MATERNAL ADHD SYMPTOMS AND PARENTING STRESS: THE ROLES OF
PERSONALITY AND PARENTING SELF-EFFICACY BELIEFS

by

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A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

in

THE FACULTY OF GRADUATE AND POSTDOCTORAL STUDIES

(Psychology)

THE UNIVERSITY OF BRITISH COLUMBIA

(Vancouver)

June 2016

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Abstract

ADHD symptoms in adults are consistently related to the experience of stress in a variety of domains. One domain that often elicits feelings of stress is parenting, and it is not clear to what extent maternal ADHD symptoms are directly related to the stress that mothers feel as a parent and to what extent this relationship is mediated by other variables. This dissertation examined whether parenting self-efficacy beliefs mediate the relationship between maternal ADHD symptoms and parenting stress. Further, this mediation was hypothesized to be conditional on the levels of maternal neuroticism. In this study, 120 mothers of 6-12 year old children completed an online study, and they also provided collateral informants who reported on the mother’s level of ADHD symptoms and neuroticism. Maternal ADHD symptoms were found to be significantly associated with parenting stress, but this relationship was partially mediated by parenting self-efficacy beliefs. Maternal neuroticism was related to parenting stress, parenting self-efficacy beliefs, and maternal ADHD symptoms, but did not moderate the mediation. However, follow-up exploratory analyses revealed that parenting self-efficacy beliefs are central in mediating the relationship between a variety of mother-centered variables and parenting stress. In addition, the indirect effect of parenting self-efficacy beliefs on the relationship between maternal ADHD symptoms and parenting stress is better accounted for by positive and negative parenting behavior and by maternal feelings of warmth and tenderness towards their child. The results highlight the importance of self-efficacy beliefs in the functioning of mothers, and that awareness of a mother’s psychological symptoms is not sufficient to understand her experience of parenting self-efficacy beliefs or parenting stress.
Preface

All of the work presented henceforth was conducted in the Parenting Lab at the University of British Columbia, Point Grey campus. All projects and associated methods were approved by the University of British Columbia’s Research Ethics Board [certificate #H15-01239].

I was the lead investigator, responsible for all major areas of concept formation, data collection and analysis, as well as manuscript composition. Dr. Charlotte Johnston was the supervisory author on this project and was involved in the early stages of concept formation, contributed to manuscript edits, and provided guidance and suggestions for theoretical background and justification, research design, and interpretation of results.
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Acknowledgements

I extend my heartfelt thanks to the faculty, staff, students, and supervisors whose advice and support underpins all of my work. I owe particular thanks to Dr. Charlotte Johnston who never fails to know exactly how to help me grow both academically and clinically. Thank you to Dr. Lynn Alden and Dr. Mark Schaller for their incredibly useful insights into this project. Special thanks are owed to my family and loved ones who have been my unwavering supporters and cheerleaders for all these many years. Thank you to the Canadian Institutes of Health Research whose grant (F10-00927) to Dr. Charlotte Johnston supported this work.
Introduction

Parenting, while a rewarding and worthwhile endeavor, is often difficult and stressful. Compared to non-parents, parents report lower cohesion with their partner, and more demanding and less positive communication styles within the couple (Kurdek, 2001). In a prospective study of 1,933 adults, those who had had at least one child within 7 years of the initial assessment reported lower self-efficacy, more daily strains, and lower psychological well-being compared to those adults who remained childless, with women being particularly affected by the move to parental status (Nomaguchi & Milkie, 2003). Additionally, parenting is likely even more stressful when a parent's own capacity to cope with stress is diminished by personal or life circumstances. In this study, I investigate the association between parent attention-deficit/hyperactivity disorder (ADHD) symptoms and parenting stress. In recognition of the fact that mothers are typically the primary caregivers of their children (and therefore associations with parenting stress may be stronger; Finley, Mira, & Schwartz, 2008), and the challenges associated with recruiting a valid sample of fathers (Mitchell et al., 2007), this study focuses on mothers’ ADHD symptoms and parenting stress, although I recognize that ADHD symptoms and parenting stress are likely related in fathers as well. Further, the focus on mothers in this study also allows for comparability with previous research which also tends to primarily recruit mothers.

Maternal mental health is consistently associated with parenting stress. Mothers struggling with mental health difficulties such as depression (Thomason et al., 2014), anxiety (Skreden et al., 2012), or hostility (Delvecchio et al., 2014) experience more parenting stress than mothers not affected by such difficulties. As ADHD symptoms are repeatedly associated with both negative parenting (Wymbs, Wymbs, & Dawson, 2015) and stressful life events
(Friedrichs, Igl, Larsson, & Larsson, 2012), it is likely that ADHD symptoms also are associated with parenting stress. There is already some evidence suggesting that maternal ADHD symptoms are related to parenting stress (Wietecha et al., 2012) and further, the reciprocal nature of mother-child interactions suggests that parenting stress may contribute to child problems which may further increase parenting stress (Woodman, Mawdsley, & Hauser-Cram, 2015). These facts have important clinical implications, as reducing parenting stress may be a worthwhile goal not only to improve the quality of life of the stressed mother, but also to improve parent-child interactions and therefore the quality of life of the child.

Although there is likely a strong bivariate association between maternal ADHD symptoms and parenting stress, it is not clear how this relationship occurs and under what conditions the relationship between maternal ADHD symptoms and parenting stress becomes stronger or weaker. It is possible that the relationship between maternal ADHD symptoms and parenting stress is at least partially accounted for by a third variable. Maternal cognitions are a likely candidate, as several cognitive processes are important for understanding parenting (Johnson, 2015). One cognitive process that has strong theoretical connections to parenting stress is parenting self-efficacy beliefs. Mothers’ perceptions of their own parenting self-efficacy have been shown to predict outcomes above and beyond actual capabilities (Paunonen & Hong, 2010) suggesting that perceptions of one’s ability are distinct from actual skill. In addition, parenting self-efficacy beliefs have been shown to mediate the relationship between maternal social support and parenting stress, suggesting that parenting self-efficacy beliefs may be a pathway through which mother characteristics such as ADHD symptoms act on parenting stress (Finzi-Dottan, Triwitz, & Golubchik, 2011).
It also is possible that the strength of parenting self-efficacy beliefs as a mediating variable between maternal ADHD symptoms and parenting stress may depend on another variable. The extent to which ADHD symptoms are related to parenting self-efficacy beliefs, and the extent to which those beliefs lead to parenting stress, are likely dependent on stable personality characteristics such as those governing a person’s tendency to experience negative emotion. Specifically, neurotic personality features may exacerbate the mediating effect of parenting self-efficacy beliefs on maternal ADHD symptoms and parenting stress. Neuroticism is the personality characteristic most consistently associated with ADHD (Di Nicola et al., 2014; Gomez & Corr, 2014; Jacob et al., 2007) and has been shown to distinguish adults with high levels of ADHD symptoms into two distinct groups that respond differentially to life stressors (Robin et al., 2008). Robin and colleagues found that adults with higher levels of ADHD symptoms and those with more severe neurotic personality features manifested significantly more pessimism, negative emotionality, reactivity, and fatalism than participants with high levels of ADHD symptoms but low levels of neuroticism. In addition, higher levels of neuroticism are longitudinally associated with maternal ADHD symptoms (Robin, Tzelepis, & Bedway, 2008), increased parenting stress (Rantanen, Tillemann, Metsäpelto, Kokko, & Pulkinnen, 2015), and decreased self-efficacy beliefs (Merritt & Tharp, 2013) and are therefore likely to influence the indirect effect of parenting self-efficacy beliefs on the association between maternal ADHD symptoms and parenting stress.

In sum, the overarching purpose of this study is to better understand the nature of the relationship between maternal ADHD symptoms and parenting stress as there are strong reasons to believe this is an important element in the functioning of both mother and child. However, existing evidence regarding this relationship is minimal. Lee, Sibley, and Epstein (2016) recently
called for further research into the substantial heterogeneity that has been observed in individuals with ADHD. Among their recommendations are additional investigations of the mediators of positive and negative outcomes related to ADHD as well as increased testing of the conditional indirect effects of ADHD such as those employed in the current study. This study has three specific aims: first, to establish the extent to which mothers with higher levels of ADHD symptoms experience more parenting stress compared to mothers with lower levels of ADHD symptoms. Second, to investigate whether the relationship between maternal ADHD symptoms and parenting stress can be partially or wholly accounted for by a mother’s perceived self-efficacy in her parenting role. And finally, to test whether maternal neuroticism influences the extent to which parenting self-efficacy accounts for the relationship between maternal ADHD symptoms and parenting stress. In the remainder of this introduction, I first review what is known about maternal ADHD symptoms and parenting stress and then how parenting self-efficacy beliefs are related to both maternal ADHD symptoms and parenting stress. Finally, I outline how higher levels of neuroticism are associated with maternal ADHD symptoms, parenting self-efficacy beliefs, and parenting stress.

**ADHD in Adults**

ADHD is a chronic neurodevelopmental disorder that is broadly characterized by symptoms of inattention, hyperactivity, and impulsivity (American Psychiatric Association, 2013). ADHD symptoms begin before the age of 12, and 30-66% of people with ADHD symptoms in childhood continue to experience clinically significant levels of symptoms into adulthood (Barkley, Fischer, Smallish, & Fletcher, 2002; Molina et al., 2009; Roberts, Milich, & Barkley, 2015). High levels of adult ADHD symptoms are present in approximately 2-4% of the population (Bitter, Simon, Bálint, Mészáros, & Czobor, 2010; Kessler et al., 2006) with men
experiencing symptoms more often than women (the male to female prevalence rate is approximately 3:2; Cahill et al., 2012; de los Cobos et al., 2011), although there is some evidence that the distribution of symptoms across genders may differ by ADHD subtype (Ramtekkar et al., 2010). As in childhood, ADHD symptoms in adulthood are highly heritable (heritability coefficient = .72; Larsson, Chang, D’Onofrio, & Lichtentstein, 2014).

People experiencing symptoms of ADHD may have difficulty with planning, organization, memory, and restlessness. These difficulties can manifest in a variety of ways including losing objects, forgetting appointments, and having difficulty sitting quietly for extended periods of time (Barkley, 2008). Adults with higher levels of ADHD symptoms are typically impaired by their symptoms. Compared to adults with lower levels of ADHD symptoms, adults with higher levels of ADHD symptoms report significant impairments in a wide range of domains including academic achievement (Fedele, Lefler, Hartung, & Canu, 2012), social relationships (Fedele et al., 2012), vocational functioning (Das, Cherbuin, Butterworth, Anstey, & Easteal, 2012), cognition (Boonstra, Kooij, Oosterlaan, Sergeant, & Buitelaar, 2010), physical health (Das et al., 2012), and parenting (Johnston, Mash, Miller, & Ninowski, 2012). Mothers with ADHD symptoms often have more difficulty than other mothers with family organization, monitoring their children, problem-solving, and effectively disciplining their children (Johnston et al., 2012).

For years, researchers have discussed whether ADHD should be considered as a discrete diagnostic category with distinct differences separating people with and without ADHD at the diagnostic boundary, or whether ADHD symptoms should be conceptualized as existing on a continuum of severity (Carson, 1991). Recent research on this question has consistently supported a dimensional approach with neuroimaging (Shaw et al., 2011), neurocognitive (Salum
et al., 2014), and behavioral genetic studies (Larsson et al., 2012) all demonstrating deficits that increase linearly with increasing symptoms, rather than finding abrupt changes at a diagnostic boundary. In addition, evidence consistently indicates that adults with ADHD symptoms are impaired at subdiagnostic symptom levels (Kooij et al., 2005), and therefore treating mothers experiencing such subdiagnostic levels of symptoms as though they do not experience any symptoms of ADHD could obscure the relationship between ADHD symptoms and parenting stress. As a result, ADHD symptoms are treated dimensionally in this study in order to investigate how a broad range of symptom levels is related to parenting stress.

**Maternal ADHD symptoms, Stress, and Parenting Stress**

Consistent with classic stress and coping models (Lazarus, Baker, Broverman, & Mayer, 1955), the internal experience of stress is related to, but separate from, external events that cause feelings of stress. These stressful external events are known as stressors to distinguish them from the internal experience of stress (hereafter referred to simply as stress). That is, stress can be defined as the negative internal consequences of being unable to adaptively respond to an external stressor. Therefore, parenting stress is conceptualized as the negative internal experience of a mother that is a consequence of parenting-related stressors, combined with the mother’s own capacity to cope with challenging parenting situations (Abidin, 1995). When a mother’s ability to cope is outstripped by the demands placed on her as a mother (e.g., difficult child behavior), the mother can be said to be experiencing a level of stress that is proportional to the degree of mismatch between the intensity of the parenting stressor and the ability of the mother to cope with that stressor. Parenting stress is associated with a number of negative outcomes in the parenting domain, including a lower quality relationship between the mother and child, as well as more negative parenting behavior (Kazdin, 1995; Morgan, Robinson, & Alridge, 2002).
Previous research has tested associations between ADHD symptoms in adults and various kinds of stress. Compared to adults with lower levels of ADHD symptoms, adults with higher levels of ADHD symptoms experience more stressful life events (e.g., divorce, family problems, job loss, sick leave, financial problems; Das et al., 2012; Friedrichs et al., 2012), higher levels of conflict and lower levels of cohesion in their nuclear families (Agha, Zammit, Thapar, & Langley, 2013), and greater subjective feelings of stress in response to various life events even after controlling for comorbid anxiety and depressive symptoms (Alexander & Harrison, 2013). In addition, there is some evidence that physiological responses to stress are impaired or at least altered in adults with higher levels of ADHD symptoms. In a recent review of physiological stress responses in people with higher levels of ADHD symptoms, Johnson (2015) concluded that, in comparison to control individuals, cortisol levels in people with higher levels of ADHD symptoms do not increase as much in response to acute stress. As a result, some of the cognitive benefits associated with a moderate increase in cortisol (e.g., improved working memory, better executive functioning) may not be experienced by people with higher levels of ADHD symptoms. Although a reduced cortisol response might suggest decreased levels of stress in adults with higher levels of ADHD symptoms, a history of chronic stress has been associated with lower cortisol levels (Zandstra et al., 2015), likely due to the prolonged strain on the stress response and therefore the lower cortisol response may reflect this chronic history. Further, objective or physiological measures of stress have been shown to be less predictive of various outcomes than subjective assessments of stress, particularly in people with mental health problems (Norberg, Pöder, Ljungman, & von Essen, 2012).

A study by Lackschewitz, Hüther, and Kröner-Herwig (2008) measured both physiological and psychological stress responses in 36 adults with and without ADHD before,
during, and after an experimentally-induced stressful situation. They found that the two groups did not differ in their baseline levels of stress, but that compared to the non-ADHD group, the ADHD group reported significantly increased subjective stress while anticipating the stressor, during the stressful situation, and after the stressful situation had concluded. Interestingly, group differences on physiological measures of stress were only observed while the stressful situation was occurring (i.e., the ADHD group had an increased heart rate compared to the non-ADHD group). These results were recently replicated by Raz and Leykin (2015). Combined, these two studies suggest that adults with ADHD are more strongly affected by the presence of a stressor than adults without ADHD, and that subjective experience is a key component in understanding stress in adults with ADHD symptoms; it is insufficient to rely exclusively on physiological measures of stress. These results imply that adults with higher levels of ADHD symptoms, in response to adverse events, subjectively experience more stress for a longer period of time than adults without ADHD symptoms. Further, the objective and subjective experiences of stress appear to differ in people with lower and higher levels of ADHD symptoms. Although it would be worthwhile to further investigate the atypical physiological responses to stress in people with ADHD symptoms, the focus of this study remains on the importance of the subjective experience of stress.

It is important to consider the theoretical plausibility of adult ADHD symptoms being linked to stress. Perhaps the symptoms of ADHD serve to create stressful situations or experiences (e.g., losing important documents, offending others with impulsive actions), and therefore people with higher levels of ADHD symptoms have developed greater subjective sensitivity to feelings of stress as a result of these repeated stressful exposures. For example, a mother with higher levels of ADHD symptoms may be more likely than others to forget items for
her child’s lunch on a grocery list. Although this situation is likely to be stressful for anyone, a person who is more prone to forgetfulness is likely to encounter this situation more often, and therefore may be sensitized to experience greater levels of stress. Alternately, one might argue that if people with higher levels of ADHD symptoms are repeatedly presented with stressors (often arising because of their symptoms), their stress response might be expected to habituate, rather than sensitize. However, habituation is a less likely hypothesized reaction than sensitization given that sensitization to repeated stressors has been well-established for adults suffering from a variety of mental health problems (Ruscio et al., 2015; Weiss et al., 2015) and habituation is more likely to occur with repeated, identical stressors that are not personally relevant (e.g., loud tones, placing hand in ice water; Barnum, Blandino, & Deak, 2007). Arguing instead in favor of a sensitization to repeated stressors, for people with higher levels of ADHD symptoms, the exact nature of their stressors is likely to vary from day to day and will almost certainly be personally relevant (e.g., one day an adult with higher levels of ADHD symptoms may be late to work, the next day she may forget an important doctor’s appointment).

The association between ADHD symptoms and general stress is consistently positive and strong (Agha et al., 2013; Combs, Canu, Broman-Fulks, Rocheleau, & Nieman, 2015; Das et al., 2012; Friedrichs et al., 2012). Not only do people with higher levels of ADHD symptoms have atypical physiological responses to stress compared to people with lower levels of ADHD symptoms (Johnson, 2015), their subjective experience of stress also is more intense and lasts longer (Lackschewitz et al., 2008). Although this evidence regarding ADHD symptoms and overall experiences and reactions to stressors suggests that mothers with higher levels of ADHD symptoms experience higher levels of parenting stress compared to mothers with lower levels of ADHD symptoms, existing research on the relationship between maternal ADHD symptoms and
parenting stress in particular is minimal. In recognition of this fact, a recent meta-analysis of the existing research on the relationship between parenting stress and ADHD symptoms in the child has called for increased recognition and study of parent factors such as maternal ADHD symptoms in studies of parenting stress (Theule, Wiener, Tannock, & Jenkins, 2013).

To date, only one study has examined parenting stress in relation to the level of maternal ADHD symptoms. Wietecha and colleagues (2012) studied 502 parents with higher levels of ADHD symptoms and investigated the effects of the drug atomoxetine on ADHD symptoms and parenting stress. They found that parents with higher levels of ADHD symptoms who received atomoxetine experienced significantly less stress and significantly fewer ADHD symptoms than parents with higher levels of ADHD symptoms who received placebo treatment. Given that the researchers found that the medication was effective in lowering both ADHD symptoms and reports of parenting stress, this suggests that lower levels of maternal ADHD symptoms are associated with lower levels of parenting stress. Unfortunately, the results do not permit definitive conclusions as comparison to parents whose ADHD symptoms were lower without the use of medication is not possible. Nevertheless, these results underscore the potential link between maternal ADHD symptoms and parenting stress, and suggest that parenting stress may be reduced to the extent that maternal ADHD symptoms are alleviated.

In summary, existing evidence for a direct link between maternal ADHD symptoms and parenting stress is lacking. As described above, only a single study has examined these variables directly, and even then, this evidence is in the context of a treatment study and lacks a proper comparison group of adults with fewer symptoms of ADHD (Wietecha et al., 2012). However, there are several reasons to hypothesize a relationship between maternal ADHD symptoms and parenting stress. First, other maternal mental health problems such as depression, anxiety, and
hostility are associated with greater parenting stress (e.g., Delvecchio et al., 2014; Skreden et al., 2012; Thomason et al., 2014) and it is probable that maternal ADHD symptoms follow a similar pattern. Second, as reviewed, adults with higher levels of ADHD symptoms report a wide variety of stressors (Agha et al., 2013 Das et al., 2012; Friedrichs et al., 2012) and feel the effects of those stressors more intensely and for longer periods of time than adults with lower levels of ADHD symptoms (Alexander & Harrison, 2013; Lackschewitz et al., 2008). The increased sensitivity to stress and more frequent exposure to a variety of stressors among adults with higher levels of symptoms of ADHD (Alexander & Harrison, 2013; Das et al., 2012), combined with the fact that parenting is fraught with numerous stressful experiences (Nomaguchi & Milkie, 2003), lead me to expect that mothers with higher levels of ADHD symptoms experience more parenting stress than mothers with lower levels of ADHD symptoms.

