ADHD SYMPTOMS, STRESS, AND RESILIENCE IN COLLEGE STUDENTS

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Abstract: Prior research has suggested that as the number of ADHD symptoms increase, there is also an increase in stress that the individual experiences. Prior research has also claimed that individuals with high levels of ADHD symptoms may be less resilient than others. Few prior studies have investigated the interrelationships among ADHD symptoms, stress, and resilience. The current research aimed to determine whether the number of ADHD symptoms predict stress levels and whether resilience mediates this relationship. As prior research has observed sex differences in ADHD symptoms and resilience, the present research also examined whether sex moderated the mediation. In a survey, we assessed ADHD symptoms, perceived stress, and resilience for 558 college students (175 males, 383 females). The results indicated that each of the four subcomponents of resilience (social skills, social support, goal efficacy, planning and prioritizing behaviors) mediated the relationship between ADHD symptoms and stress. There was no evidence that these relationships differed for men and women, as analyses testing whether participants sex moderated these mediation relationships revealed no significant results. These results add insight into individual differences in the experience of stress in college students. Implications for increasing resilience in college students and lowering stress for college students are discussed.

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CHAPTER I

INTRODUCTION

Over the last 20 years, there has been an increasing interest in the topic of resilience (Bonanno, Romero, & Klein, 2015). Unfortunately, there is still some debate over the universal definition of resilience within the scientific community (Fletcher & Sarkar, 2013; Modesto-Lowe, Yelunina, & Hanjan, 2011). A common definition is an individual's ability to successfully adapt to substantial stressors or adverse conditions (Luthar, Cicchetti, & Becker, 2000; Masten, 2011; Windle, 2011). Numerous studies have been conducted to explore why certain individuals are more resilient than others (Adler, Kessler, & Spencer, 2003; Bonanno, Romero, & Klein, 2015; Connor & Davidson, 2003; Dyer & McGuinness, 1996; Fletcher & Sarkar, 2013; Friborg, Hjemdal, Martinussen, & Rosenvinge, 2009; Luthar, Cicchetti, & Becker, 2000; Masten, 2011; Modesto-Lowe, Yelunina, & Hanjan, 2011;

Ponce-Garcia, Madewell, & Kennison, 2015; Reich, Zautra, & Hall, 2010; Windle, 2011). Some have recognized that resilience is the result of the interaction of specific protective factors that offset the experience of adversity, producing a neutral or positive effect (Connor & Davidson, 2003; Masten, 2011). These specific protective factors include social support, intelligence and education, problem-solving and coping skills, and social skills (Adler et al., 2006; Connor & Davidson, 2003; Friborg et al., 2009; Windle, 2011). Research indicates that these areas of protective factors are critical to the development of resilience (Friborg et al., 2009; Johnson-Powell, Yamamoto, & Arroyo, 1997). The aim of the present research is to investigate resilience in college students with attention deficit/hyperactivity disorder (ADHD) in the context of daily stress.

CHAPTER II

REVIEW OF LITERATURE

Resilience theory is centered around Garmezy and colleagues's research (Garmezy, Masten, & Tellegen, 1984; Garmezy & Rutter, 1983; Masten, Best, & Garmezy, 1990; Rutter, 1987; Werner & Smith, 1982), which suggests that resilience is derived from protective factors that ease the effects of risk factors (Garmezy, Masten, & Tellegen, 1984). In the literature, *protective factors* moderate using specific patterns of positive adaptation within the context of adverse circumstances and environmental threats (Masten, Best, & Garmezy, 1990). The idea of *risk factors* suggests the likelihood of a negatively adaptive outcome for individuals belonging to a particular risk group (Masten, Best, & Garmezy, 1990). However, the entire concept of protective factors hinges on the presence of risk (Obradović, Shaffer, & Masten, 2012). Rutter (1987) asserted that, when it comes to the effects of risk, an

individual's total number of risk factors can be used to predict dysfunction, but the presence of a single risk factor is not substantial enough evidence to support predictability. In a later study, Rutter (1990) suggests that an individual can show resiliency in varying amounts dependent on the situation or context—depending entirely on the relationship between the pertinent mechanisms of their social and cognitive environment. Also relevant is the fact that protective factors and risk effects are, more often than not, contrarily correlated and represent opposing ends of a continuum (e.g., attachment styles, intellectual ability).

Typically, resilience is measured through assessment of the social and cognitive components of protective factors (Reich, Zautra, & Hall, 2010). The social factors of resilience include social support, social skills, quality of close relationships, and positive attachment styles. The cognitive factors of resilience include executive functioning, intellectual ability, problem-solving skills, and various facets of self-regulation such as coping strategy self-efficacy, goal efficacy, and planning behaviors (Dumont &

Provost, 1999; Farrell, Henry, Mays, & Schoeny, 2011; Masten, 2014; Masten et al., 2005; Masten & Obradović, 2006; Mikami & Hinshaw, 2003; Vaughan, Foshee, & Ennett, 2010; Wills et al., 2007). Ponce-Garcia, Madewell, & Kennison (2015) developed and confirmed the psychometric properties and factor structure of the Scale of Protective Factors (SPF), determining the diagnostic applicability of the scale to undergraduate college-aged students.

The SPF was initially established to assess four protective factors indicted through previous research to be markers of resilience (i.e., social support, social skills, goal efficacy, and planning behavior). High levels of consistency and reliability were found overall for both the scale and subscales. In principle, resilience theory revolves around the supposition that negative effects, fostered by an accumulation of risk factors, can be offset with the accrual of pertinent protective factors. Older measures of resilience, such as the Brief Resilience Scale (BRS; Bernard, Dalen, Smith, & Wiggins, 2008), the Resilience Scale (Wagnild & Young, 1993), and the Resilience Scale for Adults (RSA; Friborg,

Hjemdal, Rosenvinge, & Martinussen, 2003) involve only one or two factors.

