perceptions and conceptualizations of teachers and parents on case vignettes of girls with ADHD (Groenewald et al., 2009). Results showed that 98% of teachers were able to recognize that the child had a problem, but their conceptualizations of the problem were attributed to the girl having indistinct attentional or emotional difficulties as opposed to ADHD. Results also showed that the teachers were more accurate in identifying girls with the inattentive presentation than the combined presentation (Groenewald et al., 2009). These findings may be explained by gender stereotypes and gender schemata, which suggest that internalized, emotional, and "shy" behaviors are consistent with the gender role expectations for girls (Doey et al., 2014; Eagly & Wood, 2012). Consistent with the data suggesting individuals are more likely to attend to and recall gender-consistent information (Frawley, 2008; Kleider et al., 2008; Liben & Bigler, 1990), it makes sense then that stakeholders more accurately perceive and identify the inattentive subtype in girls.

Further demonstrating the likelihood of a gender bias, studies have also shown that a gender bias exists in referral likelihood and treatment seeking. In the study mentioned above, teachers were less likely to conclude that a child's behaviors warranted a clinical referral when the behaviors were attributed to indistinct attention or emotional problems. Teachers also did not believe that medication would be beneficial to the girls in the vignettes (Groenewald et al., 2009). In addition, Scuitto and colleagues (2004) examined whether a gender bias emerged from teachers rating the likelihood of a referral for hypothetical vignettes of children with ADHD varying by gender and symptom type. Results showed that teachers were less likely to refer girls than boys, regardless of ADHD subtype. Researchers concluded that because teachers read the same behavioral descriptions across vignettes, with only gender varying, it can be concluded that the differences in referrals are attributable to the child's gender and not the symptoms or behaviors of the child (Scuitto, et al., 2004). This finding suggests a gender bias, whereby stakeholders hesitate to make a referral for ADHD services for girls because the behaviors are inconsistent with traditional gender roles, a finding that resembles the phenomena observed across research on schematic-processing and memory in which individuals are more likely to ignore or distort gender-inconsistent information (Frawley, 2008; Kleider et al., 2008; Liben & Bigler, 1990).

Not only do the perceptions of parents and teachers determine referrals, but they also in turn determine who receives services. This result was demonstrated in a study utilizing hypothetical ADHD case vignettes that varied by gender on parents and teachers (Ohan & Visser, 2009). Results showed that parents and teachers rated the behaviors displayed by boys and girls as being equally serious and problematic; still, they reported a higher likelihood of referring and seeking services for boys than for girls. That is, despite agreeing that the same

behaviors were severe and problematic in both boys and girls, teachers and parents were more likely to act on such behaviors when they were displayed by boys as compared to girls (Ohan & Visser, 2009). In addition, when their beliefs about the effectiveness of learning assistance for the cases were assessed, results showed that teachers and parents perceived learning assistance to be more effective for boys than for girls, which may highlight the gender role values that place emphasis on academics (i.e., mathematics and science) for boys but not for girls (Ohan & Visser, 2009; Tenenbaum & Leaper, 2003). There are no data to support that learning assistance would not be effective in girls, or that it would be more effective in boys, yet parents and teachers reportedly believe differential effects exist; a trend that is reflective of a documented gender bias in education, in which parents and teachers believe boys to be better at academic subjects than girls (Pahlke & Goble, 2015; Tenenbaum & Leaper, 2003).

As such, the gender gap might also be attributable to raters' perception of the effectiveness of treatments for boys and girls with ADHD. This hypothesis was supported by the study conducted by Groenewald and colleagues (2009), who found that teachers did not believe that medication would be beneficial to the girls in the vignettes (Groenewald et al., 2009). Similar results were found in a separate vignette study where teachers appeared to be strongly opposed to medication as a treatment option for girls, but saw it as a quick, viable, and effective option for boys (Pisecco et al., 2001).

Taken together, these studies demonstrate a gender bias in the identification, referral, and treatment selection for ADHD. These biases likely stem from the perception of impairment in girls with ADHD, where impairments associated with ADHD are likely to be attributed to schemata-consistent causes. The findings discussed above highlight the underlying assumption of the current study, which is that girls with ADHD are under-recognized, under-referred, and

subsequently underdiagnosed, resulting in a diagnosis gap through which a gender bias allows for more false-negatives in girls than for boys. Data exist to support both essentialist and female false-negative explanations, and as such, both may be worthwhile explanations for the diagnosis gap. However, most data in support of essentialist hypotheses draw from clinic-referred studies, which have methodological flaws that may interfere with the generalizability and accuracy of results. Therefore, results from clinic-based studies may reflect gender bias in referrals more so than inherent sex differences.

Statement of the Problem and Significance of the Study

The consistent and compelling data behind the female false-negative hypothesis point to a gender bias in the referral process of ADHD, in which stakeholders are more likely to refer a boy for a diagnosis of ADHD than a girl, despite identical behaviors. Although this gender bias is backed by data, to date, no known studies explore the specific mechanisms behind why such a bias exists. I argue that ADHD symptoms and associated features align closely with boy-related gender roles, stereotypes, traits, and behaviors, such that stakeholders can quickly and readily identify ADHD in boys. Although it is possible that, due to this same process, boys may be overdiagnosed, data suggest that a systematic overdiagnosis is not occurring in the case of ADHD (Sciutto & Eisenberg, 2007). In contrast, data consistently show more girls are likely affected by the disorder than are being represented in clinic settings, and that once diagnosed, girls would benefit from receiving similar treatment to boys—highlighting the need to narrow the diagnosis gap for girls in clinic settings (Bussing et al., 2003; Mowlem et al., 2019; Novick et al., 2006).

The conceptual framework of the current study combines the literature supporting a gender bias in the perception and identification of ADHD with gender schema theory and social

role theory in order to explain the differential process that occurs when stakeholders are presented with the same symptoms and behaviors in girls and boys. Under gender schema theory, gender-related schemata enable an individual to quickly and readily identify, sort, and organize perceptions into an organizational cognitive framework (Bem, 1983). Equipped with advanced gender schemata, an individual likely associates boys with the traditional male gender roles, such as high activity levels, aggression, risk-taking, and impulsivity (Doey et al., 2014; Else-Quest et al., 2006; Weinstein & Dannon, 2015). These gender-role-congruent traits for boys are also common symptoms observed in ADHD (i.e., impulsivity, hyperactivity). Thus, an overlap likely exists between the conceptualization of ADHD *and* the shared understanding of male gender roles, allowing stakeholders to easily identify ADHD symptoms in boys. Thus, the research on schematic-processing suggesting that information consistent with gender schemata are likely to be noticed (Bigler & Liben, 1990; Martin & Dinella, 2001) may explain why boys receive more diagnoses than girls.

In contrast, due to the inconsistencies between ADHD symptoms, associated features, and female gender role expectations, girls with ADHD do not fit neatly into stakeholders/perceivers conceptualization and understanding of *either* girls or ADHD, making it difficult for stakeholders to accurately identify ADHD in girls. That is, when presented with a girl experiencing ADHD-related academic and/or social impairments, stakeholders may attribute that impairment to something schemata-consistent rather than to ADHD. Based on the assumptions of social role theory and gender schema theory, girls may be less likely to be referred for an ADHD diagnosis because their behaviors do not fit into the schematic and stereotypical understanding of ADHD *or* girl gender roles. The influence of gender schemata on perception and recall would explain the findings that the same behaviors are perceived and rated

differently by stakeholders according to gender (Groenewald et al., 2009; Meyer et al., 2017; Mowlem et al., 2019; Ohan & Visser, 2009; Sciutto et al., 2004).

It is possible that stakeholders simply overlook ADHD in girls due to gender-inconsistent behaviors; however, it is also possible that gender schemata influence and distort their perception, memory, and recall of symptomatic behaviors to fit within their stereotypic and schematic understanding of girls (Frawley, 2008; Kleider et al., 2008; Bigler & Liben, 1990). That is, the influence of gender schemata on perceptions and memories would imply that for girls, gender-inconsistent behaviors may be attributed to other, schemata-consistent causes (e.g., transient emotional states), a finding supported by Groenewald and colleagues (2009).

It is critical for researchers, stakeholders, and psychologists alike to examine the mechanisms behind this gender bias in the referral process of ADHD, given that the gender bias is likely contributing to the diagnosis gap. A diagnosis is often the gateway to services, thus examining the gender bias and subsequent diagnosis gap in childhood is of critical concern (Thapar & Cooper, 2016; Novik et al., 2006). As such, it is paramount to study girls and women with ADHD to advance women's health, raise awareness, identify early, and intervene early to prevent pervasive and debilitating impairments.

To date, no known studies specifically examine gender roles as they relate to the gender bias in the referral process of ADHD, resulting in fewer girls being diagnosed with the disorder than boys. As such, the current study is a pilot study in order to investigate the mechanisms behind the gender bias that may be the driving force behind the diagnosis gap. The current study aims to provide an explanation for the diagnosis gap by introducing a novel interdisciplinary conceptual framework for understanding why stakeholders perceive and conceptualize the same behaviors differently according to gender.

In this study, a sample of children with ADHD were compared to a sample of children with similar demographics without ADHD in terms of their parent-rated gender role expression. The aim of the study is to determine if differences in the perception of gender role expressions exist between children with ADHD and typically-developing peers in order determine the validity of the current theoretical framework. Gender role expression was measured through parent-report on the Personal Attributes Questionnaire (PAQ; Spence et al., 1974). Due to the dated status of the PAQ, an additional indicator of gender role expression was utilized through coding the gendered-content of parent open-ended responses. Additional tests were conducted across parent-reported total ADHD symptoms, as measured by the ADHD Rating Scale-5 for Children and Adolescents, Parent Report (ADHD-RS-5; DuPaul et al., 2016). Planned exploratory tests were conducted on ADHD subtype symptoms and severity, as well as on additional coded variables. A set of research questions and hypotheses guide the current study; they are as follows:

1. What is the relationship between group (ADHD vs. typically developing peers) and parent-rated gender role expression, while controlling for child gender?
    a. It is hypothesized that there will be smaller differences between genders across masculine and feminine gender roles within the ADHD sample as compared to the typically developing sample.
2. What is the relationship between group and the gendered content in parents' open-ended descriptions of their children when controlling for child gender?
    a. It is hypothesized that coded responses with feminine content will be predicted by group; specifically, that the ADHD group will be less likely to be coded as feminine.

b. Subsequently, it is hypothesized that coded responses with masculine content will be predicted by group, specifically, that the ADHD group will be more likely to be coded as masculine.

3. What is the relationship between total ADHD symptoms and parent-rated gender role expression in children?
    a. It is hypothesized that total ADHD symptoms will be positively associated with masculine gender role expression and negatively associated with feminine gender role expression.

CHAPTER II: METHOD

All procedures in the study were approved by the Institutional Review Board (IRB) at East Carolina University (UMCIRB 19-002828; APPENDIX A). The ADHD sample was derived from an existing dataset in which the principal investigator on the present study was added to the IRB of the existing dataset and received approval in October 2019 (UMCIRB 18-001555; APPENDIX B).

Participants

In order to test for group differences between children with ADHD and children without ADHD, two samples were used in the current study. The two samples were recruited based on similar demographics. The participants included in each sample are described below.

Typically Developing Sample

Participants were recruited through Qualtrics Survey Panels (ESOMAR). Sample population parameters were specified through pre-determining select quota that must be fulfilled through participant recruitment in order to reflect similar demographics to those of the existing database of similar measures (UMCIRB 19-002828). A total of 172 participants took the online survey. The data required cleaning; of those who took the survey, 26 participants reported that their child had an existing diagnosis of ADHD as indicated by a health professional. In order to ensure that the two samples represent two distinct groups, those with a history of an ADHD diagnosis were removed from the sample and added to the ADHD sample discussed below. Because of the pre-determined demographic quotas, discussed in detail below, the 26 participants with an ADHD diagnosis had demographics consistent with those from the ADHD sample.

In addition, a total of six participants were removed from the sample and not included in the analysis. Two of the six removed participants were removed due to selecting the “prefer not

to respond" answer choice for both child sex and gender, which is a key variable in the current study. The other three removed participants were not cisgender (i.e., parent indicated a gender that differed from their sex assigned at birth; two indicated a female sex to male gender, and one indicated a male sex to female gender). Unfortunately, due to the majority of the study participants being cisgender, it would not be meaningful to include these three participants in the study because they may interfere with the accuracy of results if included. In order to achieve the statistical analyses of this study, key variables such as gender required further cleaning in order to represent a dichotomous variable. Therefore, in the analyses, answer choices such as "prefer not to respond" and "no answer," as well as irrelevant or meaningless text responses were treated as missing data. The complete response choices are presented in Appendix C and Appendix D prior to recoding the relevant variables into dichotomous variables.