Keeping in mind the probable greater sensitivity to stressful parenting experiences among mothers with higher levels of ADHD symptoms, it is easy to imagine how such mothers may present in a clinical context. Remaining organized and confronting the demands of parenthood is likely to cause stress and occasional instances of forgetfulness and disorganization for any parent. However, mothers who are predisposed to more difficulty with inattention and impulsivity must meet all of the typical demands of parenthood with the additional burden of their ADHD symptoms. For example, to the extent that a mother is inattentive and forgetful, she may have difficulty maintaining focus during mother-child interactions, or have difficulty remembering important parenting or child-related information (Weiss, Hechtman, & Weiss, 1999). Such difficulties may cause embarrassment or have other negative social consequences (e.g., forgetting the names of their child’s friends, missing or being late to school functions). In addition, the more difficulty a mother has with organization, the more likely it is that she will
struggle to manage a household and maintain her child’s social and academic lives (e.g., keeping the house clean and organized, remembering to pick up her child from extracurricular activities, getting the child ready for school in the mornings; Weiss et al., 1999). Further, hyperactive-impulsive symptoms also are likely to generate stress, as impulsive behaviors may result in unnecessary conflict when a mother is in disagreements with, or disciplining their child (e.g., punishing in a rash or impulsive fashion; Lorber, O’Leary, & Smith Slep, 2011). Thus, mothers who must routinely confront additional parenting challenges caused by their ADHD symptoms have greater demands placed upon them in their parenting role and are predicted to experience greater parenting stress.

In sum, there are strong reasons to predict that mothers with higher levels of ADHD symptoms experience more parenting stress than mothers with lower levels of ADHD symptoms. However, parenting is, of course, strongly influenced by child input, and it is important to next consider how child characteristics may influence the relationship between maternal ADHD symptoms and parenting stress.

**Influence of child behavior.** In seeking to understand the complexity of the parenting experience for mothers with higher levels of ADHD symptoms, it is important to recognize that ADHD is a highly heritable disorder (Crosbie et al., 2013; Thapar et al., 2007). On average, mothers of children with ADHD have higher levels of ADHD symptoms than mothers of non-ADHD children, and mothers with higher levels of ADHD symptoms have children with higher levels of ADHD (Larsson et al., 2014). Larsson and colleagues recently estimated the heritability of levels of ADHD symptoms as .88 in a study of nearly 60,000 twins between the ages of 8 and 50 years of age; heritability was .72 in the adult subsample and environmental influences were found to be non-significant. Further, mothers of children with higher levels of ADHD symptoms
experience more parenting stress than mothers of children without ADHD (Fischer, 1990; Theule et al., 2013), and there is some evidence that parenting behavior is the mediator through which maternal ADHD symptoms influence the future ADHD symptoms of the mother’s own child (Tung, Brammer, Li, & Lee, 2015). Thus, it is unclear the extent to which the relationship between maternal ADHD symptoms and parenting stress may be accounted for by the relationship between child ADHD symptoms and parenting stress. As a result, any study of maternal ADHD symptoms must also measure child ADHD symptoms to be able to account for the possibility of an overlap between mother and child ADHD symptoms and parenting stress. In addition, although there is a significant association between mother and child ADHD symptoms, child oppositional and defiant behaviors are more strongly associated with parenting stress than child ADHD symptoms (Podolski & Nigg, 2001) and children’s oppositional/defiant behavior mediates the relationship between child ADHD symptoms and parenting stress (Graziano, McNamara, Geffken, & Reid, 2011). The combination of the highly heritable nature of ADHD symptoms, the high comorbidity between child ADHD symptoms and oppositionality/defiance (Pliszka, 2015), and the associations between both child ADHD symptoms and oppositional/defiant behavior and parenting stress suggest that it is necessary to assess the influence of both types of child problems.

**Summary.** The first aim of this study is to examine the association between maternal ADHD symptoms and parenting stress. I predict that mothers with higher levels of ADHD symptoms experience more stress in their role as mothers than mothers with lower levels of ADHD symptoms, even when controlling for child ADHD and oppositional/defiant behaviors. What is less clear, however, is whether maternal ADHD symptoms are directly associated with
parenting stress, or whether maternal ADHD symptoms are indirectly associated with parenting stress through a third variable.

**The Role of Parenting Self-Efficacy Beliefs**

Although I recognize the possibility that, in times of increased stress, ADHD symptoms may be more strongly experienced or expressed, the strongly heritable nature of ADHD symptoms suggests that their appearance is relatively immune to environmental influences (Larsson et al., 2014). Although this study is not able to test questions of causality, I assume that the causal direction of the association is from maternal ADHD symptoms to parenting stress, rather than the reverse as, theoretically, new symptoms of ADHD should not emerge in adulthood given the disorder’s developmental nature (American Psychiatric Association, 2013). To the extent that maternal ADHD symptoms are causing parenting stress, I propose that there are two pathways through which this might happen. First, ADHD symptoms may be directly related to parenting stress. As described above, it may be that the situations that result from a mother’s ADHD symptoms are inherently stressful. For example, we might imagine a mother whose disorganization causes her child to be repeatedly late for school. Such a mother might experience increased stress in her parenting role due to the social consequences of the child’s tardy school arrivals. Alternatively, it may be that ADHD increases parenting stress indirectly via a third variable. Cognitions mediate the associations with a variety of variables related to ADHD symptoms in both children and adults. Cognitions related to locus of control (Ostrander & Herman, 2006), cognitive or behavioral avoidance of problems, or dysfunctional beliefs about the self (Knouse, Zvorsky, & Safren, 2013), and deficits in executive functioning (Sjöwall & Thorell, 2014) have all been shown to mediate the relationships between ADHD symptoms and other variables (e.g., depressive symptoms, academic achievement), so it is not unreasonable to
predict that cognitions may similarly account for the relationship between maternal ADHD symptoms and parenting stress. One cognitive variable that may be particularly relevant for the relationship between maternal ADHD symptoms and parenting stress is the extent to which mothers believe they are competent and efficacious mothers.

This study focuses on parenting self-efficacy beliefs as a mediator of parenting stress and ADHD symptoms rather than other cognitive processes for several reasons. First, many cognitive processes are other-oriented. For example, a significant body of research exists demonstrating that mothers of children with externalizing behavior make more negative attributions for their child’s behavior (Johnston, Hommersen, & Seipp, 2009). While important, the focus of this study is on mothers’ own perceptions of their parenting experience and, as a result, the cognitive process under examination should be self-oriented. Second, many self-oriented cognitions that would be candidates for inclusion as a mediator in this study are, theoretically, more distal from parenting stress than parenting self-efficacy beliefs and, to the extent that they are related to parenting stress, likely operate through parenting self-efficacy beliefs themselves. For example, a mother who has negative attributions about her child, or has an external locus of control regarding parenting likely experiences increased parenting stress. However, attributing negative intent to your child or believing that you have little control over your parenting experience is powerful environmental feedback that will impact how efficacious you believe yourself to be as a parent. Finally, some cognitive processes are inherent to the experience of people with ADHD symptoms and therefore are inappropriate as mediators of a relationship between ADHD symptoms and parenting stress (e.g., executive functioning). For these reasons, it was believed that parenting self-efficacy beliefs would be the most potent and most proximal cognitive process to the experience of parenting stress in mothers with ADHD symptoms.
Self-efficacy beliefs in the parenting context. Self-efficacy has been described as "beliefs in one's capabilities to mobilize the motivation, cognitive resources, and courses of action needed to meet given situational demands" (Wood & Bandura, 1989, p.408). Bandura (1986) outlined the reciprocal nature of behavior and self-efficacy. That is, a mother who has an efficacious self-perception is better able to marshal her personal resources to act more readily, more confidently, and more optimally than one who is doubtful of her own ability. Conversely, acting in ways that generate successful and beneficial outcomes provides valuable feedback that one is adept in a particular domain and should, in the future, proceed with confidence and a sense of efficacy. A sense of self-efficacy is hypothesized to develop based on five sources of information: direct experience, vicarious experience, verbal persuasion from others, emotional arousal (Bandura, 1977), and imagined experience (Maddux, 2002). Further, beliefs about one's self-efficacy are role- or domain-specific. For example, people may believe that they are competent mothers, but not competent students or spouses. In addition, self-efficacy beliefs are not binary, and instead exist on a continuum of certainty that a person can competently perform a particular task. For example, a mother might range anywhere from very certain she is incapable of successfully helping their child get ready for school on time, to very certain that she is capable of doing so.

In the parenting context, mothers who perceive themselves as efficacious have had successful parenting experiences, observed and reflected on others’ successful and unsuccessful parenting experiences, received positive feedback on their parenting abilities from others, imagined and planned parenting behaviors that they believe to be optimal, and received internal feedback in the form of positive emotions as a response to their parenting choices, all of which serve to guide future behavior. Further, it is only possible to draw conclusions about parenting
self-efficacy beliefs to the extent that self-efficacy beliefs in this domain are measured in such a way as to tap a variety of parenting skills. A measure of parenting self-efficacy beliefs that only assesses a mother’s perceived self-efficacy in disciplining their child is better characterized as a measure of perceived parenting discipline efficacy and not perceived parenting self-efficacy overall. Therefore, when measuring parenting self-efficacy beliefs it is important to survey as many major components of the parenting role as possible so that an overall measure of perceived parenting self-efficacy can be obtained that is not overly reliant on only one or two components of the parenting role. Important components of parenting have been identified in previous literature and include showing affection, engaging in play, facilitating routines, disciplining the child, promoting learning and development, and promoting communication and social skills (Ballenski & Cook, 1982; Kendall & Bloomfield, 2005).

Linking the above discussion to mothers with high levels of ADHD symptoms, we can return to the example of the mother whose ADHD symptoms result in repeatedly bringing her child late to school. We might imagine that such a mother comes to believe that she is an incompetent mother for repeatedly failing to perform her parenting duties effectively (e.g., getting her child ready and delivered to school on time) and experiences stress as a result of those beliefs. In this case, it isn’t the ADHD symptoms per se that are leading to increased parenting stress, but the fact that such symptoms generate in the mother a sense of lower parenting efficacy, and it is the belief that one is not a competent parent that is experienced as stressful.

In this discussion of parenting self-efficacy beliefs, it is important to distinguish between perceived self-efficacy and actual capability. Each person has a unique set of abilities that allow the execution of tasks with varying degrees of success. However, how one perceives one’s own
capability also constrains actions. Those who believe that their ability to effectively complete a task is minimal will focus on their perceived deficiencies and possible failures rather than maintaining focus on the task and a belief that the task is a challenge to be overcome (Bandura, 1993). These negative cognitions are seen to interfere with task performance, reducing the ability to appropriately execute the task. As a result, perceived self-efficacy is predictive of outcomes above and beyond actual skill, as self-efficacy beliefs constrain behaviors related to performance. For example, people who believe in their capability to solve math problems perform better than peers with an equal level of objective skill, but who have low self-efficacy beliefs (Bandura, 1989). Those who performed poorly on math problems in the Bandura study did so not because of an actual skill deficit, but because of an unwillingness or inability to use the skills they did have to successfully complete the math problems. Evidence for the importance of perceived self-efficacy also is shown through longitudinal research demonstrating the predictive power of perceived self-efficacy above and beyond actual ability across a variety of tasks including the ability to self-regulate one’s learning, academic achievement, affect regulation, and inhibition of violent behavior (Bandura, Caprara, Barbaranelli, Gerbino, & Pastorelli, 2003; Caprara et al., 2008; Caprara, Regalia, & Bandura, 2002).

**Parenting self-efficacy beliefs and maternal ADHD symptoms.** Beliefs about one’s efficacy as a mother are associated with a variety of outcomes in the mother as well as the child. For example, low parenting self-efficacy beliefs also are related to a number of other factors in a mother’s life such as endorsement of traditional gender roles, and beliefs that problematic behavior in her child will go away without intervention (Lawton, Kapke, & Gerdes, 2015). Further, parenting self-efficacy beliefs are negatively associated with child behavior problems (Meunier et al., 2012), child medical problems (Carson & Schauer, 1992), perceptions of stress
(Scheel & Tieckmann, 1998), and poor parenting behavior (Coleman & Karraker, 1998), and positively linked to access to social support (Angley, Divney, Magriples, & Kershaw, 2015), and response to intervention for families in crisis (Katsikitis, Bignell, Rooskov, Elms, & Davidson, 2013). In addition, there is reason to believe that parenting self-efficacy beliefs are related to maternal ADHD symptoms. As already noted, ADHD symptoms are associated with a wide variety of cognitive deficits including inattention, retrospective and prospective memory, and maladaptive automatic thoughts (Fuermaier et al., 2015). For example, Torrente and colleagues (2014) investigated dysfunctional cognitions in 35 adults with high levels of ADHD symptoms and found significantly more negative automatic thoughts and dysfunctional attitudes than among people without ADHD symptoms. In fact, the level of maladaptive cognitions in adults with high levels of ADHD symptoms was equivalent to that in adults experiencing other psychological disorders.

Importantly, there is often poor agreement between subjective experiences of cognitive functioning and objective performance, with adults with higher levels of ADHD symptoms reporting significantly more impairment from their cognitive deficits than what would be predicted by their objective impairments alone (Fuermaier et al., 2015). Given the strong associations among ADHD symptoms and a variety of cognitive impairments – particularly maladaptive cognitions – it is reasonable to suspect that mothers with higher levels of ADHD symptoms perceive themselves as being less competent mothers than mothers without ADHD symptoms. Consistent with the finding that mothers’ perceptions (e.g., of parenting stress) are better than objective measures at differentiating mothers with higher and lower levels of ADHD symptoms (Lackschewitz et al., 2008), it is likely that mothers’ self-efficacy beliefs, rather than actual, observed parenting efficacy is most important in relation to maternal ADHD symptoms.
As demonstrated by Bandura (1989), it doesn’t matter how capable a person is if they lack the sense of efficacy to take advantage of that capability. The long history of failures that people with ADHD likely experience due to their symptoms is expected to result in negative expectations and further failures in the parenting domain. An expectation of failure may cause a mother to not work as hard to ensure success in parenting tasks, thus resulting in a greater probability of failure. If true, this would be a problematic positive feedback loop which could lead to lower sense of parenting efficacy (i.e., “if it always goes wrong no matter what I try, I must not be very good at this”). Expectations of failure leading to lower self-efficacy beliefs have been seen in studies of mothers reporting high levels of depressive and anxious symptoms, possibly reflecting their increased worries, doubts, and negative expectancies about their ability to succeed in their parenting role (Kohlhoff & Barnett, 2013; Porter & Hsu, 2003), which in turn are related to more problematic parenting behaviors (Murdock, 2013). There also is evidence to support the hypothesis that mothers with higher levels of ADHD symptoms perceive themselves as less efficacious mothers than mothers with lower levels of ADHD symptoms. Jiang and Johnston (2012) found significant negative relationships between ADHD symptoms and sense of competence in mothers, including in a domain assessing competence beliefs in managing a household.

Compared to mothers without any ADHD symptoms, mothers with higher levels of ADHD symptoms almost certainly face additional challenges that frustrate their ability to parent effectively. However, the extent to which mothers believe themselves to be competent as mothers may also dictate how efficacious they actually are when engaging in parenting tasks, and mothers with higher levels of ADHD symptoms may be disproportionately likely to believe that they lack such parenting competence. In a study of 80 mothers with varying levels of ADHD
symptoms, Banks, Ninowski, Mash, and Semple (2008) found that mothers with higher levels of ADHD symptoms reported lower parenting self-efficacy beliefs. Similarly, there is evidence that the lower levels of parenting self-efficacy beliefs in mothers with ADHD symptoms predates any actual parenting experience, as Ninowski, Mash, and Benzies (2007) found that even among first-time expectant mothers, ADHD symptoms were related to lower parenting self-efficacy beliefs, above and beyond the effects of comorbid psychopathology. The surprising result that mothers with ADHD symptoms have a low sense of parenting self-efficacy even before they have had any parenting experience may be grounded in their long history of failures related to ADHD symptoms.

In summary, low parenting self-efficacy beliefs are predicted to cause difficulties in the parenting domain above and beyond actual parenting skill. The importance of self-efficacy beliefs has been demonstrated in studies finding that people with higher levels of self-efficacy beliefs demonstrate better performance compared to people of the same level of actual ability but who have lower self-efficacy beliefs, and it is probable that the same effect will be observed in the parenting domain (Bandura, 1989, 1997; Paunonen & Hong, 2010). In addition to its relationship with ADHD symptoms, a diminished sense of parenting efficacy also may contribute to the experience of stress in the mother, and it is important to consider how these two variables may be related to each other.

**Parenting self-efficacy beliefs and parenting stress.** In addition to parenting self-efficacy beliefs being related to maternal ADHD symptoms, lower parenting self-efficacy beliefs also may relate to parenting stress in these mothers. A belief in one's own personal agency and ability to create change in one's child is critical in promoting a sense of parenting self-efficacy (Bandura, 2008) and it is not surprising that mothers who lack these beliefs experience
significant levels of stress in their parenting role. Sense of parenting self-efficacy and parenting stress have been repeatedly negatively associated in a variety of samples (Gerdes et al., 2007; Harper et al., 2013; Hassal, Rose, & McDonald, 2005; Hill & Rose, 2009; May, Fletcher, Dempsey, & Newman, 2015; Newman, Stevenson, Bergman, & Boyce, 2007; Ngai & Chan, 2011). For example, in a study of 75 pediatric cancer patients and their parents, Harper and colleagues (2013) found that when parents reported higher levels of perceived self-efficacy in their ability to keep their child calm before or during a treatment procedure, they reported lower levels of stress before, during, and after the procedures were complete. Newman and colleagues (2007) compared parenting self-efficacy beliefs in mothers with and without borderline personality disorder. They found that parenting self-efficacy beliefs were negatively associated with parenting stress, and that mothers with borderline personality disorder reported significantly more parenting stress and less competence in their parental role compared to mothers without the disorder. This study further illustrates the importance of maternal mental health status in understanding parenting cognitions and stress responses.

The relationship between parenting self-efficacy beliefs and parenting stress makes intuitive and theoretical sense. Most mothers perceive their role as meaningful (Nelson, Kushlev, & Lyubomirsky, 2014) and when mothers do not perceive themselves as efficacious, their family satisfaction is diminished (Bandura, Caprara, Barbaranelli, Regalia, & Scabini, 2011). Therefore, it is reasonable to assume that mothers with lower self-efficacy beliefs experience negative psychic consequences of those beliefs, including increased parenting stress. In addition, parenting self-efficacy beliefs mediate the relationship between mothers’ ability to cope with stress and psychological or social outcomes (e.g., social support, emotional intelligence, Finzi-Dottan et al., 2011). Demonstrating the importance of parenting self-efficacy beliefs throughout
the lifespan, Hill and Rose (2009) tested a mediational model of parenting self-efficacy beliefs and parenting stress in a study of 44 mothers of grown children with intellectual disabilities. They found that parenting self-efficacy beliefs mediated the relationship between personal and social skills and parenting stress, as well as between social support and parenting stress. Interestingly, evidence exists showing that self-efficacy beliefs mediate the relationship between ADHD symptoms and other mental health outcomes. Michielsen and colleagues (2014), studied 234 adults with and without ADHD symptoms over the age of 60 years. They found that ADHD symptoms were significantly related to self-efficacy beliefs ($\beta = -0.18, p < .001$) and that self-efficacy beliefs significantly mediated the relationship between ADHD symptoms and depression. These results suggest not only that a parent's self-efficacy beliefs and parenting stress are strongly related, but also that parenting self-efficacy beliefs can be the mechanism through which other variables relate to parenting stress.