The purpose of the present research was to investigate the relationship between ADHD symptoms and stress in college students. An ADHD diagnosis is required by the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* to have a persistent pattern of inattention and/or hyperactivity-impulsivity with a severity that interferes with developmental functioning in 2 or more settings; was present before age 12; and cannot be accounted for by another behavioral health disorder such as depression, anxiety, or trauma. The diagnosis should include the occurrence of at least 6 of the 9 symptoms of inattention, or at least 6 of the 9 symptoms of hyperactive/impulsive behavior, persisting over the last 6 months. These symptoms are most valid when reported by at least 2 observers (see Table 1; American Psychiatric Association, 2013).

ADHD prevalence rose 42% from 2003 to 2011 (Visser et al., 2014), across nearly all demographic groups in the United

States irrespective of sex, race, or socioeconomic status. 11% of school-aged children in the United States now meet the criteria for ADHD diagnosis (Visser et al., 2014). Rates differ between states, from 4.2% of school-aged children in Nevada to 14.6% in Arkansas (Visser, Blumberg, Danielson, Bitsko, & Kogan, 2013), and international rates range from 2.2% to 17.8% (Skounti, Philalithis, & Galanakis, 2007), with a recent meta-analysis of North America and Europe indicating a 7.2% international prevalence for children 17 and younger (Thomas, Sanders, Doust, Beller, & Glasziou, 2015). These numbers have generated significant criticism, with some arguing overdiagnosis while others suggest the opposite. It is possible that individuals with relatively high levels of ADHD symptoms may not be attaining a formal diagnosis, and others may attain the diagnosis despite having relatively low levels of symptoms. It is clear that with nearly 1 in 20 adults in the United States affected by symptoms of ADHD (Kessler et al., 2006), this population deserves significant attention.

A growing number of researchers have suggested that individuals with ADHD may be less resilient than those without the disorder (Arruda, Querido, Bigal, & Polanczyk, 2015; Dvorsky & Langberg, 2014; Grenwald-Mayes, 2002; Hoza et al., 2005; Johnston & Mash, 2001; Latimer et al., 2003; Loe & Cuttino, 2008; Mannuzza & Klien, 2000; Meaux, Green, & Broussard, 2009; Molina & Pelham, 2014; Regalla, Guilherme, Aguilera, Serra-Pinheiro, & Mattos, 2015; Toner, O'Donoghue, & Houghton, 2006).

Epidemiological studies have found ADHD to affect roughly 3 to 5% of children and adults in the United States (American Psychiatric Association, 2013). Until recently, it was commonly assumed that ADHD exclusively affected children and adolescents. However, research indicates that ADHD is a lifelong difficulty and that symptoms prevail well into adulthood for 60% to 78% of individuals diagnosed in childhood (Biederman, Petty, Evans, Small, & Faraone, 2010; Sibley et al., 2012; Sobanski, Schredl, Kettler, & Alm, 2008). Academic complications for

children with ADHD are relatively common and usually manifest in early childhood.

Children with ADHD generally have a higher prevalence of problems with learning, require educational assistance, and have lower rates of overall academic achievement at a much more frequent rate (Combs, Canu, Broman-Fulks, Rocheleau, & Nieman, 2015; Loe & Cuttino, 2008; McConaughy, Volpe, Antshel, Gordon, & Eiraldi, 2011) than children having no ADHD diagnosis. Evidence also indicates that individuals with an ADHD diagnosis during childhood report higher rates of social dysfunction and fewer number of friendships than do individuals without an ADHD diagnosis during childhood (Canu & Carlson, 2004; Gaub & Carlson, 1997; Hoza et al., 2005). These social adjustment difficulties, as well as problems pertaining to the formation and maintenance of close relationships, have been shown to persist into adolescence and adulthood (Bagwell, Molina, Pelham, & Hoza, 2001; Lee, Sibley, & Epstein, 2016; Young & Gudjonsson, 2006).

In 2000, approximately $3.7 billion was lost to ADHD-related costs such as unemployment, time off from work (Birnbaum et al., 2005), behavioral interventions, and medication (Riley et al., 2006). In spite families and employers outwardly appearing supportive towards diagnosed individuals, a Swedish analysis of adult twins with ADHD suggests that diagnosed individuals are nearly twice as likely to experience substantial stressors (e.g., financial problems, family issues, divorce; Friedrichs, Igl, Larsson, & Larsson, 2012). ADHD is a primary example of a relatively common diagnosis resulting in pervasive adversity spanning across multiple domains of everyday life (Arruda, Querido, Bigal, & Polanczyk, 2015; Grenwald-Mayes, 2002). ADHD is a neurodevelopmental disorder, manifesting during childhood, with symptoms such as hyperactivity, inattentiveness, impulse control, and distractibility. Symptoms of ADHD are generally coupled with persistent impairments that effect many different aspects of daily life (Whalen, Jamner, Henker, Delfino, & Lozano, 2002).