After cleaning and checking the data, descriptive statistics were obtained from the final dataset consisting of 140 participants. The typically develping sample consisted of 69 girls and 55 boys, with an average age of 12.40 years old (*SD* = 1.16). The modal grade in school was seventh grade (25%). Twenty one percent of the sample were in eighth grade and 16% were in ninth grade or above. Nineteen percent of the sample were in sixth grade and 17% were in fifth grade or below. A detailed summary for child demographic characteristics is presented in Appendix C. Family demographic information was also obtained. The family demographic characteristics were primarily non-Hispanic, African American or Black, with a yearly household income under $60,000. A summary of family demographic characteristics are presented in Appendix D.

ADHD Sample

The ADHD group was comprised of a sample from a separate study conducting focus groups on a skill-based video game for children with ADHD. The current study focused on parent-report data regarding their children with ADHD. The original subset of the focus group data included responses from 69 participants. With the addition of the 26 participants who took the study online and indicated a history of an ADHD diagnosis, the ADHD sample included 95 participants. Data required cleaning and removal of cases. A total of two participants were removed from the sample and not included in the analysis. The two removed participants were not cisgender (i.e., parent indicated a gender that differed from their sex assigned at birth; both female sex to male gender). Data cleaning and management yielded a final dataset of 93 participants. In order to achieve the statistical analyses of this study, key variables such as gender required further cleaning in order to represent a dichotomous variable. Therefore, in the analyses, answer choices such as "prefer not to respond" and "no answer," as well as irrelevant or meaningless responses were treated as missing data. The complete response choices are presented in Appendix C and Appendix D prior to recoding the relevant variables into dichotomous variables.

After cleaning and checking the data, descriptive statistics were obtained from the final dataset consisting of 93 participants. The ADHD sample consisted of 28 girls and 60 boys, with an average age of 12.42 years old (*SD* = 1.16). The modal grade in school was eighth grade (30%); seven percent of the sample were in ninth grade, 20% were in seventh grade, 25% were in sixth grade, and 18% were in fifth grade or below. A detailed summary for child demographic characteristics is presented in Appendix C. Family demographic information was also obtained. The family demographic characteristics were primarily non-Hispanic, African American or

Black, with a yearly household income under $60,000. A summary of family demographic characteristics are presented in Appendix D.

Measures

ADHD Rating Scale-Fifth Edition

The ADHD Rating Scale-5 for Children and Adolescents, Parent Report (ADHD-RS-5; DuPaul et al., 2016) is a widely used instrument with psychometric support for its reliability and validity, with separate norms for boys and girls, as well as combined norms. The scale targets developmentally appropriate behavioral symptoms relevant to the DSM-5 diagnostic criteria for ADHD and takes an estimate of 5-minutes to complete. The ADHD-RS-5 includes two symptom subscales measuring inattention and hyperactivity-impulsivity, each with 9 items respectively. The two subscales combine to form a Total Scale of all 18 items. Finally, the ADHD-RS-5 includes a measure of impairment across six domains (relationships with family members, peer relationships, academic functioning, behavioral functioning, homework performance, and self-esteem). Impairment is measured twice, once when referring symptoms endorsed on the inattentive subscale, and once when referring to the symptoms endorsed on the hyperactive-impulsive subscale (DuPaul et al., 2016).

The internal consistency for the total scale and both symptom subscales ranged from 0.89 to .96. Test–retest reliability ranged from .80 to .87. Test–retest reliability for the impairment domains ranged from .62 to .90. The factor structure of the two subscales and the six impairment domains were confirmed through a confirmatory factor analysis (DuPaul et al., 2016).

Personality Attributes Questionnaire (PAQ)

The PAQ Short Form (Spence et al., 1974) is a 24-item self-report measure using a 5-point Likert scale. The scale is intended to measure instrumentality and expressiveness that map

onto traditional gender role attributes for boys and girls. There are three subscales consisting of masculine, feminine, and masculine-feminine domains. The masculine subscale includes traditionally masculine (i.e., instrumental) traits such as independence, self-assertion, and self-confidence. The feminine subscale reflects traditionally feminine (i.e., expressive) characteristics such as being interpersonal, kind, and emotionally aware. The masculine-feminine subscale includes various traits that vary in traditional social desirability depending on the gender of the participant, such as dominance, aggressiveness, and ease of crying; however, the masculine-feminine subscale has been regarded as trending in a masculine direction, and is not typically used in studies utilizing the PAQ (Choi, 2004; Hall & Halberstadt, 1980). The separate masculine and feminine subscales are typically considered the two core subscales of the PAQ.

The PAQ is a dated and imperfect instrument; however, to the researcher's knowledge, no better alternative exists for the current purpose of the study. The current study focused on parent-report data, which ultimately excluded any existing child self-report questionnaires. Few parent report instruments exist that reflect child gender roles. The PAQ was deemed the best fit for the purpose of the current study due to its documented use with parents. In the development of the Children's Personal Attributes Questionnaire (CPAQ), construct validity was assessed through correlating parent responses about their children on both the CPAQ and the PAQ to child self-report responses on the CPAQ (Hall & Halberstadt, 1980). Results showed significant positive correlations between child self-report and parent report on both the PAQ and the CPAQ (Hall & Halberstadt, 1980). The PAQ was ultimately selected over the CPAQ due to the low reliability found across CPAQ subscales (Beere, 1990), the availability of literature regarding the psychometric properties of the PAQ, and the PAQ's extensive use throughout the literature (Hall & Halberstadt, 1980).

The factor structure of the PAQ was replicated and confirmed across various samples and found to distinguish between genders (Helmreich et al.,1981). The masculine and feminine factors of the scale have been evaluated across cultures and age ranges; results show that the masculine and feminine factors represent two independent dimensions (Cota & Fekken, 1987). A study evaluating the psychometric properties of the scale through a multi-trait, multi-method approach showed acceptable construct validity for PAQ scores (Choi, 2004). Reliability across the subscales range from .78 to .85 (Beere, 1990).

Demographic Information

Participant demographic data were collected using a modified version of a standard social, health, and developmental history form, which collects information on parent, family, and child demographics. Information on family income and parent education level were collected, as well as child sex, gender, grade, age, race, and ethnicity. In the sample collected through the online survey, an item was added to the demographic form to obtain information on whether or not the children had an existing diagnosis of ADHD as diagnosed by a physician, psychologist, or other health professional.

Coded Data

Due to the fact that the PAQ is a dated instrument, an additional indicator of parent-reported child gender role expression was employed. The open-response item asking parents to describe their child's strengths ("What are some of your child's strengths?") was coded for gendered-content as the additional indicator of parent-reported gender role expression in children. The qualitative responses were coded using a coding manual, two trained coders, and a third coder in order to resolve any discrepancies (i.e., non-agreements) between the two coders. Responses were coded on a Yes/No basis on whether or not responses applied to four possible

categories: Masculine (i.e., instrumental), Feminine (i.e., expressive), Neither (neither masculine nor feminine), or Both (both masculine and feminine). Further information regarding the coding process and the coded variables are described in the Design and Data Analysis section below.

Procedure

ADHD Sample

The current study used a subset of a sample from a study conducting focus groups on a skill-based video game for children with ADHD. Staff at the ECU Physician's Pediatric Outpatient Clinic reviewed patient records and targeted recruitment to adolescents with a documented clinical diagnosis of ADHD. Participants were recruited through direct mailings and word of mouth advertising. Detailed flyers were sent to families of eligible participants identified by the ECU Outpatient Clinic staff. Flyers were not sent to patients without ADHD or with comorbid autism spectrum disorder, intellectual disability, or psychosis to ensure a relatively homogenous sample that represents the target population. All recruitment flyers encouraged parents to telephone the research lab for more information. When parents called, research lab staff conducted a phone screen. The phone screen confirmed the presence of 4+ inattention symptoms (rates as pretty much or very much) from the disruptive behavior rating scale (Pelham, Gnagy, et al., 1992).

A series of focus groups were conducted with a group of children ranging in size from 12 children per group to individual meetings (due to COVID-19 restrictions). Written parent consent was obtained at the start of each focus group, following an informed consent statement. Once consent and child assent was obtained, the children proceeded to partake in the video game focus group and the parents waited in a separate room. While parents waited for their children to complete the focus group study, they were asked to complete a packet from which the data

relevant to the current study were obtained. Parents were given a packet of surveys containing the modified social, health, and developmental history form, the PAQ, ADHD-RS-5, and a questionnaire regarding video game habits that was not included in the current analyses. Prior to distributing surveys, the research staff instructed parents to complete all surveys thinking of their child's typical behavior and mood when they are not currently taking ADHD medication if their child was medicated for ADHD.

Risks for participating in the study were minimized through having all researchers (investigators, graduate assistants) complete training and ongoing supervision on ethical research conduct. In addition, all flyers announcing the focus group study were sent through the ECU Physician's Pediatric Outpatient Clinic to ensure that contact is initiated by interested parents. All identifiable information (e.g., names, addresses, birthdates) obtained from participating families were kept confidential through using ID numbers only, which were entered into a secure database. Parents were instructed to only put identifying information on the consent form, releases, and receipts; otherwise, all measurement protocols were identified with a client ID only. All participants were able to discontinue their participating in the study at any time without repercussions, or the loss of any previously earned benefit. Families were compensated at 75$ each in order to reimburse for their time and travel to ECU.

Typically Developing Sample

Due to complications and unprecedented difficulties with participant recruitment and data collection that arose from the COVID-19 pandemic, it became necessary to look to a data analytic company to assist in participant recruitment and data collection. The company, ESOMAR, is promoted through Qualtrics and is a not-for-profit organization. The company recruits participants for the researcher through various sources, including targeted email lists,

permission-based networks, and social media. They also provide some form of incentive to participants, such as airline points and gift cards. Use of the company was funded through the PI's advisor's lab funding (the School Behavior Consultation Lab, Psychology Department at ECU, directed by Brandon K. Schultz, Ed.D.). The PI, ECU, and the lab provided no direct payment to participants—the only payment provided was to the company for their services. The participant's incentives were from the company's funds, not from the PI, the lab, or ECU. Sample population parameters were specified with the company through pre-determined quotas for participant demographics to ensure similar demographics to those in the existing database of similar measures (i.e., the focus group study described above; UMCIRB18-001555). The minimum quota to meet were that 70% of the sample would identify as Black or African American, 10% Hispanic or Latinx, 20% White or Caucasian, and 15% of the sample could report an income level of $60,000 and above.

When participants were invited to take the survey through Qualtrics Survey Panels, they were informed of their incentive before agreeing to participate. Participant incentives varied depending on their recruitment source and listed preferences—incentives ranged from gift cards to airline points of similar value. If the participant accepted the incentive offered, they were directed to the online Qualtrics survey where they were met with an online informed consent procedure. The online informed consent procedure included information about the study, contact information for the PI and ECU IRB, as well as any risks and benefits of participating. The consent procedure also included the criteria to participate in the study (i.e., over 18 years old and a parent or legal guardian to a child between the ages of 11-14 years old). If the participant agreed to the informed consent procedure, they were directed to the survey and the study began. All survey questionnaires and items were consistent to those from the focus group study;

however, one item was added to the demographic items for the online survey to obtain information on whether or not the children had an existing diagnosis of ADHD as diagnosed by a physician, psychologist, or other health professional. If the participant answered yes to this item, they were instructed to complete the survey thinking of their child's behavior when they are not taking medication, if applicable.

If ESOMAR participants did not agree to participate, accept their incentive, and/or did not provide consent, they were unable to proceed to the survey and were prompted to exit. Once the pre-specified quota was fulfilled, any participants who took the survey who indicated a response option that exceeded the quota were redirected from the survey and their responses were not recorded in the final dataset. The study setting was conducted online; therefore, participants were able to choose where they completed the study at their own discretion, and on which device (i.e., mobile phone, computer, tablet). Safeguards in place to protect participants included being able to exit the survey at any time without penalty, choosing one's own location, and taking the survey anonymously.

Design and Data Analysis

As part of the data cleaning process, each dataset was cleaned to simplify the merging process. All variable labels were updated to be consistent across both datasets and any variables not used in the current analysis were removed from the datasets and saved in their original dataset copy. In order to further simplify the data, quantitative codes were applied to signify response choices consistently across both datasets. Other details of the data cleaning process are described above in the Participants section.

Following data cleaning, the two datasets were merged by variables. A dummy coded variable was utilized in order to signify which case was from the typically developing sample

and which case was from the ADHD sample. In addition, the PAQ was scored by first recoding the raw scores of the reverse-scored items as identified by the test-makers. Next, mean scores for the feminine (i.e., expressive) and masculine (i.e., instrumental) subscales were calculated by creating a new variable in which the items for each subscale were summed and then averaged by the number of items per scale respectively. This resulted in total mean scores for both subscales. The same process was repeated for the ADHD-RS-5 subscales in which total mean scores were obtained.