In summary, two possible pathways are proposed to explain the association between maternal ADHD symptoms and parenting stress (Figure 1). The first is a direct pathway such that maternal ADHD symptoms result in parenting situations that are perceived as stressful (path c in Figure 1). That is, stressors that occur due to maternal ADHD symptoms generate parenting stress. The other possibility is that the relationship between maternal ADHD symptoms and parenting stress is partially or wholly accounted for by the mother’s sense of their own competence as a parent (paths a and b in Figure 1). That is, mothers with higher levels of ADHD symptoms are proposed to feel less competent as mothers (e.g., due to a history of negative parenting experiences associated with their ADHD symptoms) and it is that lower sense of parenting self-efficacy that is related to parenting stress.
Given the current state of the literature, both proposed pathways between maternal ADHD symptoms and parenting stress are defensible. It is the second aim of this study to investigate whether one or both of these possible pathways accurately describe the relationship between maternal ADHD symptoms and parenting stress. Specifically, I predict that parenting self-efficacy beliefs account for a significant part of the relationship between maternal ADHD symptoms and parenting stress such that mothers with higher levels of ADHD symptoms have lower self-efficacy beliefs, and it is those lower self-efficacy beliefs that are related to parenting stress.

Importantly, I recognize that the relationship between parenting stress and parenting self-efficacy beliefs is likely bidirectional. Experiencing parenting stress is a source of feedback for the mother, and higher levels of parenting stress may be interpreted by the mother as evidence that she is not an efficacious mother, which is then, likely, stressful (Banis & Lorist, 2012; Keefe, Kajrlsen, Lobo, Kotzer, & Dudley, 2006). However, the cross-sectional design of the current study means that I am not able to examine both directions of the relationship between

Figure 1. Hypothesized model of the indirect effect of parenting self-efficacy beliefs on the relationship between maternal ADHD symptoms and parenting stress.
parenting self-efficacy beliefs and parenting stress, and instead I am only able to test whether parenting self-efficacy beliefs can account for the relationship between maternal ADHD symptoms and parenting stress.

Although I predict parenting self-efficacy beliefs account for a significant amount of the variance between maternal ADHD symptom and parenting stress, I believe that this may only be true for a subset of mothers with higher levels of ADHD symptoms, and that the links between maternal ADHD symptoms and parenting self-efficacy as well as between parenting self-efficacy and parenting stress are of variable importance depending on other factors. Specifically, I propose that the strength of the indirect relationship between maternal ADHD symptoms and parenting stress through parenting self-efficacy beliefs depends on the personal characteristics of the mother.

**Personality**

The most commonly understood model of personality consists of five factors: neuroticism (tendency towards negative affect), extraversion (tendency towards sociability and interpersonal involvement), openness to experience (tendency towards curiosity and intellectual inquiry), conscientiousness (tendency towards dependability and will to achieve), and agreeableness (tendency towards altruism and likeability; Costa & McCrae, 1992; Digman, 1990). These traits represent persistent tendencies for a person to think or behave in particular ways across time and contexts, and have been repeatedly associated with cognitive and behavioral outcomes in adults with and without mental health problems (Curtis, Windsor, & Soubelet, 2015; Klimstra, Luyckx, Hale, & Goossens, 2014). Relevant to the research questions of this project, maternal personality factors have been shown to be important for a variety of outcomes, including stress (Casalin Tang, Vliegen, & Luyten, 2014).
Neuroticism is the most theoretically plausible personality characteristic that may distinguish the hypothesized pathways between maternal ADHD symptoms and parenting stress. I propose that how people interpret their own role in negative or stressful occurrences in their life is the factor that distinguishes mothers with high levels of ADHD symptoms whose parenting stress is fully versus partially accounted for by parenting self-efficacy beliefs. People with higher levels of neuroticism are prone to self-criticism and self-doubt. It is likely that neurotic personality characteristics are closely related to parenting self-efficacy beliefs such that a tendency towards pessimism and negative emotions (i.e., neuroticism) makes mothers more likely to doubt their competence as a parent.

**ADHD and neuroticism.** Nigg, Goldsmith, and Sachek (2004) hypothesize that there are different groups of people with equivalently high levels of ADHD symptoms, differentiated by distinct underlying temperamental and personality characteristics. Nigg and colleagues speculate that these personality differences may direct people with similar levels of ADHD symptoms down different developmental pathways and that these differing trajectories (initiated by personality characteristics) explain some of the heterogeneity that is observed in the clinical presentations of adults with ADHD symptoms.

Studies demonstrate that neuroticism is the personality factor most consistently related to ADHD (Di Nicola et al., 2014; Jacob et al., 2007; Polner, Aichert, Macare, Costa, & Ettinger, 2015), and a recent meta-analysis confirmed that neuroticism is strongly associated with ADHD symptoms (Gomez & Corr, 2014). Based on their findings, Gomez and Corr (2014) developed a personality model of ADHD in which neuroticism is primarily viewed as a personality factor dictating how one reacts to emotional events; including stressful events. Similarly, Robin and colleagues (2008) demonstrated two clusters of adults with ADHD who were distinguishable by
the presence of negative expectations, maladaptive interpersonal behaviors, and a tendency to be reactive to negative life events rather than to be proactive; personality features highly analogous to the construct of neuroticism. He, Antshel, Biederman, and Faraone (2015) recently found that adults with ADHD symptoms are more sensitive to negative events, and are more avoidant of threatening stimuli than adults without ADHD symptoms. Furthermore, neurotic personality features in the adults with ADHD symptoms were found to predict impaired interpersonal functioning (He et al., 2015). In sum, personality symptoms, and neuroticism in particular, are related to both mental health difficulties in general (Klimstra et al., 2014), and ADHD symptoms specifically (Di Nicola et al., 2014; Polner et al., 2015), and may therefore impact the relationships among maternal ADHD symptoms and other variables.

Parenting stress, self-efficacy beliefs, and neuroticism. There is some research on the relationships between neuroticism and both parenting stress and perceived self-efficacy. In a sample of 150 first-time mothers, Casalin and colleagues (2014) found that self-criticism and dependency – lower-order forms of neuroticism – were associated with concurrent parenting stress when parenting newborns. Further, parenting stress when their child was an infant was predictive of parental self-criticism and dependency 1-year later as their child entered toddlerhood. In addition, a recent longitudinal study of parent personality and parenting stress found levels of neuroticism at age 33 were positively predictive of parenting stress 9 years later, even after controlling for initial stress (Rantanen et al., 2015). These studies suggest a strong link between parental neuroticism and parenting stress that warrants further analysis.

In addition, neuroticism has been associated with a general sense of self-efficacy in adults. For example, Merritt and Tharp (2013) investigated how personality features were related to self-efficacy beliefs in the athletic skills of young adults. They found that neuroticism was
significantly related to self-efficacy beliefs ($r = -.37, p<.001$), and that neuroticism was marginally related to risky behavior above and beyond the effects of self-efficacy beliefs ($\beta = .11, p = .07$). A meta-analysis summarizing the relationship between personality and self-efficacy beliefs confirms neuroticism as the strongest and most consistent predictor of self-efficacy beliefs based on 37 studies and 6,730 participants (average $r = -.29$; Judge & Ilies, 2002).

Importantly, although there is typically a significant relationship between neuroticism and self-efficacy beliefs (e.g., people prone to negative emotions in general are likely to be more critical about their ability to parent effectively; Kaplan, Kevinson, Rodebaugh, Menatti, & Weeks, 2015), there is evidence that these remain distinct constructs. Neuroticism is a broad construct encompassing personal characteristics that are relatively constant across time and situations and is often defined as a tendency towards experiencing negative emotions. In contrast, parenting self-efficacy beliefs are specific to the parenting domain and, while likely emotionally laden, are characterized as cognitive constructs. Finally, while neuroticism and self-efficacy beliefs are significantly related, their correlation is typically only small to moderate ($r_s \sim -.30$, Kaplan et al., 2015; Karwowski, Lebuda, Wisniewska, & Gralewski, 2014), signaling that most of the variance between the two constructs is nonshared.

In sum, existing research suggests that personality, parenting stress, and parenting self-efficacy beliefs are all linked and may have important relationships that warrant investigation within a single model. Therefore, the third and final aim of this study is to investigate whether neurotic personality features moderate the strength of the indirect effect of parenting self-efficacy beliefs on the association between maternal ADHD symptoms and parenting stress (the dotted lines in Figure 2). Given the associations among neuroticism, ADHD symptoms, parenting self-efficacy beliefs, and parenting stress, it is likely that the entire model is influenced...
by neurotic personality features. Therefore, I hypothesize that the overall indirect effect of parental sense of competence on the relationship between maternal ADHD symptoms and parenting stress is conditional on the level of maternal neuroticism such that these links are stronger for mothers with higher levels of neuroticism (dashed lines in Figure 2).

Covariates and Exploratory Analyses

Given that the variables of interest in this study are each related to numerous other variables, a number of covariates that may account for variance in the proposed model are measured. As previously described, psychopathology in mothers (in particular symptoms of depression, anxiety and hostility) is related to both ADHD symptoms and to parenting stress (Delvecchio et al., 2014; Skreden et al., 2012; Thomason et al., 2014). As a result, it is important to control for these co-occurring difficulties to ensure that it is ADHD symptoms and not other psychological problems that are associated with self-efficacy beliefs and parenting stress.

Similarly, child problems are assessed. Mothers with ADHD symptoms are likely to have children with ADHD symptoms and/or oppositional/defiant behavior (Larsson et al., 2014), and mothers with children with symptoms of oppositional/defiant disorder report a number of parenting difficulties including family dysfunction, and lower parenting self-efficacy beliefs (Cunningham & Boyle, 2002). As a result, it is critical to control for these child problems in order to account for the stress that is generated by parenting a child with ADHD or oppositional/defiant behavior (van der Oord, Prins, Oosterlaan, & Emmelkamp, 2006).

In addition, parenting behavior has been associated with parenting stress (Paulussen-Hoogeboom, Stams, Hermanns, & Peetsma, 2008) and was assessed in order to be able to control for the likelihood that the nature of a mother’s interactions with their child is an
important correlate of parenting stress. Maternal social support has been identified as an important factor that can buffer the effects of stressors (Finzi-Dottan et al., 2011), and are measured and controlled as necessary. To ensure that measured stress is the stress that is experienced in the parenting role and not from other areas of the mother’s life, it is necessary to administer a measure of general life stress, especially given evidence that adults with higher levels of ADHD symptoms experience more stressful life events than adults with lower levels of ADHD symptoms (Das et al., 2012; Friedrichs et al., 2012). Finally, demographic characteristics including level of education, income, acculturation, and marital status are collected in order to both accurately describe the sample, and to allow for the possibility of controlling for particular demographic characteristics in the event they are significantly related to the variables of interest.
Including the covariates described above in this study not only allowed control for their associations with mediational variables, their measurement may also reveal other important information about mothers’ experience of parenting stress and parenting self-efficacy beliefs. Parenting behavior and other maternal psychological symptoms have been shown to be related to both parenting stress and parenting self-efficacy beliefs (Benson, 2016; Chau & Giallo, 2015; Delvecchio et al., 2014; Paulussen-Hoogeboom et al., 2008) and parenting self-efficacy beliefs have been shown to mediate the relationship between maternal social support and parenting stress (Finzi-Dottan et al., 2011). Thus, in an exploratory fashion, the possibility was considered that variables included as covariates might also be associated with mediational variables in such a way as to be appropriate predictor variables in mediations of their own.

**Use of Collateral Informants**

It is important to consider the use of collateral informants when assessing adult personality and psychopathology, specifically ADHD symptoms. There are two benefits to using multiple informants to measure these adult characteristics. First, a combination of self- and collateral-reports likely better approximates the “true” value of the variable of interest than either informant’s report alone. A meta-analysis of 51,000 articles found correlations of only .30 to .44 between self-reported and collateral-reported adult externalizing symptoms (such as ADHD symptoms), even when using the same assessment instrument (Achenbach, Krukowski, Dumenci, & Ivanova, 2005). Although these correlations are significant, they suggest that there is considerable disagreement between raters regarding the nature and severity of symptoms. In addition to the discrepancies in self and collateral reports that have been demonstrated in ratings of adult psychopathology or personality in general (Achenbach et al., 2005), discrepancies have been shown in people with higher levels of ADHD symptoms. People with higher levels of
ADHD symptoms have been shown to disagree with collateral informants on the severity of their symptoms, although the evidence is inconsistent regarding whether they report more or fewer symptoms (Barkley et al., 2011; Zucker, Morris, Ingram, Morris, & Bakeman, 2002). A recent study found correlations between .30 and .40 for the degree of agreement on symptom severity between adult women with ADHD symptoms and collateral informants (both parents and partners; Mörstedt, Corbisiero, Bitto, & Stieglitz, 2015). As a result, in the current study it is important to collect a report of ADHD symptoms from both the mother and from a collateral informant. As I am interested in assessing the underlying, actual severity of symptoms (rather than raters' perceptions), I follow the recommendations made by Achenbach and colleagues (2005) and others (Barkley, Knouse, & Murphy, 2011), and combine self- and collateral-symptom reports to maximize the validity of the assessment.

For the same reasons that multiple raters report on participants’ ADHD symptoms (i.e., maximizing the validity of the assessment, low agreement between self- and collateral informants), neuroticism also is assessed with both self- and collateral reports. A coherent measure of personality is best achieved by utilizing both self- and collaterally-reported personality measures (Biesanz & West, 2000; Biesanz, West, & Graziano, 1998) particularly because the typical correlation between self- and collateral-reports of neuroticism is only .13 to .24 (Biesanz, West, & Millevoi, 2007). As a result, to enhance measurement of this construct, both self- and collateral reports of maternal neuroticism are administered and combined into a composite.

The second benefit of using collateral informants is linked to how the variable assessed is related to other measures. Associations with a given construct are inflated to the extent that the different constructs are measured with fewer methods and by fewer raters (Campbell & Fiske,
If a single rater is used for all measures, associations among the ratings are likely inflated to an unknown degree. Therefore, to the extent possible, it is important to use multiple raters to decrease inflation due to single rater effects and to generate more accurate estimates of the true value of relationships among constructs. Two key variables in this study – parenting self-efficacy beliefs, and parenting stress – are only reported on by mothers. This is because the constructs of interest are how mothers’ own perceptions of their sense of competence as parents are related to their subjective experience of parenting stress, not constructs that are easily assessed by anyone other than the mothers themselves. Although the drawbacks of utilizing single raters for some variables (parenting self-efficacy beliefs and parenting stress) and both self- and collateral-reports for other variables (ADHD symptoms and neuroticism) are non-trivial, I believe that this design strikes the optimal balance of reliability and validity. Rater-specific variance may contain useful information (e.g., the subjective experience of parenting stress and parenting self-efficacy beliefs), and other informant reports of these constructs may sacrifice validity (i.e., using any other rater to rate others' perceptions of self-efficacy or parenting stress is less valid than using that person's own perceptions) for reliability (Bartels, Boomsma, Hudziak, van Beijsterveldt, & van den Oord, 2007). By using both self- and collateral-reports for those variables where I am more interested in their objective value (i.e., ADHD symptoms and personality), and using only self-reports for those variables where I am more interested in the subjective value (i.e., parenting self-efficacy beliefs and parenting stress) the effect of the loss of validity is minimal and rater variance effects are minimized where possible, increasing both reliability and validity. Together, I believe that this is an appropriate balance.
The Current Study

The model outlined above is what would classically be described as moderated mediation (James & Brett, 1984). That is, the presence of the indirect effect is moderated by another variable. However, due to a multitude of possible ways that a variable may moderate an indirect effect, considerable confusion has arisen in the literature regarding the definition of moderated mediation and mediated moderation (Baron & Kenny, 1986; Morgan-Lopez & MacKinnon, 2006; Muller et al., 2005; Preacher, Rucker, & Hayes, 2007; Wegener & Fabrigar, 2000). As a result, I use the term *conditional indirect effect* to encompass all models of indirect effects that are dependent on the value on some other variable. This also helps to avoid additional issues related to implications of causality stemming from the use of the term mediation in a cross-sectional study.

Although it would be ideal to test this model for both mothers and fathers, for this study this was not feasible from a time or financial standpoint. Therefore, as the majority of research on adults with higher levels of ADHD symptoms and, indeed, much of the research regarding parenting stress, personality, and parenting self-efficacy, is conducted with mothers, I chose to test mothers to retain comparability with previous research. I focused on mothers of children between 6 and 12 years of age in order to allow for children young enough that the maternal role requires significant organization, planning, and child management, skills that are more difficult for mothers with higher levels of ADHD symptoms (Johnston et al., 2012). Similarly, children under the age of 6 or over 12, while providing their own kind of parenting stresses, are likely qualitatively different from elementary school-aged children in the types of parenting stress they elicit.
To summarize, this study has three main aims. The first is to investigate whether a relationship exists between maternal ADHD symptoms and parenting stress. It is my hypothesis that a relationship exists such that mothers with higher levels of ADHD symptoms also experience more parenting stress, even after controlling for relevant covariates. Second, this study investigates whether the relationship between maternal ADHD symptoms and parenting stress can be at least partly accounted for by parenting self-efficacy beliefs. I hypothesize that there is such an effect. However, my hypothesis for my third aim is that this indirect effect is conditional on the level of maternal neuroticism; specifically that the indirect effect is stronger for those mothers who experience higher levels of neuroticism.

**Method**

**Recruitment**

Appropriate recruitment of families and people with mental health difficulties is challenging (Jaffee et al., 2009) and online recruitment has the potential to circumvent some of these challenges (e.g., participation is more accessible) despite introducing new ones (e.g., potential participants may not have access to the internet). Participants for this study were recruited from Amazon’s Mechanical Turk (MTurk). MTurk is a marketplace where employers or researchers post Human Intelligence Tasks (HITs) for users to complete in exchange for compensation from the provider of the task (known as the requester, in this case the researcher). Typical tasks include transcription, comparing images, and responding to questionnaires. MTurk has the advantage of providing access to a large sample of adults including from traditionally difficult-to-reach populations. The average MTurk user is a female in her mid 30s (Paolacci, Chandler, & Ipeirotis, 2010) and, although the rate of pay has been shown to affect sample recruitment, the quality of the data does not seem to be affected by compensation (Buhrmester,
The reliability of the data collected by MTurk seems no different than data gathered by more traditional means (Eriksson & Simpson, 2010; Gardner, Brown, & Boice, 2012; Horton, Rand, & Zeckhauser, 2011; Mason & Watts, 2009; Suri & Watts, 2011). These results are true even when face-to-face tasks are adapted for a computer interface. For example, Casler, Bickel, and Hackett (2013) conducted an in-person teaching task with college undergraduates, and set up the same task on MTurk. They found that the sample recruited through MTurk was more ethnically and economically diverse and older than the college undergraduates, but demonstrated equivalent performance on the teaching task. When the attentiveness of respondents on MTurk is not confirmed, the reliability of their data has been shown to be worse than for participants recruited through more conventional methods (Rouse, 2015). However, MTurk users who consistently receive positive reviews from requesters rarely fail attention check questions (Peer, Vosgerau, & Acquisti, 2014). In the current study, validity questions were included in order to ensure consistent attention, as well as actual parenthood among the participants. In addition, participants were required to have an approval rating of 95% or higher by previous requesters, as suggested by Peer and colleagues (2014). As can be seen by the small differences between the “completed the study” and “answers were valid” boxes of Figure 3, few participants were excluded as a result of validity concerns.