Research suggests that the prevalence of ADHD may be higher and the condition more severe in boys and men than girls and women (Nøvik et al., 2006; Willcutt, 2012). The differences in symptom presentation among boys and girls may in fact explain the lower amount of diagnosis for ADHD in females. For ~50-66% of individuals diagnosed with ADHD, the disorder persists from childhood to adulthood (Barkley, Fischer, Smallish, & Fletcher, 2002; Faraone, Biederman, & Mick, 2006; Lara et al., 2009). Two recent studies examined the longevity of ADHD for individuals diagnosed between the ages of 6–17 years old suggested that, 11 years after diagnosis, 35% of males and 33.3% of females continued to meet the DSM-IV criteria for ADHD; indicating that persistence from childhood to adulthood is similar between sexes (Biederman, Petty, Clarke, Lomedico, & Faraone, 2011; Biederman, Petty, O'Connor, Hyder, & Faraone, 2012). Yet, despite these relatively miniscule sex differences, ADHD research has focused primarily on males. Research into ADHD in females is gradually increasing, but at the current juncture it is still limited

(Biederman, Petty, O'Connor, Hyder, & Faraone, 2012). Some studies suggest that girls may be twice as likely as boys to have ADHD but may endure more internalizing behavior towards their symptoms, compared to the more hyperactive and aggressive symptoms displayed by boys (Biederman et al., 2002; Biederman & Faraone, 2004; Newcorn et al., 2001).

Interestingly, a growing number of individuals with ADHD are achieving admission to university and earning college degrees. Research conducted in the last few decades has revealed a small collection of individuals ADHD that have had success avoiding negative adaptation outcomes (Biederman et al., 1998; Gray, Fettes, Woltering, Mawjee, & Tannock, 2016; Lee, Lahey, Owens, & Hinshaw, 2008). Longitudinal studies looking at young adults diagnosed with ADHD in childhood have found that 20–50% of these individuals go on to pursue a university degree (Barkley, Fischer, Smallish, & Fletcher, 2006; Hechtman, 1999; Kuriyan et al., 2013). Acknowledging this heterogeneity has helped to spark

interest in isolating the protective factors contributing to adaptively resilient outcomes for individuals with an ADHD diagnosis.

Prior research has shown that individuals with ADHD may be particularly affected by stress (Combs, Canu, Broman-Fulks, Rocheleau, & Nieman, 2015; Corominas-Roso et al., 2015; Friedrichs, Igl, Larsson, & Larsson, 2012; Harrison, Alexander, & Armstrong, 2013; Hirvikoski, Lindholm, Nordenstrom, Nordstrom, & Lajic, 2009; Isaksson, Nilsson, & Lindblad, 2015; King, Barkley, & Barrett, 1998; Lackschewitz, Huther, & Kroner-Herwig, 2008; Miklósi, Máté, Somogyi, & Szabó, 2016; Raz & Leykin, 2015; Williams, Suchy, & Rau, 2009). Stress is an individually-experienced, negative cognitive-emotional state that results from difficulty adapting to or coping with negative life events (Lazarus & Folkman, 1984; Pearlin & Schooler, 1978; Sapolsky, 1996; Selye, 1973). Stress develops from the conclusion that an individual's environment is too problematic and is subjectively considered to be a threat to the individual's personal well-being (Lazarus, 1966). In times of stress, an individual will

typically experience behavioral, physical, and cognitive adaptations in order to expedite information processing, problem solving, and coping strategies (Folkman & Lazarus, 1988; Lazarus & Folkman, 1987). Yet, stress is a considerably subjective concept and it presents in many different ways, depending on the individual. In naturalistic situations of prospective danger acute stress can serve as an early warning system for the body, however stress experienced chronically is associated with a variety of negative health effects including, a higher risk of illness and disease (Cohen, Tyrrell, & Smith, 1993), lowered immune functioning (Kemeny & Schedlowski, 2007), higher risk of cardiovascular disease (Goble & Le Grande, 2008), a higher risk of infection (Cohen, 2005), and a higher risk of obesity (Dallman et al., 2003).

The physiological stress response in adults diagnosed with ADHD is commonly assessed by comparing the level of event-mediated arousal with the level of arousal in non-diagnosed peers (Hirvikoski et al., 2009). Individuals with an ADHD diagnosis

show a higher stress response, measured via salivary cortisol. Diagnosed individual also have higher self-reported subjective stress levels compared to their non-diagnosed peers (Lackschewitz et al., 2008). Furthermore, in evaluations of physiological stress levels in adults diagnosed with ADHD, participants showed prolonged instances of heightened salivary cortisol levels while recovering from exposure to the stress condition (Lackschewitz et al., 2008), as compared to controls, indicating that those with an ADHD diagnosis may also experience more difficulty recuperating from exposure to stressors than individuals without ADHD, this in turn provides additional support that ADHD-diagnosed individuals have a higher potential susceptibility to instances of subjective stress. This inability to endure stress was first suggested by Wender (1995) as a supplementary feature of ADHD, and recent research has supported his conclusions that individuals with an ADHD diagnosis express a reduced ability to cope during exposure to stressors (Riley et al., 2006). Despite these difficulties, growing numbers of individuals with ADHD are achieving admission to

university and earning college degrees. A wide array of life events during child- and adulthood have shown to be influenced by various symptoms of ADHD such as academic and occupational complications (Reaser, Prevatt, Petscher, & Proctor, 2007; Weiss & Hechtman, 1993), social dysfunction in childhood (Hoza et al., 2005) and in later adulthood (Barkley, 2006). Individuals with an ADHD diagnosis are also predispositioned to have a higher risk for mood and anxiety disorders (Able, Johnston, Adler, & Swindle, 2007; Friedrichs, Igl, Larsson, & Larsson, 2012), and, as mentioned previously, they are more prone to physiological reactivity both before, during, and after exposure to stressors (Lackschewitz et al., 2008).

However, the impact of stress effects is unlikely to be exclusive to the diagnosed individual but to extend to have an impact on the individual's personal relationships with family and friends as well. Attention-deficit hyperactivity disorder has many costs (i.e., behavioral treatment, pharmaceutical expenses, time off from work for doctor visits), and the subsequent stress that is

affiliated with these expenses can ultimately impact an individual's interpersonal environment and family dynamic (Beitchman, Inglis, & Schachter, 1992; Lange et al., 2005; Riley et al., 2006). Although employers and families appear to be understanding of the needs of individuals diagnosed with ADHD, an extensive analysis of adult twins in Sweden indicates that individuals diagnosed with ADHD are approximately twice as likely to experience a divorce, family complications, and significant financial problems (Friedrichs, Igl, Larsson, & Larsson, 2012). To conclude, the literature indicates that individuals diagnosed with ADHD tend to have more exposure to various stressors throughout the lifetime along with heightened stress responses.