Equivalence Testing

As mentioned, the two samples were recruited based on similar demographics to ensure that analyses comparing the two groups are appropriate. To test similarity, the data from the two samples were compared on key demographic variables of race, ethnicity, and income level using equivalence testing (Lakens, 2017; Lakens et al., 2018). In addition, to observe demographics between those who took the survey online who indicated an existing ADHD diagnosis and the original ADHD sample, equivalence tests were also conducted across the samples prior to adding the participants to the ADHD sample, and then again by comparing just the original ADHD sample to the select participants who took the survey online and indicated a diagnosis of ADHD.

It is recommended that an objective justification (e.g., based on previous research, predictions from computational models) for setting the smallest effect size of interest (SESOI). However, due to the nature of the current study (i.e., a pilot study conducted on a previously unstudied theory), using a subjective SESOI was warranted (Lakens, 2017; Lakens et al., 2018). Subjective SESOI's are typically based on standardized effect sizes; for example, setting the SESOI as a standardized effect size of $d = .5$ suggests that the researchers would be able to reject the hypothesis that the effect detected is at least as extreme as a medium effect size. For the

current study, based on the nature of the study and recommendations in the literature, equivalence bounds were employed with a slightly more conservative SESOI of $d = .4$ and an alpha level of .05. Results based on equivalence testing enable the researcher to conclude that the observed effect (i.e., the difference) is statistically not different from zero and statistically equivalent to zero (Lakens, 2017; Lakens et al., 2018). This suggests that any differences in the data are not meaningful and allows for conclusions of similarity for the key variables of interest.

Equivalence testing was conducted in R statistical software (R Core Team, 2020) using the *TOSTER* package (Lakens, 2017). The *TOSTER* package allows for equivalence testing using the means and standard deviations on key variables from each sample and allows users to specify the alpha level and SESOI. The output of the test includes a summary statement on whether or not, based on the equivalence test and the null-hypothesis test combined, one can conclude that the observed effect is statistically not different from zero and statistically equivalent to zero.

TOST results across the samples prior to adding the online participants who indicated an existing diagnosis of ADHD to the ADHD sample showed that some slight differences between the samples emerged across parent education, in which the typically developing sample, prior to adding the select ADHD participants to the ADHD group, had higher education levels than those in the original ADHD group. All other variables showed results suggesting that the observed effect is statistically not different from zero and statistically equivalent to zero. Results from the equivalence test are presented in Table 1 below.

Table 1

Equivalence Test Results Across Samples, Prior to Adding Online Participants with ADHD to the ADHD Sample

Variable	NT *t*-value	NT *p*-value	ET *t*-value	ET *p*-value	*df*	REB (±)
Age	.30	.765	-2.51	.007	131	.47
Ethnicity	-.50	.615	2.23	.014	122.67	.11
Race	1.17	.243	-1.68	.048	147.18	.41
Education	-1.92	.057	1.07	.142	174.24	.50
Income	.03	.975	-2.15	.018	54.94	.70
Grade	-.19	.846	2.71	.004	152.77	.60

Note: SESOI d = .4, alpha level = .05. REB = raw equivalence bounds. NT = Null test. ET = equivalence test. Positive *t*-values suggest that the means of the original ADHD group are higher than the original typically developing group.

TOST results across just those who took the survey online and indicated an existing ADHD diagnosis and the original ADHD group showed some slight differences between across all variables, in which the select ADHD online participants were slightly younger than the ADHD group, and had a slightly higher income and education level than the ADHD group. Results from the equivalence test are presented in Table 2 below.

Table 2

Equivalence Test Results Comparing Online Participants with ADHD to the Original ADHD Sample

Variable	NT *t*-value	NT *p*-value	ET *t*-value	ET *p*-value	*df*	REB (±)
Age	.35	.728	-1.62	.057	34.4	.45
Ethnicity	-.15	.880	1.47	.076	28.48	.11
Race	.75	.460	-.86	.198	34.2	45
Education	-2.91	.006	-1.33	.904	32.64	.51
Income	-.15	.884	1.45	.076	57.5	.65
Grade	.68	.50	-.93	.178	36.53	.57

Note: SESOI d = .4, alpha level = .05. REB = raw equivalence bounds. NT = Null test. ET = equivalence test. Positive *t*-values suggest that the means of the original ADHD group are higher than the ADHD participants who took the online survey.

TOST results for across the final samples, in which those who indicated an existing diagnosis of ADHD diagnosis were removed from the typically developing sample and added to the ADHD sample, showed that based on the equivalence test and the null-hypothesis test combined, the observed effect across all key variables was statistically not different from zero and statistically equivalent to zero. Results are presented in Table 3. Although child gender was not a key demographic variable used in the matching process, the ADHD sample had more boys than girls. However, this difference is to be expected given the prevalence estimates between boys and girls with ADHD.

Table 3

Equivalence Test Results Across Samples, After Adding Online Participants with ADHD to the ADHD Group

Variable	NT *t*-value	NT *p*-value	ET *t*-value	ET *p*-value	*df*	REB (±)
Age	.13	.898	-2.86	.002	197.22	.46
Ethnicity	-.53	.598	2.38	.009	190.60	.11
Race	.70	.484	-2.29	.012	201.35	.43
Education	.23	.819	-2.80	.003	214.53	.53
Income	.16	.877	-2.47	.007	119.87	.68
Grade	-.78	.439	2.24	.013	215.43	.62

Note: SESOI d = .4, alpha level = .05. REB = raw equivalence bounds. NT = Null test. ET = equivalence test. Positive *t*-values suggest that the means of the ADHD group are higher than the typically developing group.

Multigroup Path Model

A multigroup path model in which child gender was a predictor of PAQ results for both subscales across the two groups (ADHD and Typically Developing group). Through this analysis, differences in scores on the PAQ and the relationship between PAQ and gender across groups were assessed. That is, differences between the two groups across the PAQ Masculine subscale (PAQ-Masc) and PAQ Feminine subscale (PAQ-Fem) were assessed controlling for

child gender. Data were checked to confirm that the assumptions for the analysis tests were met. The data for PAQ subscales were both moderately skewed and had moderate levels of kurtosis; corrections for this were applied in the analyses; the corrections are discussed below.

The analysis was conducted through R statistical software using the *lavaan* package (R Core Team, 2020; Rosseel, 2012). A robust maximum likelihood estimator was used to correct for nonnormality of the data. In addition, missing data were accounted for using full information maximum likelihood, which is a process that estimates a likelihood function for each case based on the variables that are present (i.e., non-missing) to use all the available data (Rosseel, 2012). In a multigroup path model, a series free and constrained models are compared to one another in order to observe whether group differences emerge and if so, where.

It is recommended to first observe if differences in the intercepts (i.e., the means for each group) emerge. To do so, constraints to the intercepts are introduced and compared to a free model (i.e., paths are free to vary across groups) using a χ^2 difference test. If the χ^2 difference test is non-significant, it can be concluded that no group mean differences exist. Significant χ^2 difference test values indicate group differences across the intercepts (Rosseel, 2012).

In order to observe differences across regression pathways, a fully constrained model (i.e., all paths and intercepts are set equal to one another) is compared to the free model with no constraints through a χ^2 difference test. Significant p-values for the χ^2 difference test indicate that differences exist in the data (Rosseel, 2012). Once differences are documented through this process, a similar process in which constraints to pathways are sequentially introduced and freed is used to assess specifically which pathways differ between groups. Significant *p*-values for the χ^2 difference test from a constrained path model to the free model suggest that the constrained pathway is not valid, should *not* be constrained, and as such, the pathway should be left free to

vary between groups. In this instance, group differences can be concluded for the pathway that was constrained. However, non-significant differences suggest that the imposed constraint is valid and that no group differences can be concluded (Rosseel, 2012).

Qualitative and Coded Data

To obtain coded data from qualitative responses provided in the demographic survey, an open-response item from the demographic section of the survey was selected to be coded. The open-response item asks participants to describe their child's strengths ("What are some of your child's strengths?"). A coding manual was created by the PI in order to provide objectivity and consistency to the coding of responses (Saldaña, 2016). The coding manual was created by listing several keywords associated with male and female gender roles, as identified through a thorough review of the literature. These key words were considered common "themes" associated with each gender role (Saldaña, 2016). For example, themes related to feminine/expressive gender roles included kindness, nurturing, and other-oriented, and themes related to masculine/instrumental gender roles included activity, assertiveness, and competitiveness. After highlighting the themes, descriptors of those themes were provided based on definitions and common-use applications. In order to simplify data coding, and to meet the purposes of the study, codes were identified as applying to four possible categories—Masculine (instrumental), Feminine (expressive), Neither (neither feminine or masculine), and Both (both feminine and masculine). Codes were based on a Yes (1) No (0) basis and were coded separately for each variable and participant.

Coding was performed by two independent doctoral-level graduate research assistants in the School Behavior Consultation Lab at ECU. The graduate assistants were first trained on the coding manual by the PI. Coding instructions were that the coders were to read the qualitative

response and determine if a key word or theme for expressive gender roles were represented in that response; if they identified a feminine theme, they were to record what theme(s) were present (e.g. kindness, nurturing, etc.) in the associated column of a spreadsheet and then in the coded column, they were to put a code of one (indicating Yes). If the theme was not present, they were to put a code of zero (indicating No). This process was repeated for masculine themes and masculine codes.

After training and prior to coding the current data, coders were asked to code pseudo-data in order to practice and ask any questions that arose along the way. Through this process, the coding manual was adapted and revised in order to clarify frequently asked questions and avoid common errors that emerged through the practice coding. As such, examples from the pseudo-data were added to the manual in order to emphasize what the themes or key words look like when present in the data (Saldaña, 2016). For example, a qualitative response such as, "they are socially mature and have a wonderful and sophisticated sense of humor. They are loving and empathetic. They are helpful" would be an example of a response that only fulfills the expressive/feminine category and does not show any themes consistent with instrumental/masculine roles.

As per recommendations in qualitative literature, in order to solve discrepancies between raters, a third rater was introduced and trained to code the data in which there was disagreement between the two original raters (Syed & Nelson, 2015). Coding for Neither and Both categories were completed after the Masculine and Feminine variables were coded, discrepancies were resolved, and inter-rater reliability was obtained (discussed below). To code the Neither and Both variables, a syntax through SPSS software was created to identify whether a case met criteria for Both or Neither based on the codes inputted for feminine and masculine (i.e., a code

of Yes for feminine and Yes for masculine = Yes for both; a code of No for feminine and No for masculine = Yes for Neither). An example of a response that reflected neither themes would be: "he is goofy and a great kid." Throughout the literature, being a great kid and/or being goofy, were not identified as being associated with either gender role, therefor this response would be coded as Neither.

Inter-Rater Reliability. As per recommendations in qualitative data literature, in order to solve discrepancies between raters, a third rater was introduced and trained to code the data in which there was disagreement between the two original raters (Syed & Nelson, 2015). Prior to resolving discrepancies, reliability of the coded qualitative data was assessed through IBM SPSS Statistics. Reliability was assessed for across the two coders for both masculine and feminine codes, across each dataset, for a total of four reliability indices. Cohen's kappa coefficient (κ), a commonly used statistic measuring inter-rater reliability, was used for all reliability indices. Kappa ranges from -1.00 to 1.00, with values closer to 1.00 indicating greater inter-rater reliability (Sim & Wright, 2005).

Within the typically developing sample (n = 140), the coded Masculine variable yielded acceptable reliability (κ = .64) across the two raters. A total of 24 differences across the Masculine codes needed to be reconciled by a third rater to reach consistent agreement. For the coded Feminine variable for the online sample, acceptable reliability (κ = .79) emerged across the two raters. A total of 15 differences across the Feminine codes needed to be reconciled by a third rater to reach consistent agreement.

Within the ADHD sample (n = 93), the coded Masculine variable yielded good reliability (κ = .80) emerged across the two raters. A total of nine differences across the Masculine codes needed to be reconciled by a third rater to reach consistent agreement. For the coded Feminine

variable within the focus group sample, good reliability (κ = .94) emerged across the two raters. A total of three differences across the Feminine codes needed to be reconciled by a third rater to reach consistent agreement. Summary statistics of the means and standard deviations by group are presented below in Table 4. Means and standard deviations for gender by group are provided in Table 5.