In order to ensure variability in maternal ADHD symptoms, recruitment for the study was broken into two sequential tasks that were posted on MTurk. Two waves of recruitment were conducted. The waves were nearly identical except that the second recruitment wave began with an additional screening question assessing the extent to which symptoms of inattention, hyperactivity and impulsivity impaired the daily lives of participants. Only mothers who
endorsed at least moderate levels of impairment were permitted to complete the study during the second wave.

**Participants**

I recruited 208 mothers (123 in Wave 1 and 85 in Wave 2) of 6-12 year old male and female children who completed the full battery of questionnaires. Of those, 8 had their responses rejected due to a failure to provide valid responses (see Procedure for more detail about these validity checks) and 120 provided complete collateral informant data (see Figure 3 for participant flow). All subsequent analyses were conducted on the complete 120-mother sample. Means, standard deviations, and demographic information for study variables can be found in Table 1. Mothers in this study were an average of 34 years of age and had normal distributions of education and income levels.

The average participant had completed at least one year of college or university and earned $35,000-$49,999 USD per year. The majority of mothers were married and approximately one-third had received treatment for a mental health problem (primarily depression). Only 12% of mothers reported that their child had received a mental health diagnosis, but a significant majority of these mothers had a child with ADHD. The average mother strongly identified with her majority culture, and spends the majority of her awake time outside of school hours with her child. Both biological and non-biological mothers were allowed to participate (2.5% of mothers were the adoptive parents of their child), as long as they had lived with the child for more than 1 year or saw the child at least 4 days per month if they were the noncustodial parent (in this sample, all mothers were custodial parents). Mothers with more than one child between the ages of 6 and 12 were asked to think of the child they have the most
Figure 3. Participant flow diagram
Table 1. Demographic characteristics of 120-mother sample

<table>
<thead>
<tr>
<th>Table 1: Demographic characteristics of 120-mother sample</th>
<th>Mean</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mother Age</td>
<td>33.88</td>
<td>5.95</td>
<td>24.00-52.00</td>
</tr>
<tr>
<td>Child Age</td>
<td>7.83</td>
<td>1.71</td>
<td>6-12</td>
</tr>
<tr>
<td>Acculturation(^1)</td>
<td>8.83</td>
<td>1.56</td>
<td>3.00-10.00</td>
</tr>
<tr>
<td>Time Married in Years</td>
<td>9.75</td>
<td>4.68</td>
<td>0-24</td>
</tr>
<tr>
<td>Number of Other Children</td>
<td>1.45</td>
<td>1.07</td>
<td>0-5</td>
</tr>
<tr>
<td>Percentage of Time Child Spends with Mother(^2)</td>
<td>81.22</td>
<td>20.64</td>
<td>13-100</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Percent of Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child Gender (% Boys)</td>
</tr>
<tr>
<td>Employed</td>
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### Education

<table>
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<tbody>
<tr>
<td>High School Graduate</td>
<td>11</td>
</tr>
<tr>
<td>College or University Training</td>
<td>77</td>
</tr>
<tr>
<td>Graduate Training</td>
<td>12</td>
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</table>

### Ethnicity

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<tbody>
<tr>
<td>Caucasian</td>
<td>74</td>
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<tr>
<td>African American</td>
<td>10</td>
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<tr>
<td>Asian American</td>
<td>5</td>
</tr>
<tr>
<td>Mixed Race</td>
<td>3</td>
</tr>
<tr>
<td>Other</td>
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</table>

### Household Income Per Year

<table>
<thead>
<tr>
<th>Household Income Per Year</th>
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<tbody>
<tr>
<td>&lt;$20,000</td>
<td>14</td>
</tr>
<tr>
<td>$20,000 – $74,999</td>
<td>65</td>
</tr>
<tr>
<td>&gt;$75,000</td>
<td>21</td>
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### Marital Status

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<th>Marital Status</th>
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<tbody>
<tr>
<td>Single</td>
<td>17</td>
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<tr>
<td>Divorced or Separated</td>
<td>13</td>
</tr>
<tr>
<td>Married or Common-law</td>
<td>71</td>
</tr>
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### Has Received Treatment for

<table>
<thead>
<tr>
<th>Has Received Treatment for</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mood/Anxiety Problems</td>
<td>33</td>
</tr>
<tr>
<td>ADHD Symptoms</td>
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### Taking medication for a mental health problem

<table>
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<tbody>
<tr>
<td>13</td>
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### Child Diagnosed with

<table>
<thead>
<tr>
<th>Child Diagnosed with</th>
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</tr>
</thead>
<tbody>
<tr>
<td>ADHD</td>
<td>9</td>
</tr>
<tr>
<td>Anxiety</td>
<td>1</td>
</tr>
<tr>
<td>Intellectual Disability</td>
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### Child taking medication for a mental health problem

<table>
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<th>Child taking medication for a mental health problem</th>
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<tbody>
<tr>
<td>8</td>
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\(^1\) Acculturation was measured on a scale from 1 (not at all) to 10 (completely)

\(^2\) Excluding time spent asleep or when child is at school

difficulty parenting when reporting on parenting variables and child behavior. This was done to maximize the variability in parenting experiences and responses across mothers.
Collateral informants were recruited to provide additional ratings of mothers’ ADHD symptoms and personality. For collateral informants to qualify as valid raters of the mother's ADHD symptoms and personality, they needed to be adults with a current personal relationship with the mother, and have contact at least once per week (in person, by telephone, or through internet communication). Previous research suggests that length of acquaintanceship is not highly related to accuracy or consensus of personality judgments, and any increased benefit is small and accrues only over many years (Biesanz et al., 2007). Based on this information, it was decided that collateral informants in this study must have known the participant for at least 1 year. Collateral informants were typically spouses (38%) or friends (35%), but close family members such as siblings (11%), parents (10%) and others (6%) also served as informants.

Procedure

Ethical approval for this study was obtained from the University of British Columbia. The study was advertised on MTurk as about the challenges of parenting, and how a mother’s personality is related to her parenting experiences. Mothers completed the study at any place they were able to connect to the internet and were asked to select a place that allowed for concentration with minimal disruption for approximately 1.5 hours. Once a mother clicked on the link for the study, she read about the nature of the study (including the requirement to identify an appropriate collateral informant), provided informed consent, and answered preliminary screening questions to determine that she was the mother of a child aged 6-12 (and, during Wave 2, also endorsed impairment due to ADHD-like symptoms). Mothers who met screening criteria were directed to the remainder of the survey where they provided demographic information and completed the remaining questionnaires. In this study, mothers completed questionnaires online through Qualtrics, an online survey tool designed to securely manage
sensitive data and hosted in Canada. For all mothers, the first four blocks of questionnaires (assessing ADHD symptoms, self-efficacy beliefs, parenting stress, and neuroticism) were fully counterbalanced across mothers, and the remaining questionnaires (assessing covariates) were administered in a second set, again fully counterbalanced across mothers.

Before each measure, mothers were presented with written instructions for how to complete the measure, and between measures mothers were required to answer an attention and validity question (e.g., “paraphrase one of the questions that was asked on the previous page”, “what is your child’s date of birth?”). This procedure served four purposes: first, to ensure that mothers were paying adequate attention and not providing random responses; second, to ensure that mothers’ mastery of English was sufficient that they are able to read and comprehend the questions being asked; third, to identify computer programs, or "bots", posing as mothers; and fourth, to check for mothers who may have falsified their responses to the screening items to qualify for the study. In this case, it was assumed that such people would put in a date of birth for their child in the screening item, but be unlikely to remember this date later (in contrast to actual mothers who would have no such difficulty in repeatedly providing their child's date of birth).

Finally, participants were required to complete 75% of the questions in order to receive compensation and this stipulation was included in the informed consent form. This procedure allowed for mothers to not feel forced to respond to sensitive items, while still minimizing the potential for missing data.

To identify collateral informants, mothers were asked to have their collateral informants send the researcher an e-mail to express interest in the study. The researcher then responded to the collateral informants and provided them with a separate Qualtrics link where they provided informed consent and completed two questionnaires describing the mother (in counterbalanced
order across informants). Collateral informants were required to provide both their own MTurk ID as well as the ID of the mother for whom they were completing the questionnaires in order to link mothers with their collaterals (MTurk IDs are anonymized 12-digit alphanumeric codes generated by Amazon upon registering for MTurk and are not traceable to any identifying information about the participant). Collateral informants were administered attention questions similar to those used with mothers to ensure sufficient validity of responses.

Once data from the mother and collateral informant was received, each received a code that they were able to input into MTurk to signify completion. Informal investigation of online guidelines for using MTurk suggested that $0.10/minute is a reasonable rate to pay MTurk participants (“Guidelines for Academic Requesters – Fair Payment”, 2015). Based on initial piloting, the full procedure required between 60 and 90 minutes for the mothers and 30 minutes for the collaterals to complete. Therefore, upon successful completion of all tasks, mothers received $9.00 USD and collateral informants received $3.00 USD. Participants who did not meet screening criteria (i.e., began the study but indicated that they did not consent, were not a mother, did not have a child within the acceptable age range, or, in the case of the second wave of data collection, were not sufficiently impaired by ADHD symptoms) received $0.10.

Measures

Maternal ADHD symptoms. Each mother completed the Barkley Adult ADHD Rating Scale-IV (BAARS-IV; Barkley, 2011), which is a screening measure for ADHD symptoms in adults. The BAARS-IV contains 18 items assessing current ADHD symptoms on a 4-point Likert-type scale (1 = Never or Rarely, and 4 = Very Often) and the questions are keyed to DSM criteria with a nine item Inattention subscale and a nine item Hyperactivity-Impulsivity subscale. The BAARS-IV (or its earlier version) has consistently exhibited good psychometric properties,
including significant construct (Kooij et al., 2008), discriminant (Caterino et al., 2009), and criterion validity (Barkley & Murphy, 2010). An item analysis by Gomez (2011) found an earlier version of the BAARS-IV to be a useful screening measure of ADHD symptoms in adults, with most items providing good discriminability and the measure was reliable across different levels of ADHD symptoms. Similarly, a psychometric analysis of an earlier version of the BAARS-IV by Ladner, Schulenberg, Smith, and Dunaway (2011) found high internal consistencies for both subscales, and that the BAARS-IV had excellent convergent validity, correlating .58 to .87 with other, much longer self-report rating scales. In this study, mothers also completed items on the BAARS-IV relating to impairment experienced due to their ADHD symptoms, and the age of onset of their ADHD symptoms. The impairment and age of onset scores were used for descriptive purposes. In this study, internal consistencies for the inattention and hyperactivity-impulsivity subscales were .92 and .86, respectively and the internal consistency for total self-reported ADHD symptoms was .92.

Collateral informants completed a collateral-report version of the BAARS-IV rating the mother’s ADHD symptoms and level of impairment. Use of an earlier version of the BAARS-IV with collateral informants suggested acceptable levels of agreement with self-reports ($r = .59-.76$; Barkley et al., 2008; Magnusson et al., 2006; Zucker et al., 2002). In this sample, internal consistencies for the inattention and hyperactivity-impulsivity subscales were .91 and .87, respectively, and the internal consistency for total collaterally-reported ADHD symptoms was .93.

**Parenting stress.** Parenting stress in the mothers was measured by self-report on the short form of the Parenting Stress Index (PSI-SF; Abidin, 1995). The PSI-SF is a 36-item measure of stress for parents. Mothers rate their agreement with statements related to parenting
on a 5-point Likert scale from *strongly disagree* to *strongly agree*. The PSI-SF consists of three subscales which assess parenting stress as a result of mother characteristics, child characteristics, and mother-child interactions. A total score that is the sum of all items also is calculated. The PSI-SF is consistently used as the measure for parenting stress in a variety of contexts including evaluating medication treatments (Wietecha et al., 2012), evaluating behavioral parent training interventions (Heath et al., 2015), and studies looking at the associations of stress with personality characteristics (Algorta et al., 2014). Internal reliability of the total and subscales scores of the short form of the PSI-SF has been reported as between .80 and .88 (Abidin, 1995; Zaidman-Zait et al., 2010). The subscales of the PSI-SF are useful in assessing stress in mothers of children with mental health difficulties (Zaidman-Zait et al., 2010) and scores are reliable and valid across gender and race (McKelvey et al., 2009). In this study, the internal consistency of the PSI-SF total score was .94.

To supplement the PSI-SF, in particular because it contains a number of items unrelated to stress specific to the parenting role (e.g., “I am unhappy with the last purchase of clothing that I have made for myself”), additional scales assessing stress specific to the parenting domain were administered to mothers. These were two theoretically-related subscales drawn from the Parental Stress Scale (PSS; Berry & Jones, 1995). These scales have shown good reliability (Cronbach's alphas ranging from .80 to .84; Huang, Chang, Chi, & Lai, 2014), and validity, as they are correlated with the presence of child problems, and are able to reliably distinguish between parents of children with and without mental health problems (Huang et al., 2014). The two PSS subscales were combined in this study and demonstrated an alpha of .91.

In addition, mothers were presented with seven vignettes describing child inattentive, oppositional and positive behavior that were drawn from the Written Analogue Questionnaire.
(WAQ; Johnston & Freeman, 1997). Mothers were asked to imagine their child in each vignette and to indicate how much stress the situation makes the mother feel about being a mother (i.e., “This behavior causes me to feel a great deal of stress as a parent”). For each question, mothers responded on a 5-point scale (1 = Completely Disagree to 5 = Completely Agree). Ratings for the positive behavior vignettes were reverse coded to be consistent with ratings from the ADHD and oppositional behavior vignettes. An internal consistency of .78 was found for mothers’ responses to the stress question across the seven vignettes.

**Parenting self-efficacy beliefs.** Mothers completed the P-SEMI as a measure of their perceived level of parenting self-efficacy. Unlike other popular measures of parenting self-efficacy beliefs, the P-SEMI intentionally satisfies Bandura’s (1997) four criteria for measuring self-efficacy beliefs: the items portray different levels of task demands, items are phrased in a “can do” manner, items are phrased in a way that allow mothers to rate “the strength of their belief in their ability to execute the activity” (Bandura, 1997, p.43), and finally, items are domain-specific and comprehensive of the domain that they intend to assess.

The P-SEMI is a 40 item, task-specific measure of mothers’ perceived self-efficacy. Mothers used a 6-point Likert scale, ranging from 1 (Never) to 6 (Always), to rate how often they believe they are able to successfully complete parenting tasks. The P-SEMI assesses six subdomains of parenting: showing affection and empathy (e.g., "I can show my child love and be affectionate as well as any other parent can"), engaging in play (e.g., "I can spend time playing with my child"), facilitating routines (e.g., "I can maintain the established routine when my child protests"), establishing discipline strategies (e.g., "I can discipline my child no matter how I am feeling"), providing appropriate activities for learning and development (e.g., "I can make time in my schedule to teach my child new things that s/he needs to know"), and promoting
communication interaction (e.g., "I can communicate easily with my child"). In addition, within each subdomain there are items tapping into the hypothesized ways in which self-efficacy beliefs develop (through performance experience, vicarious experience, and emotional arousal; Bandura, 1995; Maddux, 2002), reflecting various levels of mastery and with response options that allow a mother to report the strength of her self-efficacy beliefs. The P-SEMI has excellent face and content validity (demonstrated by repeated piloting with parenting and early childhood professionals, as well as with panels of mothers with and without children with disabilities until consensus was reached). It also has strong internal consistency ($\alpha=.80-.91$ for the six subdomains), construct and convergent validity (correlations with the other measuring of parenting self-efficacy beliefs between .55 and .69 for the six subdomain scores and the P-SEMI total score), and better discriminates between mothers of children with mental health problems and mothers of typically developing children than any other widely used measure of self-efficacy beliefs (Harty, 2009). The P-SEMI subscales were averaged for a total score, with an internal consistency of .97.

In the interest of ensuring the validity of the P-SEMI in this sample, two other measures of parenting self-efficacy beliefs were administered. The Parenting Sense of Competence scale (PSOC; Johnston & Mash, 1989) is an eight item measure that assesses the degree to which mothers feel effective in their ability to successfully parent their child (e.g., "If anyone can find the answer to what is troubling my child, I am the one"). The PSOC has been used to measure parenting self-efficacy beliefs with samples of mothers that are similar to this study (Johnston & Mash, 1989), and has shown good psychometric properties (Liss, Schiffrin, Mackintosh, Miles-McLean, & Erchull, 2012; Ngai, Chan, & Holroyd, 2007; Ohan, Leung, & Johnston, 2000). The internal consistency of the PSOC was .88 in this study. The previously described vignette
measure of parenting stress was also administered as a measure of parenting self-efficacy beliefs. For each vignette, mothers were asked how the child’s behavior would affect their belief that they are an effective mother. The internal consistency for the self-efficacy belief items on the vignette measure was .86.

The P-SEMI was significantly correlated with each of the other measures of parenting self-efficacy beliefs (PSOC = .72; Vignettes = .45). As a result, all analyses were conducted with the P-SEMI as the sole measure of parenting self-efficacy beliefs.

**Neuroticism.** Mothers self-reported their neuroticism on the IPIP-120 (Maples, Guan, Carter, & Miller, 2014), a freely accessible 120 item measure assessing five personality dimensions: Neuroticism, Extraversion, Openness to Experience, Agreeableness, and Conscientiousness. Each dimension is comprised of 24 items. The IPIP-120 has shown strong psychometric properties in both undergraduate and community samples, and is comparable to the NEO-PI-R (Costa & McCrae, 1992) and the longer IPIP-NEO (Goldberg, 1999). The IPIP-120 is highly internally consistent (dimension αs=.79-.90), and correlates with the NEO-PI-R at a median of .88 (Maples et al., 2014); at least as well if not better than correlations of other measures of the five factor model with the NEO-PI-R (Gosling, Rentfrow, & Swann, 2003). Acceptable discriminant validity also has been reported (r=.18-.24), as has good criterion validity, with all domains associated with personality dysfunction, internalizing symptoms, and externalizing symptoms. Collateral informants also provided a rating of the mother's personality on the IPIP-120. Collateral reports of personality using IPIP items have shown good internal consistency (α = .83-.92) and convergence with self-reported personality (rs = .31-.48; Witt, Donnellan, & Blonigen, 2009), consistent with the level of self-other convergence of personality traits seen in other measures (Funder, 1999). Only the neuroticism subscale was used in this
study and had an internal consistency of .92 when reported by mothers and .91 when reported by collateral informants.

**Potential covariates.** Mothers completed the Brief Symptom Inventory (BSI; Derogatis, 1993) as a measure of psychological problems other than ADHD. The BSI is a 53-item self-report measure using a 5-point Likert scale (0 = *not at all*, and 4 = *extremely*). Three of the BSI's nine subscales were used: Depression, Anxiety, and Hostility. These scales were selected as both internalizing and externalizing symptoms are related to ADHD symptoms and to parenting stress (Barkley, 2015; Delvecchio et al., 2014; Skreden et al., 2012; Thomason et al., 2014). The BSI has good psychometric properties (Boulet & Boss, 1991; Derogatis, 1993; Derogatis & Melisaratos, 1983; Hayes, 1997; Seipp & Johnston, 2007) including high test-retest reliability (ranging from .79-.85), internal consistency (as = .74-.89), and good convergent validity with measures of personality. Further, the strong psychometric properties of the BSI are maintained when used with families with members who experience high levels of ADHD symptoms (Seipp & Johnston, 2005; Williamson & Johnston, 2013). In this sample, internal consistencies for the mothers’ reports on the BSI were .91 for the Depression and Anxiety subscales, and .82 for the hostility subscale.