Many individuals diagnosed with ADHD continue to struggle with academic challenges into college due to the range of symptoms that accompany the disorder increasing the likelihood of academic failure (Breslau et al., 2009). Some individuals are capable of utilizing protective factors of resilience to their advantage, limiting the negatively adaptive impact of the disorder.

Compared to peers without an ADHD diagnosis, college-aged students with ADHD are at risk for lower quality of life, rate less successfully on assessments of personal growth, and report considerably inferior parent–child relationships (Grenwald-Mayes, 2002). College-aged individuals with ADHD also report significantly more difficulty than their non-ADHD peers in areas of information processing, concentration, and motivation (Reaser, Prevatt, Petscher, & Proctor, 2007), as well as higher rates of academic and social adjustment when it comes to the varying burdens of higher education (Blase et al., 2009). Many of the same traits that impact individuals with ADHD academically continue to impact performance in the workplace later in life, becoming progressively apparent as these individuals approach adulthood and begin taking on employment opportunities (Barkley, 2006; Hill & Petty, 1995; Sibley et al., 2012). These findings underline the adverse effect of such impairments during childhood, and suggests these effects linger only to further impact later academic and employment functioning during adulthood.

The types of complications concomitant with an ADHD diagnosis can also produce increased levels of personal distress. Approximately a quarter of the population of individuals diagnosed with ADHD during childhood also have one or more anxiety disorders later in life (Barkley, 2006; Harvey, Breaux, & Lugo-Candelas, 2016). Individuals with untreated ADHD are at an elevated risk for various mood and affective disorders, along with alcohol dependency (Able, Johnston, Adler, & Swindle, 2007; Friedrichs, Igl, Larsson, & Larsson, 2012). Heiligenstein and Keeling (1995) found that approximately half of their participants diagnosed with ADHD were also at risk for drug and/or alcohol dependency (26%), depression (25%), and anxiety (5%). College-aged individuals with ADHD diagnoses that indicated positive paternal support and significantly greater support from friends also reported significantly higher ratings of quality of life; outcomes that were not reported by the controls (Wilmshurst, Peele, & Wilmshurst, 2011). Aspects of psychological functioning thought to underlie effective coping abilities and their relevant sex

differences have been indicated by research as protective factors of resilience. It has also been suggested that familial and social support are protective factors for academic success and quality of life (Grenwald-Mayes, 2002).

Individuals experiencing stress (e.g., divorce, employment termination, financial issues, loss of a loved one) may respond in very different ways (Cohen, Tyrrell, & Smith, 1993; Lazarus & Folkman, 1987; Pearlin & Schooler, 1978). Especially considering that the influence of stress varies amongst the sexes; for example, the impact of social stress on the activity of the hypothalamic–pituitary–adrenal (HPA) axis of the neuroendocrine system—one pathway by which behavior can be influenced by stress—may vary between males and females in that women tend to have higher ratings of physiological reactivity in response to marital interactions than do men, while men tend to have higher ratings of reactivity in response to paradigms of social stress (Kiecolt-Glaser & Newton, 2001; Kudielka & Kirschbaum, 2005; Miller, Margolin, Shapiro, & Timmons, 2016; Sapolsky, Romero, & Munck, 2000).

An analyses of participant responses to tests of physiological stressors (e.g., exercise) indicate no statistically significant difference between the sexes in terms of HPA-axis disparities (Friedmann and Kindermann, 1989; Kirschbaum et al., 1992a; Kraemer et al., 1989). However, the majority of studies looking at psychological stressors either showed a lack of statistical significance for sex differences, or they indicated higher ratings of cortisol response in men than in women—but *only* after exposure to (1) intense psychological stressors, such as an academic exam, or (2) experimental stressors distributed within a laboratory setting (e.g., giving a speech, mental mathematical calculations, harassment; Collins and Frankenhaeuser, 1978; Earle et al., 1999; Forsman and Lundberg, 1982; Frankenhaeuser et al., 1980, 1978; Kirschbaum et al., 1995a,b; Lundberg, 1983; Nicolson et al., 1997; Polefrone and Manuck, 1987; Stoney et al., 1987; Stroud et al., 2002).

Findings indicate that women are more likely to have lower ratings of self-confidence, self-esteem, and self-efficacy than do

men (Costa, Terracciano, & McCrae, 2001; Feingold, 1994; Kling, Hyde, Showers, & Buswell, 1999; Lynn & Martin, 1997). Pearlin and Schooler (1978) examined the impact of specific psychological socialization mechanisms in regard to the management of subjective stressors. The results demonstrate that males are fortified with more psychological resources (e.g., self-esteem, environmental mastery) than are females, indicating that socialization better endows men with the ability to protect themselves from the negative impact of subjective stressors. Unfortunately, men and women are socialized differently: men and women are involved in different life roles (women are encouraged to be relationship-oriented, while men are encouraged to be independent) and have varying access to social and/or material resources over the lifespan (boardman 2007). Further, several studies investigating a range of different stress responses, from daily hassles to post-traumatic stress reactions, indicates that women experience more reactivity to stress than do men, and that women reliably report more symptoms of, and a higher

vulnerability to, these subjective stressors (Bebbington, 1996; Kessler et al., 1981; Kessler and McLeod, 1984; Kroenke and Spitzer, 1998; Miller and Kirsch, 1987; Troisi, 2001). Due to the conflicting nature of this socialization, in both men and women, the level of heritability for resilience factors is reported as higher for males than females (boardman 2007). Overall, the research seems to suggest that men respond to subjective stressors with higher levels of cortisol than do women, and it can be inferred from said research that certain sex-based differences in socialization might be associated with sex-based differences in stress reactivity (Kudielka & Kirschbaum, 2004).