Table 4

Means and Standard Deviations for Subscales and Coded Data Across Groups

Variable	ADHD (n = 93)		Typically Developing (n = 140)		Total (n = 233)	
	M	*SD*	*M*	*SD*	*M*	*SD*
PAQ						
PAQ-Fem	2.46	.80	2.81	.73	2.67	.78
PAQ-Masc	2.07	.70	2.58	.74	2.38	2.67
ADHD-RS-5						
ADHD-IN	1.97	.68	.69	.60	1.20	.89
ADHD-IN-SS	1.39	.72	.45	.60	.82	.78
ADHD-HY	1.53	.75	.52	.60	.92	.81
ADHD-HY-SS	1.35	.72	.43	.61	.80	.80
ADHD Total	1.75	.62	.60	.53	1.06	.50
Coded Data	*Yes*	*No*	*Yes*	*No*	*Yes*	*No*
Feminine	43.2	56.8	47.6	52.4	45.8	54.2
Masculine	62.5	37.5	54.8	45.2	58.0	42.0
Neither	19.3	80.7	16.9	83.1	17.9	82.1
Both	25.0	75.0	19.4	80.6	21.7	78.3

Note: For the PAQ and ADHD-RS-5 subscales, means and SD's were derived from total mean scores. Across the coded data variables (Feminine, Masculine, Neither, and Both), the percentages of the total sample coded as Yes or No are listed in place of M's and SD's.

Table 5

Means and Standard Deviations for Subscales and Coded Data by Gender Across Groups

Variable	ADHD Girls		ADHD Boys		Typically Developing Girls		Typically Developing Boys		Total Girls		Total Boys	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
PAQ												
PAQ-Fem	2.64	.87	2.42	.76	2.68	.76	2.94	.64	2.67	.79	2.67	.75
PAQ-Masc	2.06	.80	2.11	.64	2.51	.76	2.65	.68	2.38	.79	2.37	.71
ADHD-RS-5												
ADHD-IN	2.03	.72	1.94	.66	.68	.63	.67	.54	1.07	.90	1.33	.88
ADHD-IN-SS	1.43	.85	1.33	.67	.45	.54	.44	.52	.73	.78	.90	.78
ADHD-HY	1.52	.90	1.53	.66	.49	.54	.53	.55	.78	.81	1.05	.79
ADHD-HY-SS	1.30	.87	1.33	.65	.40	.43	.43	.61	.66	.76	.90	.78
ADHD Total	1.77	.74	1.73	.54	.58	.54	.60	.50	.93	.81	1.19	.77
Coded Data	*Yes*	*No*	*Yes*	*No*	*Yes*	*No*	*Yes*	*No*	*Yes*	*No*	*Yes*	*No*
Feminine	9.1	22.7	34.1	34.1	28.2	27.4	19.4	25.0	20.3	25.5	25.5	28.8
Masculine	17.0	14.8	45.5	22.7	31.5	24.2	23.4	21.0	25.5	20.3	32.5	21.7
Neither	10.2	21.6	9.1	59.1	8.1	47.6	8.9	35.5	9.0	36.8	9.0	45.3
Both	4.5	27.3	20.5	47.7	12.1	43.5	7.3	37.1	9.0	36.8	12.7	41.5

Note: For the PAQ and ADHD-RS-5 subscales, means and SD's were derived from mean scores. Across the coded data variables (Feminine, Masculine, Neither, and Both), the percentages of the total sample coded as Yes or No are listed in place of M's and SD's.

Correlations. Due to the dated status of the PAQ, coded responses were used an additional indicator of parent-reported gender role expression in children. Correlation analyses were conducted across the full sample to determine the relationship between the coded variables and the PAQ subscales. The correlations between the coded variables and PAQ subscales (i.e., mean total scores on each subscale) were conducted using a point-biserial correlation (two-tailed), due to the variables being dichotomous, where missing data was accounted for using a pairwise deletion method. Values of .80 and higher were considered to display a strong relationship, and values lower than .20 were regarded as having a weak relationship.

Logistic Regressions. In order to answer a similar question as the multigroup path model using the coded data from qualitative responses, a series of logistic regressions were conducted with gender and group as predictors of Masculine and Feminine coded variables. That is, differences between the two groups on the coded data were assessed while controlling for child gender. Additionally exploratory analyses were conducted using the same methods were conducted across the Neither and Both coded variables.

Logistic regression is a statistical technique commonly used when predicting relationships between categorical or dichotomous variables. A series of logistic regressions were selected for the current analyses because the analysis does not require assumptions about the distributions of the predictors to be met and due to the dichotomous nature of the variables of interest. For a logistic regression, information is provided on the probability that a particular case, given the predictors, falls into one of the categories of the dependent variable (Tabachnick & Fidell, 2018).

The analysis was conducted in SPSS software. The results of interest were from the overall test of model coefficients, including the χ^2 value and associated *p*-value, model fit statistics, and the *Nagelkerke* R^2. The χ^2 and associated *p*-value test whether the user model has increased predictive ability more than the null (baseline) model. A non-significant value implies that the user specified model is no better of a predictor than the null model, and thus the further interpretation of individual predictors is no longer meaningful. If the model is significant, the model, including all predictors are better at predicting outcomes than the null model and each individual predictor can then be assessed for the weight, odds, or predictive ability. If significant, the Wald χ^2 statistic and its associated *p*-value was used to determine the contribution of each individual predictor, holding constant all other predictors. In each model, gender and group were

predictors of the coded variable (the outcome/dependent variable). The effect of each slope is the "main effect" of that variable, representing the differences in gender (or group) controlling for the other one (Tabachnick & Fidell, 2018).

In order to test for interactions, an additional model was conducted for each coded variable. The models included the effects of gender and group on the coded variables, with the addition of an interaction term between group and gender. In this model, for the purpose of the current study, the only predictor and associated coefficients of interest were those relating to the interaction term. If the interaction was significant, the simple slopes were probed in order to determine the slope of gender for each group. Probing for interactions involves employing a simple moderation analysis on the interaction terms (Preacher et al., 2006; Dawson, 2014). The moderation was conducted using SPSS and the PROCESS macro (version 3.5.3). The PROCESS macro allows for testing and plotting interactions (i.e., a simple moderation) using the Model = 1 command and by specifying the outcome, moderator, and focal variables (Hayes, 2018; Hayes & Matthes, 2009; Preacher et al., 2006). The output of the PROCESS Model = 1 command provides information about the slope of the predictor at different values of the moderator (i.e., conditional effects); given that the variables were dichotomous, high and low values (0, 1) were used for these points. the conditional effects were used to determine the nature of the interaction between the two variables. Exponents of the conditional effects coefficients were used to represent the odds ratios for the simple slopes. Exponents were used because the output for the conditional effects are in log units and need to be converted to odds ratios.

Multiple Regressions

In order to answer the hypothesis that ADHD Total Scores would be negatively related to feminine gender roles and positively related to masculine gender roles, as well as the additional

planned post-hoc tests on ADHD subtype symptoms and severity, a series of multiple regression analyses were conducted. Across all analyses, gender and group were used as covariates to examine the effects of ADHD symptoms and ADHD symptom severity on gender roles as measured by the PAQ subscales. Mean total scores (sum of the scores of each item loading onto the subscale, divided by the number of items) were used across all subscales for the ADHD-5-RS and the PAQ.

The overall model fit of each model were evaluated for significance; if results were significant, the coefficients for each predictor were evaluated to determine which variables significantly predicted the outcome variable (James et al., 2013). Results were evaluated by exploring each predictor and their associated *t*-statistics and *p*-values, which provides information on whether there is significant association between the predictor and the outcome variable. In addition, the coefficients were interpreted as the effect on the outcome for every 1-unit change in the predictor, while holding all other variables constant (James et al., 2013). As such, the effect of ADHD symptoms and severity on PAQ scores were able to be examined while holding gender and group constant.

Each models R^2 were evaluated as the proportion of variance, in the outcome variable, that may be predicted by the value of the predictors. Interpretation guidelines suggest that an R^2 value closer to 1 indicates that the model explains a large portion of the variance in the outcome variable (James et al., 2013). Finally, for each significant individual predictor, the semi-partial r^2 (sr^2) was used as an indicator of effect size for the unique contribution of that predictor. The semi-partial r^2 was selected due to the inclusion of categorical predictors across the regression models.

CHAPTER III: RESULTS

Multigroup Path Model

A multigroup path model in which child gender was a predictor of PAQ results for both subscales across the two groups (ADHD and Typically Developing) was conducted. Mean total scores were used across both subscales. Through this analysis, differences in scores on the PAQ and the relationship between PAQ and gender across groups were assessed. That is, differences between the two groups across the PAQ Masculine subscale (PAQ-Masc) and PAQ Feminine subscale (PAQ-Fem) were assessed controlling for child gender.

First, the differences in the intercepts (i.e., the means for each group) regardless of gender were explored. This was conducted by introducing constraints to the intercepts of each PAQ subscale respectively, and comparing the constrained intercept model to a free model with no constraints (e.g., all paths and intercepts were free to vary). When constraining the intercepts of PAQ-Masc and comparing it to the free model, significant differences emerged for the PAQ-Masc between groups, regardless of gender (χ^2 Difference Test = 6.09, df = 1, p = .014). These results suggest that estimates of the intercepts (i.e., mean scores) on PAQ-Masc, regardless of child gender, for the typically developing group was 2.51 and 2.07 for the ADHD group, which indicates that the typically developing group, on average, had higher mean scores on the PAQ-Masc. No significant differences emerged when comparing constrained PAQ-Fem intercepts to the free model (χ^2 Difference Test = .04, df = 1, p = .852). Estimates for the free model are presented in below in Table 6.

To evaluate the relationship between PAQ and gender across groups, a free model, in which all paths were free to vary, was compared to a constrained path model. Results of a χ^2 difference test show that there was a significant difference between the constrained and free

models (χ^2 Difference Test = 28.50, df = 4, $p < .001$). This significant difference implied that some paths may vary and others do not, suggesting there are some differences between groups.

In order to assess specifically which pathways were different between groups, constraints to the regression pathways were sequentially introduced and freed. First, constraints to the regression pathway from gender to PAQ-Masc were introduced (i.e., set as the same between groups) while allowing PAQ-Fem as free to vary (i.e., no constraints; allowed to differ between groups). No significant differences emerged when comparing the PAQ-Masc restricted model to the free model, (χ^2 Difference Test = .23, df = 1, $p = .629$). This result implies that there is no difference between the constrained model and the free model, suggesting that the constraint on PAQ-Masc is valid.

Next, a model was conducted in which constraints were set to the regression pathway from gender to PAQ-Fem while allowing PAQ-Masc pathways free to vary between groups. When comparing the PAQ-Fem restricted model to the free model, significant differences did emerge, (χ^2 Difference Test = 4.53, df = 1, $p = .033$). This result suggests that this pathway should *not* be constrained and should be left to vary between groups.

It can thus be concluded that there are differences between groups and that those differences emerge on PAQ-Fem, but not on PAQ-Masc. Within the PAQ-Masc restricted model, regression coefficients demonstrating the difference in gender on the PAQ show that boys are slightly higher than girls on the PAQ-Masc in both groups. On the PAQ-Fem, scores are higher for boys than girls in the typically developing group and lower for boys than girls in the ADHD sample. The difference between boys and girls is significant (i.e., different from 0) for the typically developing group but not for the ADHD group. Due to model saturation, model fit

statistics are not appropriate or interpretable for the current analysis. Estimates for the free model are presented in Table 6 and estimates for the PAQ-Masc constrained are presented in Table 7.

In conclusion, the hypothesis regarding the range of gender role expression, which was tested through the regression pathways demonstrating the difference in gender on the PAQ show that PAQ-Fem scores are significantly higher for boys than girls in the typically developing group. Within the ADHD sample, PAQ-Fem scores were lower for boys than girls; however, this difference was not significantly different from zero. This result indicates that within the ADHD group, the range of gender role expression across boys and girls on the PAQ-Fem was narrower than those in the typically developing group. The hypothesis that children with ADHD would show less variability in their gender role expression than typically developing children was partially confirmed through the analysis; however, this only applied to feminine gender roles and not for masculine gender roles. The results from a test of intercepts (i.e., group means) show that the typically developing group, on average, had higher mean scores on the PAQ-Masc than the ADHD group. This appears to be inconsistent with the theoretical framework of the current study, suggesting that children with ADHD may *not* be perceived as more masculine than children without ADHD.

Table 6

Multigroup Path Model Estimates for Free Model

Estimates	*b*	*se*	*z*	*p*
Typically Developing Group				
Regressions				
PAQ-Masc ~ Gender	0.14	0.13	1.07	.286
PAQ-Fem ~ Gender	0.26	0.12	2.12	.034
Covariances				
PAQ-Masc ~~PAQ-Fem	0.26	0.07	3.95	< .001
Intercepts				

Estimates	*b*	*se*	*z*	*p*
PAQ-Masc	2.51	0.09	27.77	< .001
PAQ-Fem	2.68	0.09	29.56	< .001
Variances				
PAQ-Masc	0.52	0.09	8.68	< 0.001
PAQ-Fem	0.49	0.08	6.54	< 0.001
ADHD Group				
Regressions				
PAQ-Masc ~ Gender	0.03	0.17	.19	.847
PAQ-Fem ~ Gender	-0.22	0.19	-1.15	.251
Covariances				
PAQ-Masc ~~PAQ-Fem	0.19	0.06	3.06	.002
Intercepts				
PAQ-Masc	2.07	0.15	13.75	< .001
PAQ-Fem	2.64	0.16	16.32	< .001
Variances				
PAQ-Masc	0.47	0.06	7.61	< .001
PAQ-Fem	0.62	0.09	6.98	< .001

Note: Gender coded as 0 = girls, 1 = boys.