Mothers’ reports on the Alabama Parenting Questionnaire (APQ; Shelton, Frick, & Wootton, 1996) were used as one measure of parenting behavior. The APQ is a 32-item, 5-point (0 = *never* to 4 = *always*) scale assessing positive and negative parenting practices in mothers of children aged 6-13. The Inconsistent Discipline and Poor Monitoring subscales were used to measure negative parenting behavior, and the Involvement and Positive Parenting subscales were used to measure positive parenting behavior. The APQ has been used in other studies of mothers with high levels of ADHD symptoms (e.g., Chronis-Tuscano et al., 2008; Psychogiou Daley,
Thompson, & Sonuga-Barke, 2007) and discriminates between clinical and non-problem families (Clerkin, Marks, Policaro, & Halperin, 2007). A confirmatory factor analysis by Essau, Sasagawa, and Frick (2006) replicated the original factor structure and found the APQ to have good internal consistency and construct validity. The inconsistent discipline and poor monitoring subscales had internal consistencies of .83 and .91, respectively, while the involvement and positive parenting subscales had internal consistencies of .77 and .86, respectively.

The Parenting Scale (PS; Arnold, O'Leary, Wolff, & Acker, 1993) was also administered to mothers to assess parent behavior. The PS is a 30-item self-report measure of the use of parenting strategies in discipline situations. It utilizes a 7-point Likert scale and items load onto three subscales: Over-reactivity (OVR) Laxness (LAX) and Verbosity. The Verbosity subscale has not been replicated in factor analytic studies, including in families with members with higher levels of ADHD symptoms (Harvey, Danforth, Ulaszek, & Eberhardt, 2001) and was not used. However, the OVR and LAX subscales are informative and stable over time (Lorber, Xu, Slep, Bulling, & O’Leary, 2014) and were used in this study. The OVR subscale is a 9-item scale of a mother's tendency to respond harshly to her child's behavior (e.g., "When my child misbehaves...", 1 = I speak to him calmly to 7 = I raise my voice and yell). The LAX subscale is an 11-item scale that addresses permissive parenting (e.g., "When my child does something I don't like..." 1 = I do something about it every time it happens to 7 =I often let it go). The psychometric properties of the PS have been repeatedly demonstrated with good internal consistency, test-retest reliability, and concurrent validity (Arnold et al, 1993; Prinzie, Onghena, & Hellinckx, 2007; Reitman et al., 2001). In this sample, the LAX subscales had an internal consistency of .88 while the OVR subscale had an internal consistency of .79.
Mothers’ feelings of caring and warmth towards children could be related the amount of stress they experience in their parenting role. To account for this possibility, the Parental Care and Tenderness questionnaire (PCAT; Buckels et al., 2015) was administered. The PCAT is a 25-item measure with five subscales assessing various ways in which a parent might experience positive emotion about children: Caring for children (e.g., “babies melt my heart”), liking of children (e.g., “I think that kids are annoying”), protective impulses regarding children (e.g., I would use any means necessary to protect a child even if I had to hurt others”), tenderness aroused in situations involving generally positive stimuli (e.g., “a newborn baby curls its hands around your finger”) and tenderness aroused in situations involving generally negative stimuli (e.g., “you need to change a baby’s soiled diaper”). Responses are rated on a 5-point scale from 1 (Strongly Disagree/No Tenderness at all) to 5 (Strongly Agree/A Lot of Tenderness). The PCAT was found to have high levels of internal consistency, test-retest reliability, convergent validity, and predictive validity (Buckels et al., 2015). In this study, the five subscales were combined to generate a total score with an internal consistency of .90.

Mothers completed the Strengths and Difficulties Questionnaire (SDQ; Goodman, 2001) to measure behavior problems in their children. The SDQ is a 25-item measure of the child's behavior in the previous 6 months, with ratings on a 3-point scale from Not True to Certainly True. There are five, five-item subscales on the SDQ: Prosocial, Hyperactivity-Inattention, Emotional Problems, Conduct Problems, and Peer Problems and the Total Difficulties score is computed as the sum of all subscale scores with the exception of the Prosocial subscale. The SDQ has demonstrated acceptable inter-rater agreement, test-retest reliability, and internal consistency (Goodman, 2001). In this sample, an internal consistency of .86 was found for the Total Difficulties scale and .71 for the Prosocial subscale.
Maternal social support is consistently related to parenting stress (Finzi-Dottan et al., 2011), and to account for variability in social support in this study, mothers completed the Maternal Social Support Index (MSSI; Pascoe, Ialong, Hom, & Reinhardt, 1988). The MSSI is a 21-item measure of the quantity and perceived quality of social support that a mother experiences (e.g., whether a mother has supportive child care in an emergency). The MSSI has shown good psychometric properties, including test-retest reliability (Pascoe et al., 1988). Internal consistency of the MSSI was .83 in this sample.

To control for external stressors not related to parenting but which may nevertheless increase parenting stress, mothers completed the Life Experiences Survey (LES; Sarason, Johnson, & Siegel, 1978). This measures whether 47 possible stressful life events have occurred for mothers in the past year. Participants rate the impact of events (e.g., death of a spouse) on a 7 point scale ranging from -3 (extremely negative) to 3 (extremely positive). The LES has demonstrated good test-retest reliability and convergent validity (Sarason et al., 1978).

Data Analytic Plan

Before conducting analyses, I investigated whether mothers who did and did not provide collateral informants were significantly different on the variables of interest, checked for missing data and for assumption violations in my primary variables, covariates, and the model as a whole. Next, I created aggregate scores based on the correlations among the constituent variables. I then calculated and examined the bivariate correlations between all study variables. The primary analysis tested the mediational model linking ADHD symptoms to parenting stress through associations with parenting self-efficacy, and the conditional indirect effect of these links by neuroticism. Although this study is cross-sectional, the term mediation is used because the analyses needed to test a true mediational model (i.e., one in which the intervening and
outcome variables are separated in time from the predictor variable) are statistically identical to
the model proposed here (where all variables in the model are measured simultaneously). That is,
the temporal component of a classic mediational analysis has no bearing on the statistical
analysis of a mediational model, only on the interpretation of the results. In addition, use of the
term mediator properly denotes the importance of the intervening variable (parenting self-
efficacy beliefs) in the model.

The distribution of products method was used to analyse the simple mediation model. In
this method, the indirect effect is not assumed to be normally distributed and the confidence
interval and critical value for the indirect effect was based on the distribution of the product of
two normal random variables, rather than on the distribution of a single normally distributed
variable. This method has more accurate Type-I error rates and higher statistical power than
other approaches (MacKinnon et al., 2002; MacKinnon, Lockwood, & Williams, 2004). This is
because the product of two normally-distributed variables is not typically normally-distributed,
which is an assumption of classical mediational analyses (Springer, 1979).

Next, the possibility of conditional indirect effects was examined (i.e., whether the
strength of the indirect effect of parenting self-efficacy beliefs was conditional upon levels of
maternal neuroticism). Here, the most appropriate statistical analyses are product of coefficients
and bootstrapping (Preacher, Rucker, & Hayes, 2007). Product of coefficients is an estimation of
the indirect effect obtained by multiplying together the sample estimates of the a path (the
relationship between maternal ADHD symptoms and parenting self-efficacy beliefs) and the b
path (parenting self-efficacy beliefs and parenting stress; Alwin & Hauser, 1975), and the
product of the a and b paths (ab) is tested for significance. Significance of this test denotes a
significant indirect effect. Bootstrapping was then employed. Bootstrapping is a method of
resampling that can be used for hypothesis testing. The obtained sample is assumed to be roughly analogous to the larger population, and the sampling distribution of the statistic can be generated by repeatedly resampling the data set. This method has the advantage of being robust to statistical inference without making assumptions about the shape of the sampling distribution.

The hypothesized conditional indirect effect that was tested here is equivalent to Preacher and colleagues’ (2007) Model 5; whereby a fourth variable is acting on both the a and the b paths. There was no reason to hypothesize a conditional indirect effect that was more strongly affecting the a path (the relationship between maternal ADHD symptoms and parenting self-efficacy beliefs) or the b path (the relationship between sense of parenting self-efficacy beliefs and parenting stress), and both effects were estimated as roughly equivalent based on previous research (Finzi-Dottan et al., 2011; Hill & Rose, 2009; Jiang & Johnston, 2012).

In order to test for the conditional indirect effect, the a path was the relationship between the interaction of maternal ADHD symptoms and neuroticism as linked to maternal self-efficacy beliefs, and the b path was the interaction of maternal self-efficacy beliefs and neuroticism as linked to parenting stress. The product of these two paths tested for whether neuroticism moderated the strength of the mediation; particularly the strength of the a and b paths together in the original simple mediation model.

Next, a sensitivity analysis was conducted to analyze whether the mediational model was correctly specified. Specifically, the model was tested for reverse causality, perfect reliability of the mediator, whether the mediator was acting as a moderator, study design considerations, and covariates. For the covariate analysis, the indirect and conditional indirect effect analyses were rerun with covariates that were significantly related to two of the variables of interest controlled, consistent with best practices for mediation analysis.
Finally, exploratory analyses were conducted to better understand the interrelationships of study variables and suggest future areas of research.

**Results**

**Preliminary Analyses**

Although 120 mother-collateral dyads completed the study, another 80 mothers met all inclusion criteria but did not provide a collateral informant. To determine whether the sample of 120 mothers who had complete self and collateral information differed from the larger set of 200 mothers, as well as whether the 120 mothers with collateral informants differed from the 80 mothers without collateral informants, these groups were compared to each other on each study variable. No significant differences were observed on any variable of interest. Because omitting mothers without collateral informants did not appear to impact the characteristics of the sample and further, because the inclusion of collateral informants provides crucial objectivity in the measurement of maternal ADHD symptoms and neuroticism by reducing the effect of rater bias, all of the following analyses were performed with the 120 mothers with collateral informants. Complete parallel analyses also were conducted with the entire sample of 200 mothers, utilizing only self-reported scores for maternal ADHD symptoms and neuroticism. Confirming the robustness of the results, the results of the mediation, conditional indirect effects analysis, and exploratory analyses mirrored the findings in the 120 mother sample in full; in no instance did the pattern of results, or interpretation of results differ depending on which sample was used (see Appendix 1 for more detailed information about this analysis). In the 120 sample, across all measures, a total of .02% of items were missing data. In the few cases where participants were missing data, their scores were prorated for that measure; no participant was missing data for more than one item on the same measure.
The mean, standard deviation, and range for every variable used in the analyses can be found in Table 2. Despite efforts to recruit mothers with high levels of ADHD symptoms during Wave 2, the level of ADHD symptoms did not differ between participants in Wave 1 and Wave 2. Although mothers in this study, on average, had higher levels of ADHD symptoms than would be expected from a random sampling of the population (the average mother’s ADHD symptoms were at the 77th percentile based on the norms provided by Barkley, 2011), only 5% of mothers met the clinical cutoff for ADHD symptoms which is consistent with prevalence estimates of ADHD in adults (Williamson & Johnston, 2015). The average mother reported that she “often” or “almost always” feels efficacious in her role as a parent, and endorsed average levels of neuroticism. Based on the only measure of parenting stress for which norms are available (the PSI-SF), mothers in this study were, on average, at the 65th percentile of parenting stress.

<table>
<thead>
<tr>
<th>Table 2. Means, standard deviations, and ranges for study variables</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ADHD Symptoms (BAARS-IV)</strong></td>
</tr>
<tr>
<td>Mother Reported</td>
</tr>
<tr>
<td>Collaterally Reported</td>
</tr>
<tr>
<td>Composite</td>
</tr>
<tr>
<td><strong>Neuroticism (IPIP-120)</strong></td>
</tr>
<tr>
<td>Mother Reported</td>
</tr>
<tr>
<td>Collaterally Reported</td>
</tr>
<tr>
<td>Composite</td>
</tr>
<tr>
<td><strong>Parenting Stress</strong></td>
</tr>
<tr>
<td>PSI</td>
</tr>
<tr>
<td>PSS</td>
</tr>
<tr>
<td>Stress Vignette Rating</td>
</tr>
<tr>
<td><strong>Self-efficacy Beliefs (P-SEMI)</strong></td>
</tr>
<tr>
<td>Maternal Psychological Symptoms (BSI)</td>
</tr>
<tr>
<td><strong>Positive Parenting Behavior (APQ)</strong></td>
</tr>
<tr>
<td>Positive Parenting</td>
</tr>
<tr>
<td><strong>Negative Parenting Behavior (APQ &amp; PS)</strong></td>
</tr>
<tr>
<td>APQ Negative Parenting Total</td>
</tr>
<tr>
<td>PS Total</td>
</tr>
<tr>
<td><strong>Maternal Affection for Children (PCAT)</strong></td>
</tr>
<tr>
<td>Child Behavior (SDQ)</td>
</tr>
<tr>
<td><strong>Prosocial Behavior</strong></td>
</tr>
<tr>
<td>Maternal Psychological Symptoms (BSI)</td>
</tr>
<tr>
<td>Positive Parenting</td>
</tr>
<tr>
<td>Negative Parenting Behavior (APQ &amp; PS)</td>
</tr>
<tr>
<td>APQ Negative Parenting Total</td>
</tr>
<tr>
<td>PS Total</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>--------------------------</td>
</tr>
<tr>
<td>Total Difficulties</td>
</tr>
<tr>
<td>Maternal Social Support (MSSI)</td>
</tr>
<tr>
<td>Stressful Life Events – Total Change (LES)</td>
</tr>
</tbody>
</table>

**Note:** BAARS-IV: Barkley Adult ADHD Rating Scale – IV; IPIP-120: International Personality Item Pool – 120 Item; PSI: Parenting Stress Index; PSS: Parental Stress Scale; P-SEMI: Parenting Self-Efficacy Measuring Instrument; BSI: Brief Symptom Inventory; APQ: Alabama Parenting Questionnaire; PS: Parenting Scale; SDQ: Strengths and Difficulties Questionnaire; MSSI: Maternal Social Support Index; LES: Life Experiences Survey; PCAT: Parental Care and Tenderness Questionnaire

Before the main analyses were conducted, composite scores for maternal ADHD symptoms, neuroticism, parenting stress, and negative parenting behavior were created. Self- and collaterally-reported ADHD symptoms were significantly correlated, \( r(118) = .35, p < .001 \). Consistent with the intention to attain an estimate of the true underlying level of maternal ADHD symptoms, the final ADHD symptom score used in primary analyses was the average of the self- and collaterally-reported ADHD symptom scores\(^1\). Similarly, the final neuroticism score used in the primary analyses was the average of the self- and collaterally-reported neuroticism score, which were correlated at \( r(118) = .64, p < .001 \). A combination of the ratings of stress vignettes in response to child behavior, PSI-SF and PSS subscales is theorized to be the most conceptually valid method for measuring the construct of parenting stress as the PSI – although the most widely used measure of parenting stress – has significant weaknesses as described previously. The PSI-SF and the PSS correlated at \( r(118) = .74, p < .001 \) and the stress vignettes correlated with the PSI-SF and PSS at \( r(118) = .47, p < .001 \) and \( r(118) = .44, p < .001 \), respectively. Given the acceptable intercorrelations among the measures of parenting stress, and the previously described advantages of using these three measures of parenting stress to create a more comprehensive measure of parenting stress, the parenting stress score utilized in this study was the standardized average of the PSI-SF, PSS, and stress vignette ratings.

\(^1\)All subsequent analyses were also conducted with self-reported and collaterally reported ADHD symptom and neuroticism scores individually. The pattern of results was unchanged in each instance.
Correlations among subscales of the covariates were also examined to determine whether or not combination was appropriate. Correlations among the Depression, Anxiety, and Hostility subscales of the BSI were all above .64 and these subscales were combined to create a composite score of maternal psychological distress. The internal consistency for the mothers’ reports on the total BSI score was .94. The negative parenting composite was intended to be a combination of the APQ Poor Monitoring and Inconsistent Discipline subscales, as well as the PS total score. The APQ subscales were significantly related to each other, \( r(118) = .34, p<.001 \), and the PS total score was significantly related to the APQ Poor Monitoring and Inconsistent Discipline subscales at \( r(118) = .23, p<.01 \) and \( r(118) = .58, p<.001 \) respectively. As a result, a composite negative parenting score was computed as the standardized average of the APQ Poor Monitoring and Inconsistent Discipline subscales as well as the PS total score. A positive parenting score was also computed as the average of the APQ Involvement and Positive Parenting subscales as they were found to correlate, \( r(118) = .58, p<.001 \).

On the covariate measures, mothers typically reported low levels of other psychological problems, negative parenting, and high levels of feelings of caring and tenderness towards children. In terms of other stressful events, three participants endorsed experiencing all 47 possible stressful life events during the previous year which was assumed to be due to a misunderstanding of the questionnaire instructions. When these mothers were excluded from the examination of stressful life events, the average participant was found to have experienced relatively few major life events (positive or negative) in the previous year. However, the contrast between relatively high levels of parenting stress and low levels of general stress suggests that the majority of the stress experienced by mothers in this sample was in the parenting domain.
Bivariate Correlations

See Table 3 for correlations among the variables included in the meditational and conditional indirect effect analysis, all of which were significant. Consistent with my predictions, higher levels of maternal ADHD symptoms were related to higher levels of parenting stress, higher levels of neuroticism, and lower levels of parenting self-efficacy beliefs. In addition, higher levels of parenting self-efficacy beliefs were related to lower levels of parenting stress and neuroticism, while higher levels of parenting stress were related to higher levels of neuroticism.

Table 3. Bivariate correlations among composite variables included in the mediation and conditional indirect effect analyses

<table>
<thead>
<tr>
<th></th>
<th>Parenting Stress</th>
<th>Parenting Self-Efficacy Beliefs</th>
<th>Neuroticism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal ADHD Symptoms</td>
<td>.30***</td>
<td>-.23**</td>
<td>.56***</td>
</tr>
<tr>
<td>Parenting Stress</td>
<td>-.61***</td>
<td></td>
<td>.47***</td>
</tr>
<tr>
<td>Parenting Self-Efficacy Beliefs</td>
<td>- .43***</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: ADHD Symptoms were calculated as the standardized average of self-reported and collaterally-reported symptoms; Stress was calculated as the standardized average of self-reported stress on the Parenting Stress Index-Short Form, Parental Stress Scale, and parenting stress vignette ratings; Parenting self-efficacy beliefs were measured with the Parenting Self-Efficacy Measuring Instrument

See Table 4 for correlations between potential covariates and the four primary variables. Consistent with previous research (e.g., Paulussen-Hoogeboom et al., 2008; Thomason et al., 2014; van der Oord et al., 2006), maternal psychological symptoms (BSI), negative parenting practices, and the behavior of the mother’s own child (SDQ-TD) were each significantly related to maternal ADHD symptoms, parenting stress, parenting self-efficacy beliefs, and neuroticism in the expected directions. In addition, higher levels of parental caring and tenderness (PCAT) were related to more parenting self-efficacy beliefs and lower levels of parenting stress. To determine whether the categorical demographic characteristics (i.e., marital status, whether the mother had sought mental health treatment, maternal employment status, and child mental health
diagnostic status) were evenly distributed among maternal ADHD symptoms, neuroticism, parenting self-efficacy beliefs, and parenting stress, \( t \)-tests were conducted. No categorical variable was significantly related to any variable that was included in the mediation, and no other variable was related to more than one other variable used in the main mediation or conditional indirect effect analysis.

**Mediation Analysis**

For all analyses and discussion, the various mediational pathways will be referred to by their path designations. Path a is the relationship between maternal ADHD symptoms and maternal self-efficacy beliefs. Path b is the relationship between parenting self-efficacy beliefs and parenting stress controlling for maternal ADHD symptoms. Path c is the relationship between maternal ADHD symptoms and parenting stress. Path c’ is the relationship between maternal ADHD symptoms and parenting stress controlling for parenting self-efficacy beliefs. Path ab is the indirect effect: the extent to which the relationship between maternal ADHD symptoms and parenting stress is accounted for by parenting self-efficacy beliefs.