Another possible explanation for this inconsistency considers the role of coping strategies. Research documenting distinctions in the coping strategies of men and women indicate that active styles of coping have a hand in determining resiliency, in that men indicate the use of a more active style when compared with the coping styles of women (Pearlin & Schooler, 1978; Nolen-Hoeksema, 1987). Pearlin & Schooler (1978) suggests that

active styles of coping have been indicated as an effective buffer against the negative effects of subjective stressors. Similar research posits that women ruminate over stressful issues, where men use an avoidance paradigm to distract themselves from stressful issues (Nolen-Hoeksema, 1987). Unfortunately, neither strategy is ideal, as ruminative coping styles tend to prolong depressive episodes (Hanninen & Aro, 1996; Kuehner & Weber, 1999; Nolen-Hoeksema, 1991). Twin studies subsequently confirm sex differences in heritability and bolster support for the shared environmental impact of coping strategies (Kato & Pedersen, 2004). Accordingly, the likelihood that women experience pressure to use coping strategies in maladaptive way can be suggested as an explanation for sex differences in the heritability of resilience.

In the present study, the relationships among ADHD symptoms, stress, and resilience in college students was examined. Because the bulk of the work in resilience and ADHD had investigated the functioning of ADHD diagnosed children and adolescents within an academic setting (DuPaul, Weyandt, O'Dell,

& Varejao, 2009; Power, 2009), the present study filled a gap in the literature. Prior research has shown that as the number of ADHD symptoms increase, there is also an increase in stress in the individual (Combs, Canu, Broman-Fulks, Rocheleau, & Nieman, 2015; Corominas-Roso et al., 2015; Friedrichs, Igl, Larsson, & Larsson, 2012; Harrison, Alexander, & Armstrong, 2013; Hirvikoski et al., 2009; Isaksson, Nilsson, & Lindblad, 2015; King, Barkley, & Barrett, 1998; Lackschewitz, Huther, & Kroner-Herwig, 2008; Miklósi, Máté, Somogyi, & Szabó, 2016; Raz & Leykin, 2015). No prior study has investigated whether the relationship between ADHD symptoms in a non-clinical sample of college students and stress is mediated by resilience. The following hypotheses will be tested:

Hypothesis 1: ADHD symptoms were expected to predict stress with a higher number of symptoms predicting more stress.

Hypothesis 2: The relationship between stress and ADHD symptoms was expected to be mediated by one or more of the four subcomponents of resilience, with one or more resilience factors

leading to a reduction of stress in the context of higher ADHD symptoms.

Hypothesis 3: The mediation relationships involving ADHD symptoms, stress, and resilience factors was expected to be moderated by sex with women having larger indirect effects of resilience factors on the relationship between ADHD symptoms and stress than men.

CHAPTER III

METHOD

Participants

A total of 1055 participants (68.2% female, 31.8% male) enrolled in the Oklahoma State University Psychology Department's SONA system participated in exchange for course credit. Participants with missing data were excluded, allowing for 558 participants (175 men, 383 women) from the SONA system to be used in the study. Only 13 percent of participants indicated that they had been diagnosed with ADHD. Another 21 percent indicated that they had not been diagnosed with ADHD but suspected that they might have it.

Materials

The online survey assessed ADHD symptoms, perceived stress, resilience, and demographics (e.g., age, sex, and whether an official ADHD diagnosis had been received).

ADHD Symptoms. The ASRS-v1.1 Symptom Checklist (ASRS-V1.1; Adler, Kessler, & Spencer, 2003) is an 18-item measure of adult ADHD symptoms. Participants rated the frequency in which they have experienced symptoms of ADHD over the previous 6 months on a 5-point rating scale scored dichotomously (e.g., Never, Rarely, Sometimes, Often, and Very often). Scores of Sometimes, Often, and Very often are allotted 1-point for items 1 through 3, 9, 12, 16, and 18, and scores of Often or Very often are allotted 1-point for the remaining 11-items. A total score was determined by summing across all items. Scores ranged from 0 to 72 (where scores of less than 9-points indicated low symptoms of ADHD, and scores of greater than 10-points indicated high symptoms of ADHD). Internal consistency and test–retest reliability for this scale is high, regardless of whether the scale is administered by a clinician or given as a self-report (Cronbach's α = .88 – .89; Adler et al., 2006). In the present study, Cronbach's α = .73, indicating internal consistency.

Perceived Stress. The PSS is a 10-item self-report measure of perceived stress (PSS; Cohen, 1988). Participants rated the frequency in which stressful situations have occurred over the previous month (e.g., "In the last month, how often have you felt that you were on top of things?") on a 5-point Likert scale (0 = Never, 4 = Very often). A total score was determined by reverse-scoring items 4, 5, 7, and 8 before summing across all scale items. The mean score was used in the analyses with higher scores indicating greater perceived stress over the last month. Internal consistency and test–retest reliability for this scale is high (Cronbach's $\alpha = .72$; Cohen, Kamarck, & Mermelstein, 1983). In the present study, Cronbach's $\alpha = .85$, indicating internal consistency.