Table 7

Multigroup Path Model Estimates for PAQ-Masc Constrained Model

Estimates	*b*	*se*	*z*	*p*
Typically Developing Group				
Regressions				
PAQ-Masc ~ Gender (b2)	0.096	0.10	.92	.355
PAQ-Fem ~ Gender	0.24	0.12	2.05	.040
Covariances				
PAQ-Masc ~~PAQ-Fem	0.26	0.07	3.95	< .001
Intercepts				
PAQ-Masc	2.53	0.08	30.82	< .001
PAQ-Fem	2.69	0.09	30.56	< .001

Estimates	*b*	*se*	*z*	*p*
Variances				
PAQ-Masc	0.52	0.06	8.70	< .001
PAQ-Fem	0.49	0.08	6.54	< .001
	ADHD Group			
Regressions				
PAQ-Masc ~ Gender (b2)	0.096	0.10	.92	.355
PAQ-Fem ~ Gender	-0.19	0.18	-1.10	.270
Covariances				
PAQ-Masc~~ PAQ-Fem	0.19	0.06	3.06	.002
Intercepts				
PAQ-Masc	2.02	0.11	18.67	< .001
PAQ-Fem	2.63	0.15	17.42	< .001
Variances				
PAQ-Masc	0.47	0.06	7.58	< .001
PAQ-Fem	0.62	0.09	6.98	< .001

Note: Gender coded as 0 = girls, 1 = boys.

Coded Data

Correlations with PAQ Subscales

Due to the dated status of the PAQ, the coded responses were used an additional indicator of parent-reported gender role expression in children. Correlation analyses were conducted across the full sample to determine the relationship between the masculine and feminine coded variables and the PAQ subscales using a point-biserial correlation (two-tailed). Results show that the coded Feminine variable (% Yes = 45.8, % No = 54.2) had a significant positive correlation to the total mean scores on the PAQ-Fem subscale (M = 2.67, SD = .78), $r_{pb}(231) = .16$, $p = .018$. However, the Masculine coded variable (% Yes = 58.0, % No = 42.0) was not significantly

related to the PAQ-Masc subscale (M = 2.38, SD = .76), $r_{pb}(230)$= .003, p = .960. A correlation matrix across all study variables, including the coded variables, is provided in Appendix E.

Logistic Regressions

In order to assess the hypotheses that children with ADHD would be less likely to be coded as feminine and more likely to be coded as masculine, a series of logistic regressions were conducted across the coded Masculine and Feminine variables in which the coded variables were predicted by group and gender in each analysis. Additional exploratory tests were also conducted across the Neither and Both coded variables. Additional models were conducted to assess the interaction between gender and group on each coded variable. Summary statistics of the means and standard deviations by group, as well as across the full sample are provided above in Table 4. Means and standard deviations for gender by group are presented in Table 5 above.

Masculine by Group and Gender

A logistic regression in which Masculine (0 = No, 1 = Yes) was predicted by Group (0 = Non-ADHD Sample, 1 = ADHD Sample) and Gender (0 = girls, 1 = boys). The reference category was the last code for each group (1). The full model did not fit better than a null model with only an intercept, $\chi^2(2) = 1.39$, p = .498, *Nagelkerke* R^2 = .009. Results show that no predictor had a significant effect on predicting Masculine codes. An additional logistic regression was conducted to test for the interaction between gender and group; results show that there was not a significant interaction. Results are presented in Table 8 below. The results of the current analysis do not appear to support the hypothesis that coded masculine variables will be predicted by group and gender.

Table 8

Logistic Regression for Masculine by Group and Gender

Predictor	*b*	*se*	*Wald* χ^2	*p*	*Odds ratio*	*Odds Ratio 95% CI*	
Masculine by Group and Gender, No Interaction Term							
Gender	.11	.29	.15	.700	1.12	.64	1.96
Group	-.29	.29	.98	.321	.75	.42	1.33
Constant	0.44	.29	2.20	.138	1.55		
Masculine by Group and Gender, With Interaction Term							
Gender	.55	.47	1.38	.239	1.73	.69	4.33
Group	.12	.45	0.07	.791	1.13	.47	2.72
Gender*Group	-.70	.59	1.41	.235	.50	.16	.71
Constant	.14	.38	0.14	.706	1.15		

Note. * Indicates an interaction term between the two variables listed

Feminine by Group and Gender

A logistic regression in which Feminine (0 = No, 1 = Yes) was predicted by Group (0 = Non-ADHD Sample, 1 = ADHD Sample) and Gender (0 = girls, 1 = boys). The reference category was the last code for each group (1). Results are presented in Table 9 below. The full model did not fit better than a null model with only an intercept, $\chi^2(2) = .70$, $p = .704$, *Nagelkerke* $R^2 = .004$. Results show that no predictor had a significant effect on predicting Feminine codes.

An additional logistic regression was conducted to test for the interaction between gender and group; results show that there was a significant interaction. The interaction was probed by testing the conditional effects of group at both levels of gender. As shown in Table 2, group had a significant negative relationship to Feminine codes when gender was zero (representing girls), but not when gender was one (representing boys). For the significant relationship across girls, the odds ratio shows that in the ADHD sample, girls are .39 times less

likely to be coded as feminine than in the non-ADHD sample. The odds ratio also implies that in the typically developing sample, girls are 2.56 times *more* likely to be coded as feminine than the ADHD sample. There was no difference in the odds of being coded as feminine for boys. The results of the current analysis appear to partially confirm the hypothesis that those in the ADHD would be less likely to be coded as feminine than those in the ADHD sample; however, this relationship only emerged for girls and not for boys.

Table 9

Logistic Regression for Feminine by Group and Gender

Predictor	*b*	*se*	*Wald* χ^2	*p*	*Odds ratio*	*Odds Ratio 95% CI*	
Feminine by Group and Gender, No Interaction Term							
Gender	.16	.29	.30	.584	1.17	.67	2.05
Group	.22	.29	.55	.457	1.24	.70	2.19
Constant	-.38	.29	1.71	.190	.68		
Feminine by Group and Gender, With Interaction Term							
Gender	.92	.49	3.47	.062	2.50	.95	6.55
Group	.95	.48	3.84	.050	2.57	1.00	6.63
Gender*Group	-1.20	.61	3.86	.049	.30	.09	.997
Constant	-.92	.42	4.80	.028	.40		
Conditional Effects of Group at Gender							
Gender = 0 (girls)	-.95	.48	-1.96	.050	.39		
Gender = 1 (boys)	.26	.38	.68	.495	1.29		

Note. * Indicates an interaction term between the two variables listed. Odds ratios listed for Conditional Effects of Group at Gender are the exponent of the coefficients.

Neither by Group and Gender

A logistic regression in which Neither (0 = No, 1 = Yes) was predicted by Group (0 = Non-ADHD Sample, 1 = ADHD Sample) and Gender (0 = girls, 1 = boys). The reference

category was the last code for each group (1). Results are presented in Table 10 below. The full model did not fit better than a null model with only an intercept, $\chi^2(2) = .70$, $p = .706$, *Nagelkerke* $R^2 = .005$. Results show that no predictor had a significant effect on predicting whether neither theme (i.e., neither masculine nor feminine) emerged across coded data from the open-ended question.

An additional logistic regression was conducted to test for the interaction between gender and group; results show that there was a significant interaction. The interaction was probed by testing the conditional effects of group at both levels of gender. As shown in Table 3, group had a significant positive relationship to Neither codes when gender was zero (representing girls), but not when gender was one (representing boys). The odds ratio for the significant relationship across girls shows that, in the ADHD sample, girls are 2.79 times more likely to be coded as neither compared to girls in the typically developing sample. This ratio can also be interpreted as showing that girls in the typically developing sample are .36 times *less* likely to be coded as neither than girls in the ADHD sample. There was no difference in the odds of being coded as neither for boys.

Although the current analysis was exploratory, the results appear to be partially consistent with the hypothesis that children with ADHD would show narrower gender role expression than typically developing children. That is, specifically for girls, the likelihood of being coded as *neither* masculine nor feminine was significantly greater than girls in the typically developing sample.

Table 10

Logistic Regression for Neither by Group and Gender

Predictor	*b*	*se*	*Wald* χ^2	*p*	*Odds ratio*	*Odds Ratio 95% CI*	
Neither by Group and Gender, Without Interaction Term							
Gender	-.26	.37	.50	.481	.77	.37	1.59
Group	-.22	.37	.36	.548	.80	.39	1.66
Constant	-1.26	.36	12.10	.001	.26		
Neither by Group and Gender, With Interaction Term							
Gender	-1.13	.56	4.11	.043	.33	.11	.96
Group	-1.03	.53	3.76	.052	.36	.13	1.01
Gender*Group	1.51	.73	4.52	.039	4.54	1.08	19.14
Constant	-.75	.41	3.41	.065	.47		
Conditional Effects of Group at Gender							
Gender = 0 (girls)	1.03	.53	1.94	.052	2.79		
Gender = 1 (boys)	-.49	.51	-.96	.339	.62		

Note. * Indicates an interaction term between the two variables listed. Odds ratios listed for Conditional Effects of Group at Gender are the exponent of the coefficients.

Both by Group and Gender

A logistic regression in which Both (0=No, 1=Yes) was predicted by Group (0 = Non-ADHD Sample, 1 = ADHD Sample) and Gender (0 = girls, 1 = boys). The reference category was the last code for each group (1). The full model did not fit better than a null model with only an intercept, $\chi^2(2) = 1.18$, $p = .555$, *Nagelkerke* $R^2 = .009$. Results show that no predictor had a significant effect on predicting whether or not both themes (i.e., both masculine and feminine) emerged across coded data from the open-ended question. An additional logistic regression was conducted to test for the interaction between gender and group; results show that there was not a significant interaction. Results are presented in Table 11 below.

Table 11

Logistic Regression for Both by Group and Gender

Predictor	*b*	*se*	*Wald* χ^2	*p*	*Odds ratio*	*Odds Ratio 95% CI*	
Both by Group and Gender, Without Interaction Term							
Gender	.16	.35	.22	.639	1.18	.60	2.33
Group	-.29	.35	.71	.400	.75	0.38	1.47
Constant	-1.21	.35	12.24	> .001	.30		
Both by Group and Gender, With Interaction Term							
Gender	.94	.61	2.40	.121	2.57	.78	8.49
Group	0.51	.61	.69	.405	1.68	.50	5.55
Gender*Group	-1.30	.77	2.85	.092	4.54	1.08	19.14
Constant	-1.79	.54	11.01	.001	.17		

Note. * Indicates an interaction term between the two variables listed.

Multiple Regressions

In order to test the hypotheses that ADHD Total symptoms will be positively associated with masculine gender role expression and negatively associated with feminine gender role expression, a series of multiple linear regressions were conducted with group, gender, and ADHD symptoms predicting results on the PAQ subscales. Due to the psychometric structure of the ADHD-5-RS, four subscales consisting of ADHD inattentive symptoms (ADHD-IN) and ADHD inattentive symptom severity (ADHD-IN-SS), as well as ADHD hyperactive symptoms (ADHD-HY) and ADHD hyperactive symptom severity (ADHD-HY-SS) were also evaluated as additional exploratory analyses. Mean total scores were used across all subscales for both the ADHD-5-RS and the PAQ.

ADHD Symptoms Predicting PAQ-Fem

A series of multiple linear regression models were conducted to investigate the relationship between group, gender, and ADHD scores (ADHD Total scores, ADHD-IN and

ADHD-HY symptoms, and ADHD-IN-SS & ADHD-HY-SS) on the Feminine subscale of the PAQ (PAQ-Fem). The coefficients, standard errors, t-values, and p-values for each regression model are presented in Table 12 below.

First, a model in which ADHD Total scores, group, and gender predicted PAQ-Fem scores was conducted. The overall model was significant, indicating that at least one of the predictor variables is significantly related to the outcome variable, R^2 = .06, $F(3, 206) = 4.49$, $p = .004$. The R^2 suggests that 6% of the variation in PAQ-Fem scores can be explained by the model containing ADHD Total scores, group, and gender. There was a significant negative relationship between ADHD Total Scores ($t[205] = -2.83$, $p = .005$, $b = -.20$) and PAQ-Fem scores. The relationship indicates that as ADHD Total Scores increase, PAQ-Fem decreases, controlling for group and gender. The effect size, as indicated by the semi-partial r^2, of ADHD Total scores was .08, suggesting that ADHD Total scores uniquely predicted 8% of the variance in PAQ-Fem. Group and gender were not significant predictors.