**Table 4.** Bivariate correlations between potential covariates and variables involved in the mediational and conditional indirect effect analyses

<table>
<thead>
<tr>
<th></th>
<th>Maternal ADHD Symptoms</th>
<th>Neuroticism</th>
<th>Parenting Self-efficacy Beliefs</th>
<th>Parenting Stress</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSI</td>
<td>.53***</td>
<td>.69***</td>
<td>- .37***</td>
<td>.52***</td>
</tr>
<tr>
<td>APQ-P</td>
<td>.01</td>
<td>-.15+</td>
<td>.49***</td>
<td>-.41***</td>
</tr>
<tr>
<td>Negative Parenting</td>
<td>.36***</td>
<td>.44***</td>
<td>-.48***</td>
<td>.50***</td>
</tr>
<tr>
<td>SDQ-TD</td>
<td>.48***</td>
<td>.43***</td>
<td>-.38***</td>
<td>.46***</td>
</tr>
<tr>
<td>SDQ-Prosocial</td>
<td>-.14</td>
<td>-.19*</td>
<td>.44***</td>
<td>-.36***</td>
</tr>
<tr>
<td>MSSI</td>
<td>-.08</td>
<td>-.05</td>
<td>.01</td>
<td>.11</td>
</tr>
<tr>
<td>LES-Total Change</td>
<td>-.02</td>
<td>-.02</td>
<td>.05</td>
<td>.11</td>
</tr>
<tr>
<td>PCAT</td>
<td>-.04</td>
<td>-.11</td>
<td>.46***</td>
<td>-.39***</td>
</tr>
<tr>
<td>Mother Age</td>
<td>-.13</td>
<td>-.17</td>
<td>.05</td>
<td>.005</td>
</tr>
<tr>
<td>Child Age</td>
<td>-.17</td>
<td>-.26**</td>
<td>.07</td>
<td>.11</td>
</tr>
<tr>
<td>Child Gender(^{1})</td>
<td>.15</td>
<td>.07</td>
<td>-.09</td>
<td>.12</td>
</tr>
<tr>
<td>Length of time Married</td>
<td>.09</td>
<td>-.10</td>
<td>-.22*</td>
<td>-.17</td>
</tr>
<tr>
<td>Number of Other Children</td>
<td>.06</td>
<td>.02</td>
<td>.002</td>
<td>.06</td>
</tr>
</tbody>
</table>
### Assumptions of linear models

Before conducting the mediation analysis, the five assumptions of linear models were considered and statistically examined where possible. The requirement of normal distributions of the relationships among the three variables in a mediation is overcome by the use of bootstrapping. However, normality was still examined to better understand the relationships in this sample. All three paths in this sample were found to be normal, except for at very low levels of ADHD symptoms in the a path. Here, the model underpredicts the extent of parenting self-efficacy beliefs that mothers with very low levels of ADHD symptoms report. However, there were very few mothers who endorsed very low levels of ADHD symptoms and parenting self-efficacy beliefs and therefore the relationship between parenting self-efficacy beliefs and ADHD symptoms that was found in this sample may not be stable at very low levels of ADHD symptoms. Visual inspection also suggested linear relationships among all four variables, and an absence of heteroscedasticity in all three paths (examined via the Breusch-Pagan test, all $p$s > .27). Examining the dataset for outliers, no data point crossed the Cook’s distance threshold of 0.5 (Cook’s $d$ < .13 across all paths) suggesting the absence of any outliers. Finally, all observations are assumed to be independent. Mothers participated anonymously online and responses were received from throughout the United States and Canada. There is no evidence than any of the mothers knew each other or referred one

### Table 1: Correlation Matrix

<table>
<thead>
<tr>
<th></th>
<th>Maternal ADHD Symptoms</th>
<th>Neuroticism</th>
<th>Parenting Self-efficacy Beliefs</th>
<th>Parenting Stress</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of Time Child Spends with Mother</td>
<td>-.05</td>
<td>-.007</td>
<td>.26**</td>
<td>-.14</td>
</tr>
<tr>
<td>Maternal Education</td>
<td>-.08</td>
<td>-.09</td>
<td>-.18*</td>
<td>.16</td>
</tr>
<tr>
<td>Maternal Acculturation</td>
<td>.04</td>
<td>&lt;.001</td>
<td>-.14</td>
<td>.002</td>
</tr>
<tr>
<td>Household Income</td>
<td>-.13</td>
<td>.13</td>
<td>.03</td>
<td>.03</td>
</tr>
</tbody>
</table>

*BSI: Brief Symptom Inventory; APQ-P: Alabama Parenting Questionnaire – Positive Parenting Composite; SDQ-TD: Strengths and Difficulties Questionnaire – Total Difficulties; SDQ-Prosocial: Strengths and Difficulties Questionnaire – Prosocial Behavior; MSSI: Maternal Social Support Index; LES: Life Experiences Survey; PCAT: Parental Care and Tenderness Questionnaire; 1: Child gender was dummy coded with boys coded as 1.
another to the study. Given the satisfaction of all five assumptions, the mediation analysis proceeded as planned.

Mediation analysis: The role parenting self-efficacy beliefs. Path c was examined by regressing the maternal parenting stress variable on maternal ADHD symptoms. As predicted, maternal ADHD symptoms were significantly related to parenting stress, $\beta(118) = .30, p<.001$. Path a was examined by regressing maternal parenting self-efficacy beliefs on maternal ADHD symptoms. Again as predicted, a significant negative relationship was found between maternal ADHD symptoms and maternal parenting self-efficacy beliefs, $\beta(118) = -.23, p<.001$. To investigate path b, maternal parenting stress was regressed on maternal self-efficacy beliefs, controlling for the effect of maternal ADHD symptoms. Confirming predictions, the relationship between maternal parenting self-efficacy beliefs and parenting stress was significant even after controlling for maternal ADHD symptoms, $\beta(117) = -.57, p<.001$. To determine whether the indirect effect was significant, that is whether a significant proportion of the c path can be accounted for by maternal self-efficacy beliefs, the indirect effect was bootstrapped with 6,000 resamples. The indirect (ab) effect was significant, $\beta(115) = .13, CI_{95\%}[.03, .25]$. Consistent with my hypothesis, this suggests that a significant proportion of the variance in the relationship between maternal ADHD symptoms and maternal parenting stress can be accounted for by parenting self-efficacy beliefs. To investigate whether the relationship between maternal ADHD symptoms and parenting stress was fully, or only partially, accounted for by maternal self-efficacy beliefs, the c path was recalculated with maternal self-efficacy beliefs in the model (the c’ path). When this was done, maternal ADHD symptoms were still significantly related to parenting stress, suggesting only a partial mediation, $\beta(117) = .17, p = .02$. A summary of these relationships can be seen in Figure 4.
Conditional indirect effect analysis: The role of neuroticism. Because maternal parenting self-efficacy beliefs were found to mediate the relationship between maternal ADHD symptoms and parenting stress, the conditional indirect effect analysis was run. In this analysis, maternal neuroticism was tested as a moderator of one or both of the a and b paths. To examine this, the mediation model was run with maternal neuroticism entered in the model and allowed to interact with both maternal ADHD symptoms and maternal self-efficacy beliefs. Although maternal neuroticism was related to all three of the other variables in the expected directions, contrary to prediction, it did not significantly moderate the indirect effect, $\beta(116) = .07, p=.39$. That is, levels of maternal neuroticism did not moderate the strength of the indirect effect of maternal self-efficacy beliefs on the relationship between maternal ADHD symptoms and parenting stress.

In order to better understand the nature of the mediation found in this sample and the role of other possible moderators, further conditional indirect effect models were examined in an
exploratory fashion. In this study, the hypothesized conditional indirect effect model was one where maternal neuroticism was believed to affect both the a path (maternal ADHD symptoms and parenting self-efficacy beliefs) and the b path (parenting self-efficacy beliefs and parenting stress) simultaneously. However, other conditional indirect effect models are possible (Preacher et al., 2007). First, maternal ADHD symptoms could be acting as a moderator on the b path, or maternal neuroticism could be moderating the a path or the b path independently. When these models were tested, maternal ADHD symptoms were not found to moderate the b path, and maternal neuroticism did not significantly moderate the a or b paths alone. The lack of any conditional effect of neuroticism on the mediation, even when tested in four configurations, suggests that the inclusion of maternal neuroticism does not enhance our understanding of how parenting self-efficacy beliefs mediate the relationship between maternal ADHD symptoms and parenting stress.

**Model specification error.** Although the mediation analysis suggests that maternal parenting self-efficacy beliefs significantly mediate the relationship between maternal ADHD symptoms and parenting stress, it is possible that this interpretation is erroneous due to misspecification of the presented model. As a result, a number of alternative explanations should be examined before any in-depth interpretation of the data is conducted.

**Reverse causal effects.** First, I wanted to investigate whether the direction of the causal effects I had assumed was fully supported by my model. The relationship between parenting self-efficacy beliefs and parenting stress was hypothesized to be bidirectional, but was analyzed such that parenting self-efficacy beliefs predicted parenting stress. To examine whether parenting stress significantly mediated the relationship between maternal ADHD symptoms and parenting self-efficacy beliefs, the mediation analysis was re-run with the positions of the mediator and
outcome variable reversed. In this model, parenting stress mediated the relationship between maternal ADHD symptoms and parenting self-efficacy beliefs (indirect effect, $\beta(117) = -0.18$, CI$_{95\%}$[-.30, -.09]). In addition, unlike the main mediation analysis, parenting stress fully mediated the relationship between maternal ADHD symptoms and parenting self-efficacy beliefs (c’ path, $\beta(117) = -0.05$, $p = .50$). This suggests that parenting stress better explains the relationship between maternal ADHD symptoms and parenting self-efficacy beliefs than parenting self-efficacy beliefs explain the relationship between maternal ADHD symptoms and parenting stress. Therefore, the assumption of the direction of causal effects is violated, and suggests that the relationship between maternal self-efficacy beliefs and parenting stress is transactional. Reverse causal effects were not examined in the a and c paths because ADHD symptoms are conceptualized neurodevelopmentally, and therefore they should not be caused by parenting stress or parenting self-efficacy beliefs. See Figure 5 for the path diagram for the reverse causal model.

*Figure 5. Model of the indirect effect of parenting stress on the relationship between maternal ADHD symptoms and parenting self-efficacy beliefs. The indirect effect (ab) was significant at $\beta = -0.18$, CI$_{95\%}$[-.30, -.09].*
**Perfect reliability in the mediator.** Next, I wanted to further investigate the reliability of my proposed mediator, parenting self-efficacy beliefs. This was important for two reasons. First, every mediation analysis assumes that the mediator is perfectly reliable, and a violation of this assumption could invalidate my results. Second, in a mediation in which the predictor variable is not manipulated (such as in this study), the mediation also operates under the assumption that the predictor variable is measured perfectly reliably. If either of these variables were not perfectly – or near-perfectly – internally consistent, the conclusions that could be drawn from a significant mediation would be limited. It is not clear whether the outcome variable must be perfectly reliable when standardized regression coefficients are used (Kenny, 2015), but in the interest of a conservative analysis, the reliability of the outcome variable also was examined and held to the same standard. In this study, the internal consistency of the mediator, independent variable, and outcome variables were .97, .93, and .96, respectively. Although not technically perfect, these internal consistencies are extremely high and as close to perfect as can be expected from real-world data. As a result, it is very unlikely that any bias in the estimates was the result of imperfect reliability, and the interpretation of the results need not be altered due to violations of this assumption.

**Mediator as a moderator.** The third possible source of error when specifying the mediation model is in erroneously treating the mediating variable as a mediator, when the model would be better specified with the mediator acting as a moderator instead. This is because, if the mediator is acting as a moderator it not only means that the level of parenting self-efficacy beliefs differs based on the level of ADHD symptoms (thereby explaining the relationship between maternal ADHD symptoms and parenting stress), but also that the nature of parenting self-efficacy beliefs may be different depending on ADHD symptoms, thereby changing the
relationship of parenting self-efficacy beliefs and parenting stress depending on maternal ADHD symptoms (Kraemer, Wilson, Fairburn, & Agras, 2002). In this study, the mediator (parenting self-efficacy beliefs) was not found to moderate the relationship between maternal ADHD symptoms and parenting stress, $\beta(117) = .05, p=.47$. This suggests that the original model is more appropriate: parenting self-efficacy beliefs mediate, but do not moderate, the relationship between maternal ADHD symptoms and parenting stress.

**Covariates.** The final possible source of error in the specification of the mediation model is that the observed relationships among the variables can be better accounted for by other variables not included in the original model. In anticipation of this possibility, several possible covariates were measured, and some were added to the model in order to determine whether their inclusion altered the pattern of results. Based on the recommendations for best practices in the analysis of covariates in mediation (Kenny, 2015; MacKinnon, Fairchild, & Fritz, 2007), covariates were included in the analysis if they were significantly bivariately related to at least two of the four variables in the conditional indirect effects analysis. The variables which met this criterion were other maternal psychopathology (BSI), positive parenting behavior (APQ-P), negative parenting behavior, negative child behavior (SDQ-TD), prosocial child behavior (SDQ-PRO), and parental care and tenderness towards children (PCAT; see Table 4). As there was no conceptual reason to expect that any one, or any particular combination of covariates, was more likely than others to alter the pattern of results found in the original analysis, all covariates were simultaneously added to each path. Once included, the mediation was re-run to investigate whether the initial findings held with the inclusion of the covariates.

When the covariates were added to the $c$ path, BSI, APQ-P, and negative parenting all significantly predicted parenting stress ($|\beta| = .25$ to $.33$, $p$s < .004) and PCAT marginally
predicted parenting stress, $\beta(112) = .13$, $p = .08$, above and beyond maternal ADHD symptoms and all other covariates. Under these conditions, maternal ADHD symptoms no longer predicted parenting stress, $\beta(112) = .04$, $p = .66$. This suggests that the relationship between maternal ADHD symptoms and parenting stress is largely accounted for by other mother characteristics; in particular other maternal psychopathology and parenting behavior.

For path a, APQ-P, negative parenting, and PCAT all significantly predicted parenting self-efficacy beliefs ($\beta$s =|.22| to |.31|, $ps < .003$) while SDQ-PRO marginally predicted parenting self-efficacy beliefs above and beyond maternal ADHD symptoms and the other covariates, $\beta(112) = .16$, $p = .06$. Maternal ADHD symptoms no longer significantly predicted parenting self-efficacy beliefs when the covariates were included in the model, $\beta(112) = .01$, $p = .90$. This suggests that the relationship between maternal ADHD symptoms and parenting self-efficacy beliefs can be wholly accounted for by other mother and child characteristics and, especially, positively valenced characteristics.

When path b was analyzed with covariates included, BSI, APQ-P and negative parenting were all significant predictors of parenting stress ($\beta$s =|.18| to |.31|, $ps < .03$). However, even with all covariates included, maternal self-efficacy beliefs remained a significant predictor of parenting stress, $\beta(112) = -.22$, $p = .02$ (in the original mediation, path b was -.57). This suggests that parenting self-efficacy beliefs are related to parenting stress even above and beyond the effects of maternal psychopathology, positive and negative parenting behavior, positive and negative child behavior, and maternal affect towards children.

When all covariates were included in each path, the indirect effect of maternal ADHD symptoms on parenting stress through parenting self-efficacy beliefs was no longer significant ($\beta = -.002$, CI$_{95%}$[-.04, .03]).
The results of the covariate analysis suggest that much of the original mediation model can be explained by the inclusion of other variables. Specifically, many other mother-centered characteristics (BSI, APQ-P, negative parenting, PCAT) accounted for significant variance in at least one of the meditational pathways even above and beyond the effects of all other variables in the model. In the case of paths a and c, the covariates accounted for enough variance that maternal ADHD symptoms were no longer uniquely predictive of parenting self-efficacy beliefs and parenting stress. However, even with all covariates included, parenting self-efficacy beliefs remained a robust and unique predictor of parenting stress.

**Exploratory Analyses**

The results from the analysis of covariates suggested that the originally hypothesized mediation (that the relationship between maternal ADHD symptoms and parenting stress was mediated by parenting self-efficacy beliefs) might have been misspecified, as other variables were found to better account for the effects of ADHD symptoms on parenting self-efficacy beliefs and parenting stress. Further, the intriguing result that many mother-centered variables were uniquely related to both parenting stress and parenting self-efficacy beliefs, while parenting self-efficacy beliefs remained strongly related to parenting suggested the possibility of other, stronger mediations that might be present among these variables and the covariates. Specifically, the pattern of results pointed towards other mother characteristics (such as parenting behavior, beliefs about children, and psychopathology) as being appropriate replacements for maternal ADHD symptoms in the original mediational model. If it is true that other mother-centered characteristics are more strongly and uniquely related to parenting self-efficacy beliefs and parenting stress than maternal ADHD symptoms, this would help to illuminate not just the role of ADHD symptoms in parenting, but the role of parenting self-efficacy beliefs in mediating the
relationship between a host of maternal experiences and parenting stress. As a result, I ran four other conditional indirect effects analyses with maternal psychopathology, positive parenting, negative parenting, and mothers’ beliefs about their care and tenderness towards children as the predictor variables. These variables were chosen due to their strong, unique relationships to the mediator and/or outcome variable that were observed in the covariate analysis. In each of these models, parenting self-efficacy beliefs were examined to determine whether they mediated the relationship between the predictor variable and parenting stress. Finally, maternal neuroticism was tested to determine if it significantly moderated the indirect effect in each case. These exploratory mediations are briefly summarized below.

Since these exploratory mediation analyses include all covariates in each path equation, the equation for path b is the same for each model and is equivalent to what was described above (maternal self-efficacy beliefs are significantly related to parenting stress above and beyond all other variables, $\beta(112) = .22, p = .02$). When parenting behavior was considered as a potential predictor, both APQ-P and negative parenting were found to be related to parenting stress ($\beta(112) = -.24, p < .001, \beta(112) = .26, p < .001$, respectively) and to maternal parenting self-efficacy beliefs ($\beta(112) = .31, p < .001, \beta(112) = -.30, p = .001$, respectively) above and beyond the effects of other covariates. Further, the indirect effect of APQ-P on stress via parenting self-efficacy beliefs was significant, even with all other covariates included ($\beta = -.07, CI_{95\%}[-.15, -.01]$). A similar result was found for the indirect effect of negative parenting behavior on parenting stress, $\beta = .06, CI_{95\%} [.007, .15]$.

PCAT was marginally related to parenting stress ($\beta(112) = -.13, p = .07$) and significantly related to parenting self-efficacy beliefs, $\beta(112) = .22, p = .003$). Like parenting
behavior, the relationship between PCAT and parenting stress was significantly mediated by parenting self-efficacy beliefs, \( \beta = -0.05, \text{ CI}_{95\%}[-0.11, -0.003] \).

Other maternal psychopathology was related to parenting stress (\( \beta(112) = 0.33, p < 0.001 \)) but was unrelated to parenting self-efficacy beliefs, \( \beta(112) = 0.04, p = 0.66 \) and the indirect effect of other maternal psychopathology on parenting stress through parenting self-efficacy was not significant \( \beta = 0.03, \text{ CI}_{95\%}[-0.02, 0.11] \).

Maternal neuroticism was allowed to moderate the exploratory mediational models to determine whether the indirect effects of parenting self-efficacy beliefs were contingent on levels of maternal neuroticism. Maternal neuroticism did not significantly moderate any mediation in any configuration.