Resilience. The Scale of Protective Factors is a self-report measure of the four protective factors of resilience: Social Skills, Social Support, Goal Efficacy, and Planning and Prioritizing Behavior (SPF; Ponce-Garcia, Madewell, & Kennison, 2015). Participants indicated their level of agreement with each item (e.g.,

"I am confident in my ability to succeed.") using a 5-point Likert scale (1 = Not at all like me, 2 = Not very much like me, 3 = Kind of not like me, 4 = I'm not sure if it's like me or not, 5 = Kind of like me, 6 = Very much like me, and 7 = Exactly like me). There are six items in each subscale. A total score will be determined by summing across all scale items. Scores ranged from 24 to 120, while the subscale scores ranged from 6 to 30. Total scores of less than 65-points indicated low levels of resilience, scores between 65- and 84-points indicated moderate levels of resilience, and scores of greater than 85-points indicated high levels of resilience. Internal consistency and test–retest reliability for this scale is high (Cronbach's $\alpha = .91$; Ponce-Garcia, Madewell, & Kennison, 2015). In the present study, Cronbach's $\alpha = .96$, indicating high internal consistency.

Demographics. Participants were asked their sex, age, and whether they have been diagnosed with ADHD (i.e., "Which of the following is true for you? I have never been diagnosed with an attention-related problem and I don't believe that I might have one.

I have never been diagnosed with an attention-related problem and but I strongly suspect that I might have one. I have been diagnosed with an attention-related problem by a health professional.").

Procedure

IRB approval was obtained before recruitment for the study began. Participant responses were collected during the 2016-2017 academic year, using a professional license of Surveymonkey, and are stored in a database with no links to names, IP addresses, or other possible identifiers. Participants received the questionnaires in the same order (e.g., SPF, PSS, ASRS-V1.1, and demographics). The survey took approximately 45-minutes to complete.

CHAPTER IV

RESULTS

Data were initially screened for missing data. Of the original 1,055 individuals that participated in the study, those that had missing data were excluded from the analysis. Listwise deletion was used for missing data in all analyses. A total of 558 participants remained after exclusions and included 175 males and 383 females. Table 2 displays the descriptive statistics and Pearson product-moment correlations for the six variables: perceived stress (t = -3.68, p = .001), ADHD symptoms (t = -.67, p = .509), and the four protective factors of resilience — social skills (t = -1.03, p = .304), social support (t = -2.28, p = .023), goal efficacy (t = 1.23, p = .195), and prioritizing and planning behavior (t = -3.71, p = .001) — for men and women, with women scoring slightly higher in ADHD symptoms, perceived stress, and three of the four

protective factors of resilience (social skills, social support, and planning and prioritizing behavior) than did men.

To test the first hypothesis, that ADHD symptoms would predict stress, a hierarchical regression analysis was conducted using perceived stress as the DV. In block one, participant sex was entered as an IV. Sex accounted for 2.2% of the variation in Perceived Stress, ($F(1,556) = 13.57$). In block two, ADHD symptoms (a continuous composite score) was entered as an IV. The results supported the hypothesis, showing that when sex is controlled for, higher numbers of ADHD symptoms predicted more perceived stress, unstandardized $\beta = 11.99$, $p < .001$, $R^2 = .171$, $F(1,555) = 98.88$. ADHD symptoms accounted for 14.8% of the variation in stress over and above sex ($\Delta R^2 = .148$). Table 3 displays the summary of these results.

To test the second hypothesis, that one or more of the four resilience factors would mediate the relationship between ADHD symptoms and stress, the PROCESS Macro v3.2 for SPSS was used (Model 4; Hayes, 2017) to test four indirect effects, one for

each of the four resilience factors using 5000 bootstrapped samples. The mediated effects were assessed using the 95% confidence intervals provided by PROCESS. Confidence intervals that do not contain zero indicate a statistically significant mediated effect. The mediated effect of each resilience factor on perceived stress and ADHD symptoms was statistically significant, supporting the hypothesis. Figure 1 displays the model tested in PROCESS. Results from these models are shown in Table 4. Each of the four indirect effects related to the resilience factors reduced the increase in stress due to relatively higher levels of ADHD symptoms: social skills (bootstrapped unstandardized indirect effect of .12, *SE* = .03, *95% CI* = .06 to .19, $p<.05$), social support (bootstrapped unstandardized indirect effect of .19, *SE* = .03, *95% CI* = .12 to .26, $p<.05$), goal efficacy (bootstrapped unstandardized indirect effect of .24, *SE* = .04, *95% CI* = .17 to .31, $p<.05$), and planning and prioritizing behavior (bootstrapped unstandardized indirect effect of .19, *SE* = .03, *95% CI* = .13 to .27 $p<.05$).

Finally, we tested the hypothesis that the indirect effect of each of the four resilience factors between perceived stress and ADHD symptoms would be moderated by sex. A separate moderated mediation analysis was conducted for each of the four resilience factors using PROCESS for SPSS (Model 8; Hayes, 2017). The results did not suggest a moderated mediation. None of the interaction terms were statistically significant. Furthermore, the index of moderated mediation was non-significant based on the 95% confidence intervals for social skills (*95% CI* = -.07 to .17, *NS*), social support (*95% CI* = -.07 to .17, *NS*), goal efficacy (*95% CI* = -.10 to .19, *NS*), and planning and prioritizing behavior (*95% CI* = -.06 to .16, *NS*).

CHAPTER V

DISCUSSION

The present research aimed to understand the relationships among ADHD symptoms, stress, and protective factors of resilience. The results of the hierarchical regression analysis supported the hypotheses, as individuals that reported higher ADHD symptoms also reported experiencing more stress. Further, the mediation analysis showed that the relationship between ADHD symptoms and perceived stress was mediated by each of the four subcomponents of resilience (i.e., social skills, social support, goal efficacy, and planning and prioritizing behaviors). Lastly, there was no evidence that participant sex moderated these mediation relationships. However, women did report insignificantly higher levels of resilience and lower levels of ADHD symptoms and stress.