In order to observe the relationship between group, gender, and ADHD symptoms and severity, additional exploratory tests were conducted across the ADHD-IN, ADHD-IN-SS, ADHD-HY, and ADHD-HY-SS subscales of the ADHD-RS-5. First, ADHD-IN, group, and gender, were included in a regression model to predict scores on the PAQ-Fem. The overall model was significant, indicating that at least one of the predictor variables is significantly related to the outcome variable, R^2 = .07, $F(3, 206) = 5.31$, $p < .001$. The R^2 suggests that 7% of the variation in PAQ-Fem can be explained by the model containing ADHD-IN, group sample, and gender. There was a significant negative relationship between ADHD-IN symptoms ($t[206] = -.22$, $p = .009$, $b = -.22$) and PAQ-Fem scores, $sr^2_{ADHD-IN}$ = .032 (3.2%). The relationship

indicates that as ADHD-IN increases, PAQ-Fem decreases, controlling for group and gender. Group and gender were not significant predictors.

In the third model, ADHD-IN-SS, group, and gender on PAQ-Fem scores. The overall model was significant, indicating that at least one of the predictor variables is significantly related to the outcome variable, R^2 = .08, $F(3, 205) = 5.65$, $p < .001$. The R^2 suggests that 8% of the variation in PAQ-Fem scores can be explained by the model containing ADHD-IN-SS, group sample, and gender. Of the predictors, there was a significant negative relationship between ADHD-IN-SS and PAQ-Fem scores ($t[205] = -2.83$, $p = .005$, $b = -.24$, $sr^2_{ADHD-IN-SS} = .036$ [3.6%]), indicating that increases in ADHD-IN-SS are associated with decreases in PAQ-Fem scores and vice versa, controlling for group sample and gender. Gender and group sample were not significant predictors.

Next, the relationship between ADHD-HY symptoms, group, and gender, on PAQ-Feminine scores was analyzed. The overall model was significant, R^2 = .05, $F(3, 206) = 3.37$, $p = .020$. The R^2 suggests that 5% of the variation in PAQ-Fem scores can be explained by the model containing ADHD hyperactive symptoms, group sample, and gender. There were no significant individual predictors in the model.

Finally, the relationship between ADHD-HY-SS, group, and gender, on PAQ-Fem scores was examined. The overall model was significant, indicating that at least one of the predictor variables is significantly related to the outcome variable, R^2 = .08, $F(3, 206) = 5.97$, $p < .001$. The R^2 suggests that 8% of the variation in PAQ-Fem scores can be explained by the model containing ADHD-HY-SS, group, and gender. There was a significant negative relationship between ADHD-HY-SS ($t[206] = -.24$, $p = .003$, $b = -.24$) and PAQ-Fem scores, $sr^2_{ADHD-HY-SS} = .040$ (4%). The relationship indicates that as ADHD-HY-SS increase, PAQ-

Fem decreases, controlling for group and gender. Group sample and gender were not significant predictors of PAQ Feminine scores.

Overall, these results appear to confirm the hypothesis that ADHD Total symptoms will be negatively associated with feminine gender role expression, as indicated by the significant negative relationship between ADHD Total scores and PAQ-Fem, in which ADHD Total scores accounted for 8% of the unique variance in the overall model. In addition, the results from the planned post-hoc tests across ADHD subtype symptoms and severity appear to provide further support for the hypothesis, with all subscales, except for ADHD-HY, having a significant negative relationship to PAQ-Fem scores. Results are presented in Table 12 below.

Table 12

Multiple Regression with ADHD-5-RS Subscales Predicting PAQ-Fem Scores

Predictor	*b*	*se*	*t*	*p*	sr^2
ADHD Total Scores predicting PAQ-Fem					
Intercept	2.88	0.10	29.19	< .001	
ADHD Total	-0.20	0.09	-2.15	.033	.080
Gender	0.08	0.11	.72	.475	.002
Group	-0.09	0.15	-.60	.549	.002
ADHD-IN predicting PAQ-Fem					
Intercept	2.91	0.10	29.31	< .001	
ADHDIn	-0.22	0.08	-2.65	.009	.032
Gender	0.07	0.11	.65	.516	.002
Group	-0.04	0.15	-.25	.803	.003
ADHD-IN-SS predicting PAQ-Fem					
Intercept	2.87	0.09	31.79	< .001	
ADHD-IN-SS	-0.24	0.08	-2.83	.005	.036
Gender	0.07	0.11	.62	.535	.002

Predictor	*b*	*se*	*t*	*p*	sr^2
Group	-0.10	0.13	-.79	.432	.003
ADHD-HY predicting PAQ-Fem					
Intercept	2.80	0.09	30.51	< .001	
ADHD-HY	-0.10	0.08	-1.19	.237	.007
Gender	0.08	0.11	0.75	.455	.003
Group	-0.22	0.14	-1.63	.104	.012
ADHD-HY-SS predicting PAQ-Fem					
Intercept	2.86	0.09	32.74	< .001	
ADHD-HY-SS	-0.24	0.01	-2.98	.003	.040
Gender	0.09	0.11	.82	.416	.003
Group	-0.11	0.13	-.82	.415	.003

ADHD Symptoms Predicting PAQ-Masc

A series of multiple linear regression models were conducted to investigate the relationship between group, gender, and ADHD scores (ADHD Total scores, ADHD-IN and ADHD-HY symptoms, and ADHD-IN-SS & ADHD-HY-SS) on the Masculine subscale of the PAQ (PAQ-Masc). The coefficients, standard errors, t-values, and p-values for each model are presented in Table 13 below.

First, a model in which ADHD Total scores, group, and gender predicted PAQ-Masc scores was conducted. The overall model was significant, indicating that at least one of the predictor variables is significantly related to the outcome variable, R^2 = .14, $F(3, 205) = 10.86$, $p < .001$. The Adjusted R^2 suggests that 14% of the variation in PAQ-Masc scores can be explained by the model containing ADHD Total scores, group sample, and gender. There was a significant negative relationship between ADHD Total Scores ($t[205] = -2.83$, $p = .005$, $b = -.25$) and PAQ-Masc scores. The relationship indicates that as ADHD Total Scores increase, PAQ-Masc

decreases, controlling for group and gender. The effect size of ADHD Total Scores, as indicated by the semi-partial r^2, was .033, suggesting that ADHD Total Scores uniquely predicted 3.3% of the variance in PAQ-Fem. Group and gender were not significant predictors.

In order to observe the relationship between group, gender, and ADHD symptoms and severity, additional exploratory tests were conducted across the ADHD-IN, ADHD-IN-SS, ADHD-HY, and ADHD-HY-SS subscales of the ADHD-RS-5. First, a multiple linear regression was carried out to investigate the relationship between ADHD-IN symptoms, group, gender, and PAQ-Masc scores. The overall model was significant, indicating that at least one of the predictor variables is significantly related to the outcome variable, R^2 = .17, $F(3, 205) = 14.31$, $p < .001$. The Adjusted R^2 suggests that 17% of the variation in PAQ-Masc scores can be explained by the model containing ADHD-IN, group, and gender. There was a significant negative relationship between ADHD-IN ($t[205] = -4.15$, $p < .001$, $b = -.32$) and PAQ-Masc scores, $sr^2_{ADHD-IN}$ = .070 (7%). The relationship indicates that as ADHD-IN increases, PAQ Masculine decreases, controlling for group and gender. Group and gender were not significant predictors of PAQ-Masc.

Next, the relationship between ADHD-IN-SS, group sample, gender, on PAQ-Masc scores was assessed. The overall model was significant, indicating that at least one of the predictor variables is significantly related to the outcome variable, R^2 = .16, $F(3, 204) = 12.83$, $p < .001$. The Adjusted R^2 suggests that 16% of the variation in PAQ-Masc scores can be explained by the model containing ADHD-IN-SS, group sample, and gender. There was a significant negative relationship between ADHD-IN-SS ($t[204] = -1.19$, $p < .001$, $b = -.28$) and PAQ-Masc, $sr^2_{ADHD-IN-SS}$ = .053 (5.3%). The relationship indicates that as ADHD-IN-SS increases, PAQ-Masc decreases, controlling for group and gender. Group was also a significant predictor of

PAQ-Masc scores, $t(204) = -1.10$, $p = .047$, $b = -.25$, $sr^2_{Group} = .016$ (1.6%). The relationship indicates that the group coded as 1 (ADHD sample) has higher means, when controlling for ADHD-IN-SS, than the group coded as 0 (typically developing sample). Gender was not a significant predictor of PAQ-Masc.

A multiple linear regression was carried out to investigate the relationship between ADHD-HY, group, gender, and PAQ-Masc scores. The overall model was significant, indicating that at least one of the predictor variables is significantly related to the outcome variable, $R^2 = .11$, $F(3, 205) = 8.22$, $p < .001$. The R^2 suggests that 11% of the variation in PAQ-Masc scores can be explained by the model containing ADHD-HY, group, and gender. There was a significant negative relationship between group and PAQ-Masc scores, $t(205) = -3.34$, $p = .001$, $b = -.43$, $sr^2_{Group} = .048$ (4.8%). The relationship indicates that the group coded as 1 (ADHD sample) has higher means, when controlling for ADHD-IN-SS, than the group coded as 0 (typically developing sample). Gender was not a significant predictor of PAQ-Masc. Gender and ADHD-HY symptoms were not significant individual predictors.

The relationship between ADHD-HY-SS, group, and gender on PAQ-Masc scores was examined. The overall model was significant, indicating that at least one of the predictor variables is significantly related to the outcome variable, $R^2 = .13$, $F(3, 205) = 9.91$, $p < .001$. The Adjusted R^2 suggests that 13% of the variation in PAQ-Masc scores can be explained by the model containing ADHD-HY-SS, group sample, and gender. There was a significant negative relationship between ADHD-HY-SS ($t[205] = -.18$, $p = .021$, $b = -.18$) and PAQ-Masc scores, $sr^2_{ADHD-HY-SS} = .023$ (2.3%). The relationship indicates that as ADHD-HY-SS increases, PAQ Masculine decreases, controlling for group and gender. Group was also a significant predictor of PAQ-Masc scores, $t(205) = -.34$, $p = .006$, $b = -.34$, $sr^2_{Group} = .033$ (3.3%). The relationship

indicates that as group increases (i.e., from 0 [typically developing group] to 1 [ADHD group]), PAQ-Masc decreases, and vice versa, regardless of ADHD-HY-SS and gender. Gender was not a significant predictor.

Overall, these results appear inconsistent with the hypothesis that ADHD Total symptoms will be positively associated with masculine gender role expression. In fact, the result appears to suggest the opposite relationship, as indicated by the significant negative relationship between ADHD Total scores and PAQ-Masc, in which ADHD Total scores accounted for 3.3% of the unique variance in the overall model. In addition, the results from the planned post-hoc tests across ADHD subtype symptoms and severity appear to be inconsistent with the hypothesis as well, with all subscales having a significant negative relationship to PAQ-Masc scores. Results are presented in Table 13 below.

Table 13

Multiple Regression with ADHD-5-RS Subscales Predicting PAQ-Masc Scores

Predictor	*b*	*se*	*t*	*p*	sr^2
ADHD Total Scores predicting PAQ-Masc					
Intercept	2.67	0.09	28.82	< .001	
ADHD Total	-0.25	0.09	-2.83	.005	.033
Gender	0.10	0.10	1.02	.307	.004
Group	-0.22	0.14	-1.57	.118	.010
ADHD-IN predicting PAQ-Masc					
Intercept	2.75	0.09	29.86	< .001	
ADHD-IN	-0.32	0.08	-4.15	< .001	.070
Gender	0.09	0.10	.93	0.353	.003
Group	-0.10	0.14	-.70	0.484	.016
ADHD-IN-SS predicting PAQ-Masc					
Intercept	2.66	0.08	31.54	< .001	

Predictor	*b*	*se*	*t*	*p*	sr^2
ADHD-IN-SS	-0.28	0.08	-3.60	.004	.053
Gender	0.09	0.10	.88	.381	.003
Group	-0.25	0.12	-1.996	.047	.016
ADHD-HY predicting PAQ-Masc					
Intercept	2.56	0.09	29.39	< .001	
ADHD-HY	-0.08	0.08	-.94	.348	.004
Gender	0.11	0.10	1.04	.298	.005
Group	-0.43	0.13	-3.34	.001	.048
ADHD-HY-SS predicting PAQ-Masc					
Intercept	2.60	0.08	31.28	< .001	
ADHD-HY-SS	-0.18	0.08	-2.33	.021	.023
Gender	0.11	0.10	1.10	.271	.005
Group	-0.34	0.12	-2.78	.006	.033

CHAPTER IV: DISCUSSION

The current study explored whether or not there are differences in the perceived gender role expressions of children with ADHD compared to children without ADHD. Results from a test of intercepts through the multigroup path model show that the typically developing group, on average, had higher mean scores on the PAQ-Masc than the ADHD group. This appears to be inconsistent with the theoretical framework of the current study, suggesting that children with ADHD may *not* be perceived as more masculine than children without ADHD.