**Mediational model analyzed by ADHD symptom dimension.** Although maternal hyperactivity/impulsivity and inattention symptoms correlated highly enough (\( r > 0.60 \)) to justify their combination in the main analysis, the possibility was explored that the mediational effect was driven by only one symptom dimension. To do this, the main mediation analysis was re-run two additional times with the predictor variable as either maternal inattention symptoms, or maternal hyperactivity/impulsivity symptoms. Both inattention and hyperactivity/impulsivity symptoms significantly predicted parenting stress (\( p < 0.01 \)), but only inattention significantly predicted maternal self-efficacy beliefs and maternal hyperactivity/impulsivity symptoms were unrelated (\( p < 0.01, p = 0.13 \), respectively). Unsurprisingly, maternal hyperactivity/impulsivity symptoms did not predict parenting stress indirectly through maternal self-efficacy beliefs (\( \beta = 0.08, \text{ CI}_{95\%}[-0.03, 0.20] \)). However, the indirect effect of maternal inattention symptoms on parenting stress through maternal self-efficacy beliefs was significant (\( \beta = 0.16, \text{ CI}_{95\%}[-0.05, 0.28] \)). No conditional indirect effect of maternal neuroticism was found.
The results of the exploratory mediation analyses suggest that maternal self-efficacy beliefs significantly mediate the relationship between parenting stress and several other mother-centered variables, not only maternal ADHD symptoms. Further, unlike maternal ADHD symptoms, these mediational effects survive the inclusion of other mother- and child-related covariates. However, like the main mediation analysis, maternal neuroticism does not moderate any aspect of any of the exploratory mediations. Further, although both inattention and hyperactivity/impulsivity symptoms are related to parenting stress, it is primarily symptoms of inattention that are related to parenting self-efficacy beliefs and therefore the indirect effect of maternal self-efficacy beliefs on the relationship between maternal ADHD symptoms and parenting stress is primarily due to inattention symptoms.

Discussion

This study addressed three main questions: first, whether a relationship exists between maternal ADHD symptoms and parenting stress, second, whether the relationship between maternal ADHD symptoms and parenting stress could be indirectly accounted for by parenting self-efficacy beliefs, and finally, whether the indirect effect of maternal ADHD symptoms on parenting stress through parenting self-efficacy beliefs was conditional on maternal neuroticism. Consistent with my hypotheses, maternal ADHD symptoms were positively related to parenting stress, and parenting self-efficacy beliefs partially mediated this relationship. However, contrary to my expectations, this mediation was not conditional on levels of maternal neuroticism. What follows is an interpretation of the findings of this study integrated with previous literature, a review of the limitations of the study and considerations for future research, and examination of the clinical implications of these results. As mentioned previously, I recognize that due to the cross-sectional nature of this study, using the term mediation to describe the model that was
investigated is not technically accurate. However, the term mediation was used – and will continue to be used – not only because the analyses conducted in this study are identical to a true meditational model, but also to quickly and easily denote the importance of parenting self-efficacy beliefs as an intervening variable. Care will be taken in the interpretation of results to not incorrectly imply causality or temporal relationships among the study variables.

My first hypothesis, that maternal ADHD symptoms would be positively related to parenting stress, was supported. Maternal ADHD symptoms were moderately related to parenting stress at levels that are consistent with what has been found in previous research ($\beta = .30$; Alexander & Harrison, 2013; Lackschewitz et al., 2008). This is not surprising, as ADHD symptoms are highly impairing in adults and may be particularly impairing in women (Williamson & Johnston, 2015). Impairments such as difficulty organizing their child’s schedule, impulsive discipline, or lack of attentiveness to their child are likely to result in feelings of stress in mothers with high levels of ADHD symptoms (Wietecha et al., 2012). The moderate relationship between maternal ADHD symptoms and parenting stress is notable because few mothers who participated had high or very high levels of symptoms, resulting in a sample that under-represents mothers with clinical levels of symptoms (only five percent of mothers were at the 98th percentile of ADHD symptoms). Although this level of ADHD symptoms is consistent with previous estimates (Bitter et al., 2010; Kessler et al., 2006), it is likely that in a sample of mothers with more normally distributed ADHD symptoms, the relationship between ADHD symptoms and parenting stress would be even stronger.

My second hypothesis, that the relationship between maternal ADHD symptoms and parenting stress would be significantly mediated by parenting self-efficacy beliefs was also supported (indirect effect $\beta = .13$). This suggests that at least a portion of the association between
maternal ADHD symptoms and parenting stress is due to the fact that maternal ADHD symptoms result in decreased parenting self-efficacy beliefs, and it is those beliefs that result in mothers experiencing parenting stress. The mediation was only partial, so there was still a significant direct relationship between maternal ADHD symptoms and parenting stress ($\beta = .17$). This can be interpreted to mean that maternal ADHD symptoms are both inherently stressful, and also result in decreased parenting self-efficacy beliefs which compound these feelings of parenting stress. To my knowledge, this is the first time that parenting self-efficacy beliefs have been shown to mediate the relationship between maternal ADHD symptoms and parenting stress, but the finding is consistent with previous research showing that ADHD symptoms in adults are related to other maladaptive beliefs (Torrente et al., 2014), that parents with other psychological problems have lower parenting self-efficacy beliefs (Kohlhoff & Barnett, 2013; Porter & Hsu, 2003), and that mothers with ADHD symptoms have lower levels of perceived efficacy in a variety of domains (Jiang & Johnston, 2012).

My third hypothesis was that the indirect effect of parenting self-efficacy beliefs on the relationship between maternal ADHD symptoms and parenting stress would be conditional on levels of maternal neuroticism, as neuroticism is strongly and consistently associated with ADHD symptoms in adults (Gomez & Corr, 2014; He et al., 2015; Polner et al., 2015). This hypothesis was not supported. Initially, I believed that two pathways existed between maternal ADHD symptoms and parenting stress. One was a direct pathway through which ADHD symptoms directly resulted in parenting stress and the other was an indirect pathway through parenting self-efficacy beliefs, where ADHD symptoms were not inherently stressful, but instead were interpreted by mothers as being an indictment on their parenting efficacy and it was these beliefs that would be interpreted as stressful. I hypothesized that what would differentiate these
pathways would be levels of maternal neuroticism; that mothers who had higher levels of neurotic personality features would be more prone to interpreting their ADHD behaviors as reflecting poorly on their ability to effectively parent their child. This belief was based in research by Robin and colleagues (2008) who found two distinct clusters of adults with ADHD that could be distinguished by their neurotic personality features and in speculation by Nigg and colleagues (2004) that much of the heterogeneity in the functioning of adults with ADHD can be attributed to levels of neuroticism, and that adults with high levels of ADHD symptoms with differing levels of neuroticism are directed down differing developmental pathways. Contrary to my hypothesis, levels of neuroticism did not moderate any of the models that were tested.

However, the results of the mediation analysis suggests that two pathways between maternal ADHD symptoms and parenting stress do indeed exist but are not dependent on levels of neuroticism: some of the effect of maternal ADHD symptoms on parenting stress is direct and some is indirect. What wasn’t expected was that these two pathways don’t exist between mothers (i.e., different paths for mothers with higher or lower levels of neuroticism), but that both pathways exist within mothers (i.e., each mother’s ADHD symptoms are related to parenting stress through the direct and the indirect pathway). Later in this discussion, I will address the issue of why neuroticism failed to moderate the mediation models in this study more thoroughly.

**Parenting Self-Efficacy Beliefs**

*Transactional relationships.* It is important to acknowledge the likely transactional nature between parenting self-efficacy beliefs and other variables. Although up to this point the discussion of causal direction has appropriately suggested that maternal ADHD symptoms cause maternal parenting self-efficacy beliefs (as, conceptually, the reverse cannot be true given the proposed genetic/biological etiology of ADHD symptoms), it is probable that for all of the other
significant mediational relationships that were found, the causal arrow between parenting self-efficacy beliefs and other variables points in both directions. For instance, it is likely that mothers who engage in negative parenting behavior see the negative results of their efforts and feel less efficacious and experience more stress in the parenting role. However, it also is likely that low feelings of parenting self-efficacy and high levels of parenting stress lead to more negative parenting behavior (perhaps due to feelings of frustration and helplessness). For example, a mother who disciplines her child only to have her child engage in the same problematic behavior in the future is likely to feel as though she is not an effective disciplinarian. This may lead to feelings of frustration and uncertainty about her parenting. As a result, the mother may adopt harsher, more negative parenting strategies in order to both regain a sense of control and also to express her frustration. Of course, in a vicious circle, these negative parenting strategies are even more likely to fail, which will further erode her sense of parenting self-efficacy.

Further, an analysis of reverse causal effects in this study found that parenting stress could mediate the relationship between maternal ADHD symptoms and parenting self-efficacy beliefs, lending even more complexity to the interpretation of causality among these variables. This suggests both that low maternal self-efficacy beliefs cause parenting stress and also that experiencing parenting stress results in decreased parenting self-efficacy beliefs. A mother who feels that she is not effectively parenting her child (perhaps because she is unable to effectively organize her daily schedule) is likely to feel stress and guilt over not behaving, as a mother, in the way she wishes to behave. This feeling of stress may further compromise her ability to effectively organize her schedule, resulting in an even lower likelihood that she will meet her own expectations, and again diminishing her feelings of parenting self-efficacy. The transactional nature of mothers’ cognitions, affects, and behaviors has been well established
(Bandura, 1986; Johnston & Chronis-Tuscano, 2015; Rantanen et al., 2015) and is especially important to consider in light of this study’s finding of the centrality of maternal self-efficacy beliefs not only in the understanding of the relation between maternal ADHD symptoms and parenting stress, but also the relations among variety of other mother-centered variables and parenting stress as well. Longitudinal, treatment (e.g., targeting self-efficacy beliefs and/or ADHD symptoms), and experimental (e.g., inducing parenting self-efficacy beliefs) research would be helpful to determine more fully the nature of the transactional relationships present in the mediations found in this study.

The centrality of parenting self-efficacy beliefs. Although this study was focused on examining the ability of maternal self-efficacy beliefs to mediate maternal ADHD symptoms and parenting stress, perhaps the most striking and unexpected result in secondary analyses was the emergence of maternal self-efficacy beliefs as a variable capable of mediating the relations between a wide variety of mother-centered variables and parenting stress. In particular, maternal self-efficacy beliefs significantly mediated not only the relationship between parenting stress and maternal ADHD, but also relations of parenting stress with other maternal psychological problems, positive and negative parenting behaviors, and parental feelings of caring and tenderness towards children. It appears that mothers’ sense of their own parenting ability links a variety of maternal problems to their experience of stress in the parenting role. In many cases, this mediation was complete, and survived the inclusion of all other covariates.

The finding that parenting self-efficacy beliefs mediate the relationships between parenting stress and a variety of mother-centered experiences, although not specifically predicted, is highly consistent with existing research (Benson, 2016; Chau & Giallo, 2015; Mouton & Roskam, 2015). A body of literature is developing that shows that parenting self-
efficacy beliefs often act as a mediator in the relationships among a variety of parent and parenting constructs, including other maternal psychopathology (e.g., Benson, 2016), parenting behavior (Boyle, Sanders, Lutzker, Prinz, Shapiro, & Whitaker, 2010; Mouton & Roskam, 2015), and maternal care and tenderness towards children (Chau & Giallo, 2015). The most parsimonious interpretation of the finding of this study (that parenting self-efficacy beliefs mediate the relationship between maternal ADHD symptoms and parenting stress), in the context of previous findings showing the general importance of parenting self-efficacy beliefs, is that parenting self-efficacy beliefs are a common and central vector through which maternal cognitions and behavior result in parenting stress. Maternal self-efficacy beliefs do not seem to be specific in their linkage of any one particular maternal characteristic and parenting stress, but instead such beliefs mediate a gestalt construct in mothers comprised of their thoughts about their children (i.e., mothers’ beliefs about children), parenting behavior (i.e., positive and negative parenting), and other characteristics that influence a wide variety of domains, not just the parenting role (i.e., psychological symptoms). However, it may be that the importance of parenting self-efficacy beliefs to the experience of parenting stress is specific to mother-centered variables, as in this study such beliefs consistently mediated the relationship between parenting stress and mother’s parenting cognitions, psychological symptoms, and parenting behavior, but did not mediate the relationships between parenting stress and child-centered variables (e.g., positive and negative behavior in the mother’s child). Further, the mediating effect of maternal self-efficacy beliefs on the relationship between mother-centered variables and parenting stress remained significant even when controlling for the effects of the behavior of the mother’s own child. Although there are many aspects of being a mother that were not measured in this study and that might change the interpretation of self-efficacy beliefs as a central variable (e.g.,
attributions for child behavior, relationship quality with the child’s other parent), the consistent mediational relationships between mother-centered variables and parenting stress are both strong and unique to variables that are specific the experiences of being a mother. This suggests that parenting self-efficacy beliefs are an important and central variable in the understanding of mothers’ experience of parenthood.

**Covariates**

Notably, contrary to my expectations, the inclusion of covariates in the proposed model eliminated the indirect effect of maternal self-efficacy beliefs on the relationship between maternal ADHD symptoms and parenting stress. In addition, when covariates were included, the relationships between maternal ADHD symptoms and parenting stress and parenting self-efficacy beliefs were also eliminated. The only mediational pathway that survived inclusion of covariates was the relationship between parenting self-efficacy beliefs and parenting stress, and this pathway survived the inclusion of covariates in every model. Further, parenting behavior and feelings of warmth towards children were themselves found to have an indirect effect on parenting stress through parenting self-efficacy beliefs. Together, these results suggest that much of the indirect effect of parenting self-efficacy beliefs on maternal ADHD symptoms and parenting stress can be better explained by other variables. Parenting behavior is, theoretically, the construct that is most proximal to parenting self-efficacy beliefs. That is, although mothers’ ADHD symptoms are related to their self-efficacy beliefs, they are related, presumably, only to the extent that those symptoms result in them engaging in parenting behaviors that they interpret as being effective or not. If the relationship between ADHD symptoms and parenting self-efficacy beliefs is functioning through parenting behavior, it is not surprising that when parenting behavior is included in the model, maternal ADHD symptoms are no longer uniquely related to
parenting self-efficacy beliefs. The robust indirect effect of parental care and tenderness towards children on parenting stress through parenting self-efficacy beliefs also is unsurprising. Like parenting self-efficacy beliefs, maternal thoughts and feelings about how much affection they have towards children are cognitions that are specific to the parenting role. In contrast, maternal ADHD symptoms and other psychological symptoms are characteristics that transcend the parenting role and affect all aspects of a mother’s life. As a result, it is likely that characteristics that are more directly related to the experience of being a parent will be more related to each other than will a general characteristic such as psychopathology. That is, a mother’s feelings of warmth towards children likely buffers her experience of stress in her role as a parent to a greater extent than her general experience of ADHD or other psychological symptoms.

Interestingly, other maternal psychological symptoms (i.e., depression, anxiety, and hostility) were related to parenting self-efficacy beliefs and parenting stress in much the same way as were maternal ADHD symptoms. Specifically, although the relationship between mothers’ psychological symptoms and parenting stress was mediated by parenting self-efficacy beliefs when covariates such as parenting behavior and maternal feelings of warmth were not included in the model, this mediation was no longer significant in the presence of such covariates. In fact, when investigating the mediations of the relationships between parenting behavior and feelings of warmth and tenderness towards children with parenting stress, it was noticed that these mediations were the only ones to remain significant when other variables (e.g., child behavior) were included in the model. This suggests two main points: first, a variety of psychological symptoms are related to maternal self-efficacy beliefs and secondly, that, parenting behavior and feelings of warmth are the predictors whose relationships with parenting stress are most strongly affected by maternal self-efficacy beliefs. The important conclusion to
be drawn as a result of these two points is that although at the bivariate level (and in a mediational analysis without covariates) a variety of maternal psychological symptoms, including ADHD symptoms, are related to parenting self-efficacy beliefs and parenting stress, but when other variables are considered, the more accurate picture is of relationships between parenting behavior and mothers' feelings of warmth towards children with parenting stress and parenting self-efficacy beliefs. This suggests that although mothers’ psychological symptoms are related to maternal impairment, they are not uniquely related, nor are they the aspect of maternal functioning most closely related to the experience of parenting stress.

However, despite this conclusion, it is important to recognize that although maternal ADHD and other psychological symptoms do not have a unique indirect effect on parenting stress when considered in the context of parenting behavior, child behavior, and feelings of warmth towards children, this does not suggest that such symptoms are unimportant or do not help us understand the subjective experience of being a mother with psychological difficulties. That is, it is still useful and important to know that mothers with high levels of ADHD symptoms are experiencing parenting stress, in part because their belief in their efficacy as a mother is diminished. The fact that this relationship is significantly accounted for by other factors (e.g., parenting behavior) does not diminish its value. Knowing that a mother’s level of parenting stress is multifaceted and primarily related to her parenting behavior and feelings of warmth towards children more than her psychological symptoms, suggests to researchers and clinicians alike where to focus their efforts when trying to determine the mechanisms behind parenting stress.
Absence of a Conditional Indirect Effect of Neuroticism

My conditional indirect effect hypothesis – that the proposed mediation of the relationship between maternal ADHD symptoms and parenting stress by parenting self-efficacy beliefs would be conditional on mothers’ neurotic personality features – was not supported. In no instance did neuroticism affect the outcome of any mediation analysis, and in each case, the observed conditional effect was approximately zero. The failure to find any effect of neuroticism occurred despite good internal consistency of the measure of neuroticism and strong bivariate relationships between neuroticism and other variables that were consistent with my hypotheses and previous research (Merritt & Tharp, 2013; Rantanen et al., 2015; Robin et al., 2008), suggesting that neuroticism was measured correctly. It is possible that the study was underpowered to detect a conditional effect of neuroticism. It has been suggested that conditional indirect effect models may require very large sample sizes, although the calculation of these requirements is usually not feasible (Beaujean, 2008). However, a too-small sample size seems unlikely as the explanation for the lack of an effect of neurotic personality features for two reasons: first, as can be seen in Appendix 1, the absence of an effect of neuroticism was found even when the full 200 mother-only sample was utilized, and this sample’s associations are, if anything, inflated due to the effect of rater bias. Second, the effect of neuroticism was small ($\beta = .07$), suggesting that even if there is an indirect effect, it is likely to be too small to be clinically meaningful. In sum, it seems that the hypothesized conditional indirect effect of neuroticism does not exist based on the results of this study.

There is no obvious explanation for the absence of an effect of neuroticism on the indirect effect maternal ADHD symptoms on parenting stress through parenting self-efficacy beliefs, as previous researchers have speculated that neuroticism is an important moderator of the
developmental trajectory of ADHD symptoms in adulthood (Nigg et al., 2004), and strong links between neuroticism and each of the primary variables considered in this study have been documented (e.g., Casalin et al., 2014; Gomez & Carr, 2014; Kaplan et al., 2015). However, to my knowledge no study has investigated the moderating role of neuroticism in the context of a mediational model involving ADHD symptoms, parenting stress, and parenting self-efficacy beliefs. It may be that although neuroticism is strongly related to maternal ADHD symptoms, parenting self-efficacy beliefs, and parenting stress, it does not alter the relationships among these variables. Because this study focused on parents and parenting-related variables, other domains (such as interpersonal functioning, employment, life satisfaction) were not measured. Neuroticism may be a more important variable in the understanding of ADHD symptoms in the contexts of other domains. In sum, the failure of this study to find a role for neuroticism in the conditional mediation of the relationship between maternal ADHD symptoms and parenting stress does not suggest that neuroticism is unimportant for understanding the experiences of people with ADHD symptoms, parenting self-efficacy beliefs, or stress, as neuroticism was found to be moderately related to all three constructs at the bivariate level. Instead, the results leave open the possibility that neuroticism is related to ADHD in ways that were not assessed in this study.