These findings provide additional support for previous work indicating that individuals with ADHD experience increased

amounts of perceived stress and have lower levels of protective factors, such as social skills (Arruda, Querido, Bigal, & Polanczyk, 2015; Dvorsky & Langberg, 2014; Grenwald-Mayes, 2002; Molina & Pelham, 2014; Regalla, Guilherme, Aguilera, Serra-Pinheiro, & Mattos, 2015). For adults with ADHD, increasing levels of resilience through ADHD-management and resilience-promotive interventions may lead to reductions in the debilitating effects of ADHD symptoms (Combs, Canu, Broman-Fulks, Rocheleau, & Nieman, 2015; Corominas-Roso et al., 2015; Friedrichs, Igl, Larsson, & Larsson, 2012; Harrison, Alexander, & Armstrong, 2013; Isaksson, Nilsson, & Lindblad, 2015; Miklósi, Máté, Somogyi, & Szabó, 2016; Raz & Leykin, 2015). Interventions could be tailored to the individual depending on which type(s) of resilience factor is lacking (e.g., social skills, social support, goal efficacy, or planning behavior).

This research has several limitations. Foremost, the study was not a clinical sample. The present research utilized a non-clinical college population; thus, the results may not generalize to

other populations, where ADHD symptoms may be higher. A second limitation is the fact that this research used self-report measures of the variables from one source, the individual with ADHD symptoms. Self-reporting can be problematic in studies of individuals with ADHD as research suggests that individuals with ADHD frequently under-estimate their own ADHD-related impairments (Manor et al., 2012). A third limitation is the fact that the study did not assess participants' current use of medications related to stress and/or ADHD symptoms. It is unclear whether the relationships among stress, ADHD symptoms, and resilience would be different for participants taking medication for stress and/or ADHD symptoms versus un-medicated participants (Prince, Morrison, & Wilens, 2015). Lastly, the length of the survey may be a limitation, as it may have been a challenge for some individuals to complete, especially those with high levels of ADHD symptoms. It is possible that individuals with the highest levels of ADHD symptoms may not be represented in our sample.

In terms of future research, utilizing a larger population sample, a more comprehensive evaluation of participant's pharmacotherapy history, and noting sex differences for ADHD and resilience factors may be valuable. Future research should examine whether these results generalize to a clinical sample. If the present results could be replicated in a clinical sample, then interventions focused on bolstering resilience factors as a way of decreasing stress in individuals with ADHD would be a logical next step. In order to limit the impact of potential reporting confounds, future research would benefit from an assessment of ratings gathered from peers and/or family members. Additionally, research on stress and individuals with ADHD would benefit from investigations seeking to more comprehensively understand the developmental processes associated with protective factors of resilience, such as studies that would examine the mediating and moderating roles of behavioral and developmental mechanisms would be valuable for determining the predictive roles played by these intricate relationships. A more comprehensive understanding

of the protective factors of resilience could provide a buffer between the influence of negative symptoms of ADHD and the outcomes elucidated in the literature for adults with ADHD. This understanding could lead to the development of efficacious intervention and prevention programs aimed at increasing resiliency in individuals with ADHD and to contribute to the knowledge of risks and deficits that are associated with the disorder.

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APPENDICES

Table 1.

DSM-V Diagnostic Criteria for Attention-deficit Hyperactivity Disorder (ADHD)

A persistent pattern of inattention and/or hyperactivity-impulsivity that interferes with functioning or development, as characterized by six (or more) of the following symptoms that have persisted for at least 6 months to a degree that is inconsistent with developmental level and that negatively impacts directly on social and academic/occupational activities:

- Often fails to give close attention to details or makes careless mistakes in schoolwork, at work, or during other activities.
- Often has difficulty sustaining attention in tasks or play activities.
- Often does not seem to listen when spoken to directly.
- Often does not follow through on instructions and fails to finish schoolwork, chores, or duties in the workplace.
- Often has difficulty organizing tasks and activities.
- Often avoids, dislikes, or is reluctant to engage in tasks that require sustained mental effort.
- Often loses things necessary for tasks or activities.
- Is often easily distracted by extraneous stimuli.
- Is often forgetful in daily activities.
- Often fidgets with or taps hands or feet or squirms in seat.
- Often leaves seat in situations when remaining seated is expected.
- Often runs about or climbs in situations where it is inappropriate.
- Often unable to play or engage in leisure activities quietly.
- Is often "on the go," acting as if "driven by a motor".
- Often talks excessively.
- Often blurts out an answer before a question has been completed.
- Often has difficulty waiting his or her turn.
- Often interrupts or intrudes on others.

Table 2.

Descriptive Statistics for ADHD Symptoms, Perceived Stress, and the Four Protective Factors of Resilience by Sex

Men (n = 175)												
	Descriptive Statistics						Correlations					
Variable	Mean	SD	Min	Max	Skewedness	Kurtosis	1	2	3	4	5	6
1. ADHD symptoms	5.58	3.68	.00	15.00	.44	-.51	1	--	--	--	--	--
2. Stress	15.79	6.49	.00	40.00	.00	.62	.37**	1	--	--	--	--
3. Social Skills	4.85	1.22	1.00	7.00	-.16	-.54	-.13	-.51**	1	--	--	--
4. Social Support	4.80	1.12	1.33	7.00	-.17	-.14	-.23**	-.50**	.65**	1	--	--
5. Goal Efficacy	5.29	1.11	1.17	7.00	-.42	-.02	-.26**	-.61**	.65**	.66**	1	--
6. Planning Behavior	4.53	1.24	1.67	7.00	.04	-.52	-.28**	-.38**	.47**	.58**	.67**	1