The hypothesis that there will be smaller differences between genders on gender roles within the ADHD sample as compared to the typically developing sample was partially confirmed through observing the regression pathways in the multigroup path model. The regression coefficients demonstrating the difference in gender on the PAQ show that PAQ-Fem scores are significantly higher for boys than girls in the typically developing group. Within the ADHD sample, the differences between boys and girls on the PAQ-Fem was not significantly different from zero. This finding suggests that in the ADHD group, there were smaller differences between genders on the PAQ-Fem, but not the PAQ-Masc.

Due to the dated nature of the PAQ, qualitative responses coded for gendered content were used as a second indicator of parent-reported gender role expression in children. The coded variables were used to test the hypotheses that children in the ADHD group will be less likely to be coded as feminine than those in the typically developing group, and more more likely to be coded as masculine than those in the typically developing group. Results of a logistic regression and significant interaction partially confirmed the hypothesis that children with ADHD would be less likely to be coded as feminine than those in the typically developing group. The hypothesis was partially confirmed because this pattern only emerged for girls and was not significant for

boys. The hypothesis that children with ADHD would be more likely to be coded as masculine was not confirmed in the current study; results showed no significant predictors nor a significant interaction when assessing masculine codes. The additional exploratory tests assessing whether neither coded variable showed additional support for the hypothesis that children with ADHD would show narrower gender role expression than typically developing children; that is, girls in the ADHD sample were significantly more likely to be coded as being neither masculine nor feminine than girls in the typically developing sample. This pattern did not emerge across groups for boys.

Finally, to test the hypothesis that ADHD Total symptoms will be positively associated with masculine gender role expression and negatively associated with feminine gender role expression, a series of multiple regressions were conducted predicting PAQ scores. Overall, the results from the analyses predicting PAQ-Fem appear to confirm the hypothesis that ADHD Total symptoms will be negatively associated with feminine gender role expression. In addition, the results from the planned exploratory tests across ADHD subtype symptoms and severity appear to provide further support for the hypothesis, with all subscales except for ADHD-HY having a significant negative relationship to PAQ-Fem scores.

In contrast, when assessing the relationship between ADHD scores and PAQ-Masc, results appear inconsistent with the hypothesis that ADHD Total symptoms will be positively associated with masculine gender role expression. In fact, the results appear to suggest the opposite relationship. In addition, the results from the planned exploratory tests across ADHD subtype symptoms and severity appear to be inconsistent with the hypothesis as well, with all subscales having a significant negative relationship to PAQ-Masc scores.

It appears as though ADHD symptoms and severity do not correspond as highly with boy gender roles than hypothesized by the current theoretical framework. In contrast to results predicting PAQ-Masc, the results predicting PAQ-Fem appear consistent with the assumptions of the current framework. Despite the bipolar structure of the PAQ, contradictory results such as these appear to confirm the multidimensionality of gender role expression, such that masculinity and femininity are not two ends of the same spectrum (i.e., being high in one area corresponds to being low in the other), but instead two separate constructs in which individuals can vary across both, being high in one area and high in the theoretical opposite dimension as well, and vice versa.

Consistencies between male gender roles and ADHD symptoms can be qualitatively and visually observed, and it is easily assumed that male gender roles are closely related to the symptoms commonly observed in ADHD (Mowlem et al., 2019). But despite the clear qualitative overlap, it is unknown why the current study did not reflect this quantitively. A speculative explanation for the negative relationship between ADHD symptoms and male gender roles may have to do with the emotional lability and emotional reactivity often observed in individuals with ADHD. Although emotionality is not a core symptom of the disorder, it is a commonly observed associated feature. It may be that perhaps at face-value, through the public understanding of ADHD, ADHD symptoms appear to be closely aligned with male gender roles; however, in practice, through parent report and perceptions, the emotional manifestation of ADHD symptoms is better captured.

Allowing for the implied multidimensionality of most psychological attributes, it appears that ADHD symptoms and children with ADHD may not be as strongly associated with boy gender roles as implied by the current theoretical framework. However, the results of the current

study also suggest that they are not in line with girl gender roles either, which provides tentative support for the current framework, particularly for girls. The results of the current study suggest that ADHD symptoms and severity are negatively associated with feminine gender roles, and that girls with ADHD demonstrated a narrower range in gender role expression than girls without ADHD, which may explain why stakeholders fail to accurately identify ADHD in girls. Based on these data, there is inconclusive support for the hypotheses testing the current theoretical framework.

Although the theoretical framework was not confirmed through the study, the results point to an interesting pattern that may indicate a changing gender role landscape for boys, in which boys in the ADHD sample are perceived as being more feminine than expected based on the theoretical framework and traditional gender roles. In addition, it appears as though girls with ADHD may be perceived by parents as being less feminine, which may have clinical implications regarding the personality attributes of young girls being presented and referred to clinics. In contrast, boys with ADHD within the current sample were perceived by parents as being less masculine than would be expected. This finding may also have clinical implications regarding the personality attributes of young boys being presented to clinic settings. It is noteworthy to discuss the unique ADHD sample recruited through the current study, which consisted of predominantly low income and African American parents of children from eastern North Carolina. The unique sample may provide insight into patterns of parent perception of gender roles for boys and girls with ADHD for this narrow population. In addition, the unique sample has implications for the interpretation and generalizability of results. As such, the current study has several limitations that may explain the lack of conclusive support for the proposed theoretical framework.

Limitations

The current study has several limitations in methodology and in generalizability. First, the study focused on two samples of similar demographics, of which data were obtained through different recruitment and study procedures. The differences in the recruitment and study procedures between the two groups is a limitation of the current study. In the ADHD group, data were gathered through pencil-paper surveys from parents while they waited for their children to complete a focus group study. Many parents attended the focus group session with multiple children to care for while they waited, suggesting that parents may have been distracted while completing the surveys. In addition, the paper-pencil nature of the survey allows more room for fatigue to confound results than do online surveys. In contrast, the typically developing data was obtained through online survey software, allowing parents to take the study at flexible times, perhaps with less distractions than the ADHD group parents; in addition, the online element of the study likely reduced the effects of fatigue interfering with the accuracy of results. The high genetic heritability of the disorder suggests that it is possible some of the parents of children with ADHD may have ADHD themselves, which, especially when in a distracting environment, may have further confounds on the accuracy of results. Another recruitment limitation has to do with the nature of the studies; the focus group study by which the ADHD sample was obtained from was a focus group for a video game, thus children likely self-selected to be included in the study, whereas in the online sample participation was likely driven exclusively by the parents.

Second, the current study had narrow demographics that are unlikely to be generalizable to the population; the study included primarily African American participants with a yearly household income below $60,000. Although, this can be considered a strength of the study, given that most psychological studies include predominantly white middle class participants and the

data that show African American children may be underdiagnosed with ADHD and undertreated (Coker et al., 2016). Despite this, it is also a limitation given the complex intersectionality of race and gender, which likely not only limit the generalizability of results, but also have a confounding effect on the interpretation of results.

The ADHD sample recruitment took place in eastern North Carolina, a rural and low-income area with southern culture. Therefore, the current study provides unique insight into parent gender role perceptions within this community. It is possible that due to racial tension in the United States, Black parents strive to foster feminine gender role traits in their male children in order to protect them from negative stereotypes harming the Black community, such as being angry or threatening (Sesko & Biernat, 2010). Relatedly, it is also possible that the parents in this study demonstrated a response bias in a similar way to protect their children or influence others' perception of their children, by rating their children as being high in femininity even if the ratings may not align with actual behavior. However, following this logical process would lead to an assumption that parents would rate their daughters as high in femininity as well, given the various harmful negative stereotypes about angry or aggressive Black women in particular (Sesko & Biernat, 2010). A similar pattern for girls with ADHD was not found in the current study. That is, although the girls in the ADHD sample were not necessarily rated as high in masculine traits, they were not rated as high in feminine traits either. This finding appears to be somewhat consistent with the pervasive stereotypes that suggest that Black women are perceived as more masculine and less feminine (Sesko & Biernat, 2010). The complex intersection between ADHD, gender roles, race, and the pervasive stereotypes accompanying each provide nuanced limitations to the interpretation of the current studies results. Future research may be interested in exploring these intersections.

In addition, the results may not be generalizable to children outside of the current studies age parameters (12-14 years old). The age group was selected because it represents a developmental period in which they are likely to have already received a diagnosis. In addition, middle school represents a time in which internalized gender roles become slightly more flexible; as such, the results of gender role expression would not be confounded by the concrete thinking styles in earlier developmental stages (Weisgram, 2013).

Third, the PAQ is a dated instrument that was selected due to its frequent use throughout gender studies literature and, in contrast to the BSRI, had been used before in children and parent-report contexts. However, it is an imperfect instrument that was not originally created with the intention of measuring parent-report of gender roles in their children. As such, results on the PAQ from the current study may not reflect what the device intended to measure during its initial construction (i.e., self-report gender-roles and attributes). The PAQ may not be the best, most recent, or most applicable measurement device to measure parent-report gender roles of their children. Perhaps an updated measure of gender roles that is appropriate to use in other-report contexts (i.e., not solely self-report) would have been better fit for the current study, but to the researchers knowledge, no better alternative exists. In order to account for the flaws of the PAQ, a second indicator of gender role expression was utilized (i.e., coded open-ended responses); however, the masculine coded responses were not correlated with the masculine PAQ subscale, which is another limitation.

Although, even if a better fit instrument was employed, the social and subjective nature of gender-related constructs make self- and other-report data prone to bias. Gender stereotypes often reflect the idealized and simplified beliefs of how an individual "should" behave, and as such, the items measuring each construct are typically deemed socially desirable and expected

for a given gender (Eagly & Wood, 2012; Haines et al., 2016). Therefore, observers or raters are likely to have their own bias interfere with the accuracy of results (Eagly & Wood, 2012). Because it was not possible to measure parent-report data in a way they are blind to their child's gender, the possibility that the responses to on the PAQ represent parents' personal beliefs about gender and beliefs regarding their child's gender is high. This limitation persists in the evaluation of open-ended responses for the coded variables, in which parents may describe their child in a manner consistent with how they believe their child should behave. Data show that parent perception of child gender-related attributes is complex; it is partly dependent on their own stereotypic beliefs of boys and girls generally, partly related to an expectancy bias, and partly related to their unique knowledge about their child (Eccles et al., 1990). Relatedly, another limitation of the study is the fact that parent report data was used rather than child report of gender-related constructs. However, since children do not self-refer for ADHD diagnoses or treatment, but parents can be one of the first to identify symptoms, the use of parent report data was appropriate for the purposes of the study in order to reflect the realistic referral process of ADHD.

In addition, recent data show that more girls are endorsing instrumental traits than they were before, a change attributed to the increased trend of women in the workforce and thus an increase in the self-desirability of appearing and/or being competent (i.e., competency is commonly associated with instrumental/masculine attributes) (Hentschel et al., 2019; Moore, 2007). The changing social landscape, particularly among girls and women, may have influenced the responses of parents who may themselves find competency and other instrumental traits as increasingly desirable for girls and women. Another layer of bias is likely to have emerged in the coding process of parents open-ended responses. All three coders were female, and inter-rater

reliability showed highest reliability among the coding for feminine content, suggesting that the raters own knowledge and experience with girl-related gender roles may have had an influence on the coding process.

Arguably one of the greatest, albeit uncontrollable, limitations was the fact that the study took place during the corona-virus (COVID-19) global pandemic. The implications that the timing of the study have on the interpretability and generalizability of results are vast. The pandemic resulted in an increase of parents working from home while children also attended school from home. These shifts in parenthood and the workforce resulted in parents experiencing frustration, overwhelm, depression, and economic stress (Elder & Greene, 2021). The impact these shifts likely had on children, their behaviors, and the parent-child relationship are likely influencing results of the current study, given that the study relied on parent-report data of their child's behaviors and perceptions of their child.

Future Directions

There are many opportunities for future research to explore the current theoretical framework without the methodological flaws of the current study. For example, future researchers may be interested in examining the current framework through a social-cognitive psychology lens, drawing methodology from research on schematic processing in order to observe the direct influence of gender schemata on parents' perception and recall of ADHD-related behaviors across boys and girls. Future research may also be interested in exploring the current framework throughout a community or population-level sample in order to reduce the likelihood of referral and clinic bias from interfering with results. Finally, given the likelihood of COVID-19 impacting psychological well-being, the current framework may be worth studying again during a less turbulent time in world history.