**Influence of ADHD Symptom Dimensions**

In a follow-up analysis of the mediation of the relation between parenting stress and maternal ADHD symptoms, inattention symptoms were found to be responsible for the indirect effect, while hyperactivity/impulsivity symptoms were related only to parenting stress. This difference in the associations of the two dimensions is consistent with a growing body of research finding that inattention symptoms in adults are particularly impairing, and also that
hyperactivity/impulsivity may not be obviously disadvantageous to mothers in all situations (Johnston, et al., 2012; Lui, Johnston, Lee, & Lee-Flynn, 2013; Murray & Johnston, 2006). It is unsurprising that both inattention symptoms and hyperactivity/impulsivity symptoms are related to parenting stress. Behaviors such as having difficulty concentrating during a conversation with your child, or impulsively disciplining your child are both likely to result in feelings of stress in the parenting role. However, unlike inattention symptoms, symptoms of hyperactivity/impulsivity may also be related to a mother’s ability to be outgoing, disinhibited playmates which may mitigate the deleterious effects of hyperactivity/impulsivity symptoms on maternal self-efficacy beliefs. Thus, if hyperactivity/impulsivity symptoms increase maternal self-efficacy beliefs in some situations or contexts and decrease them in others, the two variables may appear unrelated when assessed globally. This is in contrast to maternal inattention symptoms which do not have any demonstrated or hypothetical benefits in any parenting situation. If this explanation is true, it means that the result found in this study (that the indirect effect of ADHD symptoms on parenting stress is primarily due to inattention symptoms) is a consequence of the consistently negative relationship that maternal inattention symptoms have with parenting self-efficacy beliefs, as opposed to maternal hyperactivity/impulsivity symptoms which may not always be negatively related to parenting self-efficacy beliefs.

**Demographic and Other Characteristics**

Surprisingly, many demographic characteristics (e.g., mother age, household income, number of other children in the home), stressful life events (other than those related to parenting), and maternal social support were not related to maternal ADHD symptoms, parenting self-efficacy beliefs, parenting stress, or maternal neuroticism. This lack of significant relationships is believed to be valid, as other strong, significant relationships emerged as
expected among demographic characteristics. For instance, more educated mothers reported higher incomes and older mothers had been married longer.

The absence of relationships among general stressful life events, maternal social support and the primary variables is more puzzling as these factors are known risk factors for parenting stress, low parenting self-efficacy beliefs, and psychological problems in mothers (Angley et al., 2015; Finzi-Dottan et al., 2011; Friedrichs et al., 2012). However, the mothers in this sample reported relatively few stressful life events (i.e., mothers reported, on average, 8 out of 141 on a measure assessing their experience of stressful life events in the previous year) and this low base rate and a reduced variability in levels reported may account for the lack of relationships between general stress and maternal ADHD symptoms, parenting self-efficacy beliefs, maternal neuroticism, and parenting stress. That is, the lack of relationships may be explained by the relatively well-functioning nature of this sample. This possibility is supported by the one significant relationship which did emerge for major life events, a finding that positive life changes were associated with decreased parenting stress.

The lack of relationships between maternal social support and the primary variables may be attributed to the chosen measure of social support. The social support measure selected for this study is over 35 years old. Many measure items ask about community involvement (e.g., in religious or political activities), but there are no items asking about online communities, social media, or support networks that are not physically nearby. Given possible historical trends in changes in social networks, it is possible that maternal social support would be an important explanatory variable if such electronic or virtual social networks were included in measures, particularly since the mothers in this study were familiar with online services, given the fact that they were recruited from an online resource.
Behavior of the Mother’s Own Child

Although the behavior of the mother’s child was related to study variables at the bivariate level, it is notable that it was not influential in the mediation analysis. This suggests that maternal self-efficacy beliefs and the experience of parenting stress is driven, at least proximally, by mothers’ own characteristics, more so than by child characteristics. It is well established that child behavior is strongly related to mothers’ cognitions and behavior, as mothers of children who exhibit externalizing behavior problems experience significantly more stress, negative parenting behavior, and psychological symptoms than mothers of children without externalizing problems (August, Realmuto, Joyce, & Hektner, 1999; Fischer, 1990; Graziano et al., 2011; Podolski & Nigg, 2001; Theule et al., 2013). However, in the current study it appears that although mothers’ feelings of self-efficacy and parenting stress are related to their child’s negative behavior, they are not a direct reaction to it. This is supported by the presence of bivariate associations between child negative behavior and maternal ADHD symptoms, parenting self-efficacy beliefs, and parenting stress, but also by the absence of a unique effect of negative child behavior on the mediation of maternal ADHD symptoms and parenting stress by parenting self-efficacy beliefs. This is consistent with the idea that mothers are using child behavior as crucial feedback for how effective they are as mothers. A mother whose child is behaving negatively feels less effective as a mother, but only to the extent that her child’s negative behavior is evidence of her own ineffectiveness as a mother.

Collateral Informants

A critical component of this study was the use of collateral informants in the measurement of maternal ADHD symptoms and personality. Collateral informants were used to capture more objective measurements of these constructs, in contrast to mothers’ more subjective
reports. Although mothers and their collateral informants agreed with one another to a degree that is consistent with previous literature (Achenbach et al., 2005; Mörstedt et al., 2015), the bivariate correlations also suggested substantial differences in the perceptions of symptoms and personality across the two informants ($r_s = .35-.64$). This difference highlights the importance of utilizing multiple raters when attempting to measure the true value of a construct.

Measurement of adult externalizing symptoms in general, and ADHD symptoms in particular, is known to vary widely depending on the rater and method of assessment (Chronis-Tuscano et al., 2008; Jiang & Johnston, 2012). Further, there is evidence that people with high levels of ADHD symptoms have particularly low insight into the nature of their symptoms (Barkley, 1997; Barkley et al., 2011; Knouse, Bagwell, Barkley, & Murphy, 2005; Wender, 1999). As a result, how ADHD symptoms are assessed is likely to have a profound impact on the findings of a particular study. The moderate correlation in this study between self- and collaterally-reported levels of ADHD symptoms ($r = .35$) is consistent with what has been found in previous literature (Achenbach et al., 2005) and supports the a priori reasoning for utilizing multiple raters of ADHD symptoms.

The association between self- and collaterally-reported levels of neuroticism in this study was somewhat divergent from previous literature. Other studies have recommended using multiple raters to assess personality symptoms because of very low agreement between raters, particularly for neurotic personality features (Biesanz et al., 2007; $r_s = .13$ to .24). However, in this study, agreement between mothers and their collateral informants on the mothers’ levels of neuroticism was substantially higher at $r = .64$. There is no obvious explanation for this difference, other than the use of different measures. Biesanz and colleagues (2007) utilized a measure where respondents were presented with a list of abstract concepts that could be used to
describe a person (e.g., “emotional”, “excitable”) and then were asked to indicate how well each concept described the person in question. In this case, participants would have had to match how well this concept fit into their pre-existing attitude about the person, assess how well the person fits the descriptor, or attempt to think of behavioral examples that would provide evidence for fit (or lack of fit) with the descriptor. In contrast, this study used a measure where respondents were asked to rate the accuracy of specific, concrete behavioral examples of the personality construct (e.g., “they experience very few emotional highs and lows”). In this case, respondents need only search their memories for instances where the person in question engaged in the behavior provided by item. Perhaps it is easier for raters to agree on the presence of concrete behaviors than on the intensity of abstract personality characteristics. Beliefs about how accurate an abstract concept is in the description of a person may be more prone to subjective judgments (and therefore more susceptible to disagreement) than evaluating for the presence of specific instances of a demonstrated behavior.

Another possible differentiator between this study and the findings of Biesanz and colleagues (2007) was that in this study, only 35% of mothers used friends as collateral informants, while in the Biesanz and colleagues (2007) study, all collateral informants were friends. In addition, the participants in the Biesanz and colleagues (2007) study were, on average, 20 years of age and approximately one-third were male. Perhaps the personality characteristics of older women are more salient or stable (and therefore more easily agreed upon) than those of younger sample that consisted partially of men.

Limitations and Future Directions

This study had many strengths, but limitations should also be noted. Although throughout this paper the term mediation has been used to describe the model under analysis, I again
acknowledge that the design of this study did not meet criteria for mediation in a classic sense. First, simultaneous measurement of all study variables makes it impossible to statistically disentangle causal effects. A conceptual analysis of the issue of causality in this study was presented above, but a longitudinal or experimental study, in which the specific causal effects of ADHD symptoms, maternal self-efficacy beliefs and parenting stress could be determined, would be ideal for more fully understanding this model. Second, in an ideal mediation, the predictor variable (in this case, maternal ADHD symptoms) would be randomized (Kenny, 2015). Doing so allows for the conclusion that neither the mediator nor the outcome variable causes the independent variable. However, the nature of this study precluded such a manipulation because, obviously, ADHD symptoms cannot be randomly assigned to mothers. Another study design may be able to approximate this by randomizing mothers with high levels of ADHD symptoms to receive medication for their ADHD symptoms or a placebo medication and then measuring parenting self-efficacy beliefs, parenting stress, and maternal neuroticism. Although it could never be definitively known if people without ADHD symptoms would react the same way as people with ADHD symptoms who received medication, this study design would be helpful in resolving the impact of non-random assignment of maternal ADHD symptoms. However, the theoretical understanding of the origin of ADHD symptoms does permit a conclusion that neither the mediator nor the outcome variable should be causing maternal ADHD symptoms. However, the possibility exists that a mother’s ADHD symptoms would become more pronounced as a result of environmental stressors, or that increased parenting stress and lower maternal self-efficacy beliefs would heighten a mother’s awareness or experience of her ADHD symptoms, which may result in increased reporting of symptoms. Again, a longitudinal design would help to mitigate the problems that arise from not being able
to randomly assign ADHD symptoms, as the effect of measuring parenting stress and parenting self-efficacy beliefs at multiple time points on the subsequent levels of ADHD symptoms can be determined.

Given the importance of multiple raters in accurately measuring the objective level of ADHD symptoms and neuroticism, this study could be further improved by the use of additional raters and, particularly, other methods of assessment of ADHD symptoms and neuroticism. ADHD symptoms might be measured by direct observation, or assessed by trained clinicians conducting semi-structured clinical interviews (Epstein, Johnson, & Conners, 2001). An ideal study would utilize a combination of self-reported, collaterally-reported, observed, and clinically assessed ADHD symptoms and thereby minimize not only rater variance, but method variance as well.

As previously mentioned, the average level of ADHD symptoms in this sample was relatively low. Mothers were recruited from the community, and although efforts were made to screen for mothers with higher levels of symptoms, the relative paucity of mothers with high or very high levels of ADHD symptoms likely attenuates the results. Perhaps because of these relatively low levels of ADHD symptoms, other variables for which mothers provided a wider range of responses may have been more strongly and consistently related to parenting stress and maternal self-efficacy beliefs. However, it is notable that even at lower levels, maternal ADHD symptoms were reliably related to the other study variables and demonstrated an indirect effect on parenting stress through maternal self-efficacy beliefs. It will be important for future research to replicate these findings both with a more normally distributed pattern of maternal ADHD symptoms, and among a sample of mothers with diagnostic levels of ADHD symptoms.
Gender differences in adults with ADHD have been demonstrated in a number of domains (Williamson & Johnston, 2015). The decision to use mothers exclusively in this study was both practical, and in order to ensure comparability with previous research, as the vast majority of research in this area is with mothers exclusively. Future research should include fathers in order to determine whether gender differences are present in the pattern of effects observed in this study. There is emerging evidence that the pattern of ADHD symptoms present in family members is related to negative parenting (Johnston, Williamson, & Noyes, 2016). That is, negative parenting is not simply dependent on whether a parent has high levels of ADHD symptoms, but that it also matters which parent has ADHD symptoms and whether the child also has symptoms of ADHD. This suggests the possibility that the indirect effect of maternal ADHD symptoms on parenting stress through parenting self-efficacy beliefs may be conditional on the level of ADHD symptoms in the mother’s partner.

Although the use of online methods for recruitment was a strength of this study, as it facilitated reaching a sample of mothers that might otherwise have been difficult to recruit, there are limitations inherent to online recruitment methods. First, even though methods were in place to detect falsified responses, there was no way to definitively verify that participants were, in fact, mothers of a child between the ages of 6 and 12. Second, time limits were in place to prevent mothers from taking an extended period of time to complete the study, but there was not any way to determine whether mothers took breaks for shorter periods of time or were distracted by their children or other environmental stimuli while completing the measures. Third, despite agreeing to do so, many mothers completed their portion of the study but did not provide collateral informants. Although I cannot be sure exactly how representative the subgroup of mothers who provided collaterals is of the total sample of mothers who completed the study,
mothers who provided and did not provide collateral informants did not differ on any of the measured variables. Similarly, although previous research suggests that samples recruited via MTurk are as representative of the general population – or more – as samples recruited with more traditional techniques (Casler et al., 2013), it is possible that mothers who participate in online studies do not accurately represent the larger population of mothers. Future research should replicate these results with mothers recruited from other sources.

**Clinical Implications**

The results of this study have several implications for clinical practice with mothers with high levels of ADHD symptoms. First, the significant relationships among maternal ADHD symptoms, parenting self-efficacy beliefs, and parenting stress imply that, although mothers with more ADHD symptoms may present with parenting difficulties related to their ADHD symptoms, their parenting stress may be less related to ADHD symptoms specifically, and instead may be better explained by a combination of mother-centered factors. For example, it is not simply that a mother with ADHD symptoms has difficulty with organization, and that that difficulty causes stress and problems with parenting. More likely, a mother with ADHD symptoms has difficulty organizing herself and that difficulty is both inherently stressful and makes her feel less efficacious as a mother and also that this diminished sense of efficacy is stressful. Further, much of the effect of how her ADHD symptoms (and anxiety, depression, and hostility) are related to her experience of stress in the parenting role can be linked to her parenting behavior and feelings of warmth towards children. Finally, her child’s behavior is providing important feedback that is likely amplifying all of the other effects. This complex series of interrelationships argues for thorough assessment of a range of psychological problems,
parenting behaviors, and parenting cognitions even when a particular mother presents specifically with ADHD symptoms.

Second, the mediation analyses in this study indicate the centrality of maternal parenting self-efficacy beliefs in the relations among parenting stress, maternal ADHD symptoms or other psychological symptoms, and other parenting behavior. Knowing this, clinicians would be advised to spend time assessing and focusing on enhancing not only actual parenting strategies but also developing mothers’ perceived mastery of parenting skills. Beliefs in one’s own parenting self-efficacy are not often an explicit goal in parenting interventions. However, self-efficacy theory would argue that it is critical that one believes in their ability to meet task demands and sees problems as challenges to be overcome (Bandura, 1997). This study furthers that analysis by demonstrating the harmful effects (e.g., negative parenting, parenting stress, increased psychological symptoms) that can be present when beliefs in one’s parenting efficacy are low.

Finally, although considerable research has demonstrated the efficacy of changing parent behaviors as a means of improving child behavior (Sanders, Kirby, Tellegen, & Day, 2014), this study suggests the possibility that changes in any of parenting behavior, psychological functioning, or parenting cognitions could affect parenting stress. Improving parenting self-efficacy beliefs and parenting stress are worthwhile goals in and of themselves and may have reciprocal relationships with child behavior. That is, increasing parenting self-efficacy beliefs may decrease the stress that a mother feels. This reduction in stress may allow the mother’s psychological functioning to improve and permit her to make less impulsive, more positive parenting decisions which may improve child behavior. With the increased positive feedback of
improved child behavior, mothers are likely to feel more confident and efficacious, setting the stage for the positive cycle to continue.

Conclusion

This paper investigated whether maternal self-efficacy beliefs mediated the relationship between ADHD symptoms and parenting stress and tested whether neuroticism moderated these relations. Hypothesized moderating influences of maternal neuroticism were not found, however the mediation of maternal ADHD and parenting stress by parenting self-efficacy beliefs was established. Maternal self-efficacy beliefs also mediated other maternal psychopathology, parenting behavior, and mothers’ feelings about children, suggesting that maternal self-efficacy beliefs are a central variable through which many aspects of motherhood are related to stress. These results strongly suggest that clinicians and researchers pay greater attention to the subjective experiences of mothers. Parenting self-efficacy beliefs are central to a wide variety of factors that, together, could greatly improve the functioning of families. By focusing our resources not only on improving mothers’ parenting skill, but also on improving their belief in their ability to effectively implement the skills they have, we allow mothers to not only improve their own well-being, but the well-being of their children and families.
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Appendix 1: Results with the 200 Mother Sample

In the interest of better understanding the robustness of the results in the sample of mother who provided collateral informants, the mediation, conditional indirect effect, covariate, and exploratory analyses were re-run with the entire 200 mother sample. Maternal ADHD symptoms and maternal neuroticism did not include any collateral reports for these analyses.

Mediation analysis: The role parenting self-efficacy beliefs. Path c was examined by regressing the maternal parenting stress variable on maternal ADHD symptoms. As predicted, maternal ADHD symptoms were significantly related to parenting stress, $\beta(198) = .37$, $p < .001$. Path a was examined by regressing maternal parenting self-efficacy beliefs on maternal ADHD symptoms. Again as predicted, a significant negative relationship was found between maternal ADHD symptoms and maternal parenting self-efficacy beliefs, $\beta(198) = -.20$, $p < .01$. To investigate path b, maternal parenting stress was regressed on maternal self-efficacy beliefs, controlling for the effect of maternal ADHD symptoms. Confirming predictions, the relationship between maternal parenting self-efficacy beliefs and parenting stress was significant even after controlling for maternal ADHD symptoms, $\beta(197) = -.53$, $p < .001$. To determine whether the indirect effect was significant, that is whether a significant proportion of the c path can be accounted for by maternal self-efficacy beliefs, the indirect effect was bootstrapped with 6,000 resamples. The indirect (ab) effect was significant, $\beta(195) = .11$, CI$_{95\%} [.02, .20]$. To investigate whether the relationship between maternal ADHD symptoms and parenting stress was fully, or only partially, accounted for by maternal self-efficacy beliefs, the c path was recalculated with maternal self-efficacy beliefs in the model (the c’ path). When this was done, maternal ADHD symptoms were still significantly related to parenting stress, suggesting only a partial mediation, $\beta(197) = .26$, $p < .001$. 

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Conditional indirect effect analysis: The role of neuroticism. Because maternal parenting self-efficacy beliefs were found to mediate the relationship between maternal ADHD symptoms and parenting stress, the conditional indirect effect analysis was run. In this analysis, maternal neuroticism was tested as a moderator of one or both of the a and b paths. To examine this, the mediation model was run with maternal neuroticism entered in the model and allowed to interact with both maternal ADHD symptoms and maternal self-efficacy beliefs. Although maternal neuroticism was related to all three of the other variables in the expected directions, contrary to prediction, it did not significantly moderate the indirect effect, $\beta(195) = .03$, $p=.50$.

Exploratory analyses. The exploratory results from the 120 mother-collateral sample were also re-run to determine whether the patterns among the mediations of the covariates was mirrored in the full, 200 mother-only sample. In each case, the pattern of results was identical: the effects of maternal ADHD that were seen in the a and c paths were no longer significant once all covariates were included, although parenting self-efficacy beliefs continued to be associated with parenting stress even in the presence of all covariates. Further, positive and negative parenting and parental care and tenderness towards children had a significant indirect effect on parenting stress through parenting self-efficacy beliefs even with all covariates in the model. As with maternal ADHD symptoms, a significant indirect effect of other maternal psychopathology was found only in the absence of other covariates. Finally, mirroring what was found in the 120 mother-collateral sample, a significant indirect effect of ADHD symptoms on parenting stress was found for maternal inattention symptoms, but not hyperactivity/impulsivity symptoms, although both symptom domains were related to parenting stress at the bivariate level.