Women (n = 383)												
	Descriptive Statistics						Correlations					
Variable	Mean	SD	Min	Max	Skewedness	Kurtosis	1	2	3	4	5	6
1. ADHD symptoms	5.89	4.09	.00	18.00	.46	-.24	1	--	--	--	--	--
2. Stress	17.79	6.59	.00	36.00	-.13	.02	.40**	1	--	--	--	--
3. Social Skills	4.99	1.27	1.00	7.00	-.54	-.08	-.22**	-.41**	1	--	--	--
4. Social Support	5.11	1.15	1.50	7.00	-.42	-.17	-.33**	-.43**	.55**	1	--	--
5. Goal Efficacy	5.20	1.16	1.00	7.00	-.65	-.12	-.34**	-.49**	.69**	.70**	1	--
6. Planning Behavior	4.98	1.26	1.00	7.00	-.36	-.12	-.39**	-.45**	.56**	.69**	.80**	1

Note. *p<.05, **p<.01, and ***p<.001

Table 3.

Summary of Hierarchical Regression Analysis for Variables Predicting Stress

	Block 1			Block 2		
Predictors	*B*	*SE*	*β*	*B*	*SE*	*β*
Intercept	15.61	.50		11.99	.59	
Sex	2.21	.60	.15	2.06	.55	.14
ADHD Symptoms				.65	.07	.38
Adjusted R^2	.02			.14		
ΔR^2	p=.001***			p=.001***		

Note: B = unstandardized beta; *SE* = Standard Error; *β* = standardized beta;

***p<.001

Table 4.

PROCESS Model Summary – Social Skills

	Coefficient	SE	*t*	*p*	LLCI	ULCI
Constant	22.38	1.14	19.60	.000**	20.14	24.62
ADHD symptoms	.53	.06	8.65	.000**	.41	.65
Social Skills	-1.99	.19	-10.32	.000**	-2.38	-1.61
Participant Sex	2.32	.51	4.56	.000**	1.32	3.32
Interaction	.53	.06	8.65	.000**	.41	.65

PROCESS Model Summary – Social Support

	Coefficient	SE	*t*	*p*	LLCI	ULCI
Constant	23.27	1.29	17.99	.000**	20.73	25.81
ADHD symptoms	.46	.06	7.30	.000**	.34	.59
Social Support	-2.11	.22	-9.62	.000**	-2.54	-1.68
Participant Sex	2.60	.52	5.04	.000**	1.59	3.61
Interaction	.46	.06	7.30	.000**	.34	.59

PROCESS Model Summary – Goal Efficacy

	Coefficient	SE	*t*	*p*	LLCI	ULCI
Constant	27.25	1.36	19.96	.000**	24.57	29.93
ADHD symptoms	.41	.06	6.71	.000**	.29	.53
Goal Efficacy	-2.61	.22	-12.10	.000**	-3.04	-2.19
Participant Sex	1.77	.49	3.58	.000**	.80	2.74
Interaction	.41	.06	6.71	.000**	.29	.53

Table, continued…

PROCESS Model Summary – Planning and Prioritizing Behavior

	Coefficient	SE	*t*	*p*	LLCI	ULCI
Constant	21.01	1.22	17.26	.000**	18.62	23.40
ADHD symptoms	.45	.07	6.88	.000**	.32	.58
Planning Behavior	-1.74	.21	-8.33	.000**	-2.15	-1.33
Participant Sex	2.84	.53	5.34	.000**	1.79	3.88
Interaction	.4521	.07	6.88	.000**	.32	.58

Note. ***p*<.001.

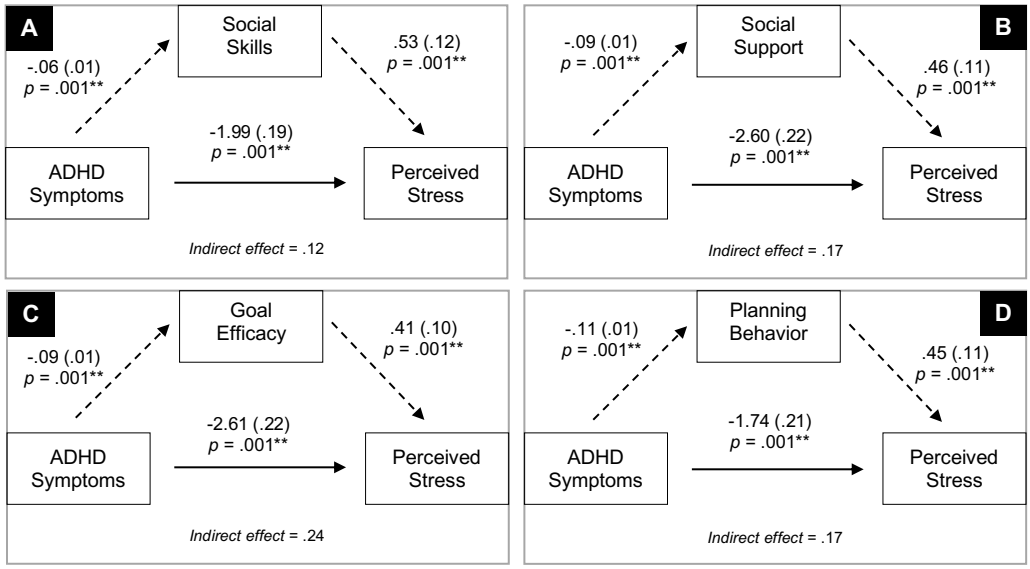

Figure 1. Relationship between ADHD symptoms and perceived stress as mediated by protective factors of resilience: social skills (A), social support (B), goal efficacy (C), & planning behavior (D). Unstandardized regression coefficients, standard errors in parentheses, and *p*-values. *Note*. **p*<.05, and ***p*<.001.

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