It is also noteworthy the lack of modern and psychometrically sound instruments measuring gender roles and gender-related attributes, and even more so in the context of other-report measures (i.e., not solely self-report). Future research may benefit from contemporary and updated scale development of gender-related attributes reflecting the changing landscape of gender roles. In addition, future researchers may be interested in examining the differential patterns of stakeholders' perception of ADHD for girls and boys as they relate to the intersections of race, culture, disability, gender roles, and gender.

Due to the introductory and pilot nature of the current study, the scope of the current study was limited and was not intended to broadly cover all possibly related areas across the ADHD literature. As such, there are several other phenomena throughout ADHD literature not examined through the current study that may be explained by extension of the current theoretical framework. For example, social functioning was not an area explored in the current study, but by extension of the current framework, may have profound implications on the knowledge-base of social functioning in girls with ADHD. The data suggesting that deviations from gender-consistent behavior are met with overt or covert negative responses from others may help explain the impaired social functioning observed across girls with ADHD (Diamantopoulou et al., 2005). In addition, although the current framework was not designed to directly address the gender paradox documented in clinic samples in which girls with ADHD are observed to have greater comorbidity and symptom severity, a similar logical process drawing from the current framework can potentially explain such results. The current framework suggests that ADHD symptoms are overlooked or misattributed to something schemata-consistent, and as such, girls presenting with high levels of comorbidity may be more likely to receive a referral for the suspected gender-consistent comorbid disorder (e.g., depression, anxiety) than for their ADHD

symptoms; however, once more objective measures are used by health-care professionals, ADHD diagnoses may be provided in addition to the comorbid disorder. This may explain why the girls represented in clinic samples experience greater severity and comorbidity than boys. Finally, future studies may be interested in observing the emotional lability as a feature of ADHD and its relation to gender role expression.

Conclusion

It is critical to examine the mechanisms behind the gender bias in the referral process of ADHD, given that the gender bias is likely contributing to the diagnosis gap. A diagnosis is often the gateway to services, thus examining the gender bias and subsequent diagnosis gap in childhood is of critical importance to advance women's health, raise awareness, identify early, and intervene early to prevent pervasive and debilitating impairments (Thapar & Cooper, 2016; Novik et al., 2006). Although studies suggesting a potential gender bias are backed by persuasive data (Meyer et al., 2017; Mowlem et al., 2019), to date, no known studies examined the specific mechanisms behind the gender bias resulting in fewer girls being diagnosed with ADHD than boys. As such, the current study was a pilot study in order to investigate the mechanisms behind the gender bias by introducing a novel interdisciplinary conceptual framework for understanding why stakeholders perceive and conceptualize the same behaviors differently according to gender.

To determine the validity of the conceptual framework proposed in this study, a sample of children with ADHD were compared to a sample of children with similar demographics without ADHD across parent-rated ADHD symptoms and gender role expression to determine if differences in the perception of gender role expression exists, as well as examine the relationship between ADHD symptoms and gender roles. Results of the current study are inconclusive in supporting the proposed theoretical framework. Support for hypotheses that children with ADHD

and ADHD symptoms would be positively associated with male gender roles was not found. However, support for the negative relationship between ADHD and feminine gender roles was found, in addition to partial support for the hypothesis that children with ADHD would have a narrower range of gender role expression than children without ADHD.

Given the limitations, pilot nature, and turbulent time in history of the current study, the proposed theoretical framework may find support in other contexts and with other methods. Despite the limitations and inconclusive results, framing ADHD within the context of gender roles and gender schemata in order to understand the gender bias that may result in the diagnosis gap of ADHD is a novel contribution to the literature. In addition, the theoretical framework outlined in this study provides vast opportunities and areas for future research to explore by extending the framework to other phenomena observed throughout the ADHD literature. The implications of the current theoretical framework call for greater attention and awareness to internal biases that contribute to the undervaluing of girl's and women's health in society (Heise et al., 2019).

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APPENDIX A:

IRB APPROVAL LETTER FOR TYPICALLY DEVELOPING SAMPLE

EAST CAROLINA UNIVERSITY
University & Medical Center Institutional Review Board
4N-64 Brody Medical Sciences Building· Mail Stop 682
600 Moye Boulevard · Greenville, NC 27834
Office **252-744-2914** · Fax **252-744-2284** ·
rede.ecu.edu/umcirb/

Notification of Exempt Certification

From: Social/Behavioral IRB
To: Karlie Mirabelli
CC: Brandon Schultz
Date: 8/27/2020
Re: UMCIRB 19-002828
Gender Roles and ADHD

I am pleased to inform you that your research submission has been certified as exempt on 8/27/2020. This study is eligible for Exempt Certification under category # 2b.

It is your responsibility to ensure that this research is conducted in the manner reported in your application and/or protocol, as well as being consistent with the ethical principles of the Belmont Report and your profession.

This research study does not require any additional interaction with the UMCIRB unless there are proposed changes to this study. Any change, prior to implementing that change, must be submitted to the UMCIRB for review and approval. The UMCIRB will determine if the change impacts the eligibility of the research for exempt status. If more substantive review is required, you will be notified within five business days.

Document	Description
Diss_Consent.docx(0.01)	Consent Forms
Disseration Fyler_final1.0.docx(0.02)	Recruitment Documents/Scripts
Dissertation Proposal (0.01)	Study Protocol or Grant Application
Dissertation_Qualtrics Survey_Final.docx(0.01)	Surveys and Questionnaires

For research studies where a waiver or alteration of HIPAA Authorization has been approved, the IRB states that each of the waiver criteria in 45 CFR 164.512(i)(1)(i)(A) and (2)(i) through (v) have been met. Additionally, the elements of PHI to be collected as described in items 1 and 2 of the Application for Waiver of Authorization have been determined to be the minimal necessary for the specified research.

The Chairperson (or designee) does not have a potential for conflict of interest on this study.

APPENDIX B:

IRB APPROVAL LETTER FOR ADHD SAMPLE

EAST CAROLINA UNIVERSITY
University & Medical Center Institutional Review Board
4N-64 Brody Medical Sciences Building- Mail Stop 682
600 Moye Boulevard · Greenville, NC 27834
Office 252-744-2914 · Fax 252-744-2284 ·
rede.ecu.edu/umcirb/

Notification of Amendment Approval

From: Social/Behavioral IRB
To: Brandon Schultz
CC:

Lauren Gaither
Date: 10/24/2019
Re: Ame3_UMCIRB 18-001555
UMCIRB 18-001555
Game-supported Intervention to Improve Learning and Study Strategies

Your Amendment has been reviewed and approved using expedited review for the period of 10/23/2019 to 12/20/2019 . It was the determination of the UMCIRB Chairperson (or designee) that this revision does not impact the overall risk/benefit ratio of the study and is appropriate for the population and procedures proposed.

Please note that any further changes to this approved research may not be initiated without UMCIRB review except when necessary to eliminate an apparent immediate hazard to the participant. All unanticipated problems involving risks to participants and others must be promptly reported to the UMCIRB. A continuing or final review must be submitted to the UMCIRB prior to the date of study expiration.The investigator must adhere to all reporting requirements for this study.

Approved consent documents with the IRB approval date stamped on the document should be used to consent participants (consent documents with the IRB approval date stamp are found under the Documents tab in the study workspace).

The approval includes the following items:

Document	Description
Personal Attributes Questionnaire - Short Form(0.02)	Surveys and Questionnaires
Recruitment Flyer for Focus Groups (Year 2, ECU Pediatrics - ALTERNATIVE VERSION)(0.02)	Recruitment Documents/Scripts
Other Study Staff Added: Collier & Mirabelli. Other Study Staff Removed: Moore.	

For research studies where a waiver of HIPAA Authorization has been approved, each of the waiver criteria in 45 CFR 164.512(i)(2)(ii) has been met. Additionally, the elements of PHI to be collected as described in items 1 and 2 of the Application for Waiver of Authorization have been determined to be the minimal necessary for the specified research.

The Chairperson (or designee) does not have a potential for conflict of interest on this study.

APPENDIX C:

SUMMARY OF CHILD DEMOGRAPHIC CHARACTERISTICS

Characteristic	ADHD (*n* = 93)		Typically Developing (*n* = 140)		Total (*n* = 233)	
	n	%	*n*	%	*n*	%
Sex						
Female/Girl	29	31.2	80	57.1	109	46.8
Male/Boy	64	68.8	59	42.1	123	52.8
Intersex	0	0	0	0	0	0
Missing	*0*	*0*	*1*	*0.7*	*1*	*0.4*
Gender						
Female/Girl	28	30.1	69	49.3	97	41.6
Male/Boy	64	68.8	55	39.3	115	49.4
Other	0	0	6	4.3	6	2.6
Prefer Not to Respond	0	0	7	5.0	7	3.0
Missing	*5*	*5.4*	*3*	*2.1*	*8*	*3.4*
Ethnicity						
Non-Hispanic	78	83.9	122	87.1	200	85.8
Hispanic	6	6.5	12	8.6	18	7.7
Prefer Not to Respond	2	2.2	0	0	2	0.8
Missing	*2*	*2.2*	*6*	*4.3*	*13*	*4.3*
Race						
American Indian or Alaska Native	1	1.1	2	1.4	3	1.3
Asian	1	1.1	2	1.4	3	1.3
Black or African American	70	75.3	112	80.0	182	78.1
Native Hawaiian or Other Pacific Islander	1	1.1	0	0	1	0.4
White	17	18.3	14	10.0	31	13.3
Bi-Racial or Mixed Race	0	0	3	2.1	3	1.3
Prefer Not to Respond	3	3.2	7	5.0	10	4.3
Missing	*0*	*0*	*0*	*0*	*0*	*0*

APPENDIX D:

SUMMARY OF CHILD DEMOGRAPHIC CHARACTERISTICS

Characteristic	ADHD (*n* = 93)		Typically Developing (*n* = 140)		Total (*n* = 233)	
	n	%	*n*	%	*n*	%
Relationship to Child						
Mother	60	64.5	91	65.0	151	64.8
Father	11	11.8	32	22.9	43	18.5
Other	7	7.5	17	12.1	24	10.3
Prefer Not to Respond	13	14.0	0	0	13	5.6
Missing	*2*	*2.2*	*0*	*0*	*2*	*9*
Education Level						
Graduate professional training	6	6.5	12	8.6	18	7.7
4-year college	11	11.8	26	18.6	37	15.9
1-3 years college	40	43.0	47	33.6	87	37.3
High school graduate	24	25.8	34	24.3	58	24.9
Some high school	6	6.5	11	7.9	17	7.3
Completed junior high	4	4.3	3	2.1	7	3.0
Less than seven years of school	2	2.2	7	5.0	9	3.9
Missing	*0*	*0*	*0*	*0*	*0*	*0*
Yearly Household Income						
$0-$20,000	11	11.8	34	24.3	45	19.3
$20,001-$40,000	28	30.1	38	27.1	66	28.3
$40,001-$60,000	12	12.9	45	32.1	57	24.5
$60,001-$80,000	4	4.3	6	4.3	10	4.3
$80,001,$100,000	4	4.3	4	2.9	8	3.4
$100,001-$120,000	0	0	1	0.7	1	0.4
$120,001-$140,000	1	1.1	3	2.1	4	1.7
$140,001 +	3	3.2	6	4.3	9	3.9
Prefer Not to Respond	30	32.3	3	2.1	33	14.2
Missing	*0*	*0*	*0*	*0*	*0*	*0*

APPENDIX E:

CORRELATIONS FOR STUDY VARIABLES

Variable	1	2	3	4	5	6	7	8	9	10
1. PAQ-Fem	—									
2. PAQ-Masc	.50**	—								
3. ADHD-IN	-.27**	-.39**	—							
4. ADHD-IN-SS	-.29**	-.36**	.79**	—						
5. ADHD-HY	-.19**	-.23**	.77**	.71**	—					
6. ADHD-HY-SS	-.29**	-.29**	.76**	.89**	.78**	—				
7. ADHD Total	-.25**	-.33**	.95**	.80**	.93**	.82**	—			
8. Feminine	.16*	-.06	-.01	-.07	-.06	-.06	-.04	—		
9.Masculine	.04	.003	.03	.02	.06	.005	.04	-.19**	—	
10. Neither	-.14*	.03	.04	.09	.05	.08	.05	-.45**	-.54**	—
11. Both	.10	-.04	.05	.02	.04	.009	.05	.56**	.47**	-.25**

Note: $^{*}p < .05$. $^{**}p < .01$. Correlations for PAQ and ADHD-5-RS subscales conducted using mean scores. all correlations with variables 8-11 were conducted using a point-biserial correlation; all other correlations conducted with a Pearson product moment correlation.