THE IMPACT OF EMOTION REGULATION ON ADHD AND DEPRESSIVE SYMPTOMS IN EMERGING ADULTS

by

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ABSTRACT

The present thesis describes a study examining the process of emotion regulation (ER) and its connections to symptoms of two forms of psychopathology, attention-deficit/hyperactivity disorder (ADHD) and depression, both separately and comorbidly. ER can be characterized as the processes and components that make up a person's ability to express, experience, and control his/her emotions. It is theorized to be an important component of a variety of psychological disorders, including ADHD and depression. ER has been found to play a vital role in the development of both of these disorders and there has been speculation that ER may explain some of the observed comorbidity between them. This thesis project will explore the connections among ER, ADHD symptoms, and depressive symptoms, how ER relates to each disorder, and its possible role in mediating the relationship between the two symptom types. Results indicated that females (M = 86.95, SD = 25.51) reported significantly higher ER difficulties than males (M = 80.73, SD = 23.29), $t(359) = -2.25$, $p = 0.03$. No significant difference in ADHD symptoms was found between males (M = 31.08, SD = 11.59) and females (M = 32.15, SD = 11.03), $t(359) = -0.85$, $p = 0.40$. Females (M = 17.97, SD = 15.58) reported significantly higher depressive symptoms than males (M = 14.22, SD = 13.99), $t(359) = -2.25$, $p = 0.03$. In regards to correlations, it was also found that higher emotion regulation difficulties were associated with higher ADHD symptoms ($r = .47$, $p < .001$). Higher emotion regulation difficulties were associated with higher depressive symptoms ($r = .65$, $p < .001$). Higher ADHD symptoms were associated with higher depressive symptoms ($r = .49$, $p < .001$). In the final mediational model, results found a significant indirect effect of ADHD symptoms on

depressive symptoms through ER, b = .35, *BCa CI* [0.24, 0.46]. This indirect effect accounted for 25% of the variance, b = .25, *BCa CI* [0.19, 0.33]. Therefore, ADHD symptoms had an indirect effect on depressive symptoms through ER in a population of emerging adults.

TABLE OF CONTENTS

LIST OF FIGURES AND TABLES

INTRODUCTION

Emotion

Emotions are the mechanisms by which people perceive and interact with the world around them (Gross, 2002). They are a complex combination of physiological and psychological processes that allow individuals to reflect on and understand their environments and interactions (Dolan, 2002). The term 'emotion' refers to a wide variety of responses and behaviors that can be positive or negative, mild or intense, and short-term or long-term (Werner & Gross, 2010). They are variable in their type, intensity, and duration, but also between and within individuals. Two individuals presented with the same emotional stimuli may have completely different appraisals and reactions to it. For example, two friends sitting in a movie theater see a mouse running across the floor. One of them perceives this as threatening and jumps out of the seat, while the other is unconcerned and stays relaxed. As situations, stimuli, and goals change overtime, so does the emotional expression that accompanies them. For example, one person may initially see a mouse in their house as non-threatening, until droppings start to appear in kitchen drawers and molding shows signs of being gnawed on. At this point, this person may see the mouse as a violation of cleanliness, switch the emotional response to threatening, and take actions to get rid of it in order to fulfill a goal of a clean home. Clearly, emotions do not follow a fixed pattern; "When afraid, we may run, but do not always do so. When angry, we may strike, but do not always do so. And when amused, we may laugh, but do not always do so" (Gross, 2002, p. 281).

Emotions serve several functions for psychological well-being. At their most basic level, emotions evoke behavioral and physiological responses that then impact one's ability to problem solve and work toward long term goals (Gross, 2002). They aid in connecting fundamental responses with higher-order cognitive processes, such as decision making abilities, social interactions and functioning, and memory consolidation (Werner & Gross, 2010). Emotions are even able to script social behavior as people gather information and clues about the behavioral intentions of others and perceive these stimuli as good or bad (Gross, 1998). Emotions are an essential component of goal achievement and thus overall regulation. This aspect of regulation is key to the current thesis, which hopes to expand on previous literature of emotion regulation and its relationship to ADHD and depressive symptoms. This review will cover descriptions and prior research about each of the variables individually, as well as their relationships to each other.

Emotion Regulation

Emotion regulation (ER) can be a difficult concept to define, as contained within it are a multitude of components pertaining to both how and what is being regulated. A possible definition of ER is the "process of initiating, avoiding, inhibiting, maintaining, or modulating the occurrence, form, or intensity" of emotions (Özbaran, Kalyoncu, & Köse, 2018, p. 117) through external and internal processes in order to accomplish goals (Thompson, 1994). ER can be intrinsic (within the individual) or extrinsic (external to the individual), and when engaging in ER, individuals use both of these processes to play a role in choosing the emotions that they have, when they are felt, and how to experience, express, or interact with them (Gross, 1998), thus lending to the variability of emotions discussed previously. In the following sections are overviews of the insights of three

leading theorists on ER and its complexities. The first is the work of Thompson, who outlines essential characteristics and an understanding of what is being regulated during ER. This is followed by the contributions of Gross, who identifies other important aspects of ER. Finally comes Werner and his elaboration of five common ER strategies. Subsequently there will be discussion about consequences for an individual with ineffective ER.

Thompson

There are four essential characteristics that should be considered in the understanding of ER. These characteristics describe key components that aid in forming a complete picture of what it truly means to regulate emotions (Thompson, 1994). First, ER includes processes of maintaining, enhancing, inhibiting, or subduing emotional expression (Thompson, 1994). For example, consider a doctor who just received good news from his family, but following that has to deliver negative news to a patient. In light of just receiving positive news, the doctor may feel or show increased joyful emotions, but would want to inhibit these when discussing the negative news that must be shared with the patient. Second, ER can be intrinsic, however, external sources can bring about ER as well (Thompson, 1994). Examples may include a caregiver soothing an infant, parental strategies used to regulate the emotions of children, or adults making jokes to ease the discomfort of others. Third, ER sometimes affects the short-term emotion of an individual (e.g., feeling angry after being cut off on the road), but it can also affect long-term emotion (e.g., going through a lengthy divorce; Thompson, 1994). The fact that individual goals can change over time is an important note when discussing long-term ER. Emotions change over time to better meet an individual's goals, just as ER strategies can change in order to

better serve the individual. These strategies alter the intensity, speed of onset and recovery, persistence, and range of emotions that a person experiences, and will be discussed in greater detail in the section below overviewing the contributions of Werner. Finally, ER is functional to an individual. This means that it operates and is practical for a single person, and, therefore, ER looks different for everyone. It must be viewed and understood in regards to a specific person's goals for a specific situation or time (Thompson, 1994).

Fundamental to understanding the biology of ER is the answer to the question 'what is being regulated during ER?' Thompson (1994) cites seven constructs that are essential to this process: (a) Neurophysiological constituents. At birth, most connections between excitatory and inhibitory neurons are not yet mature enough to effectively take part in ER. As we age, these become stronger and limit susceptibility to external influences. Part of what is regulated during ER is the use of these neural pathways and systems as they mature; (b) Attention processes. An essential component of ER is knowing or learning how to cope with stimuli that arouses potentially very intense emotions, and how to avoid it when necessary. For example, avoiding stimuli that makes a person angry and instead focusing on something pleasing; (c) Perception of emotionally arousing stimuli. People can regulate emotions by avoiding or giving attention to things, but they can also regulate by changing the way they interpret a situation. For example, seeing an audience member laugh while giving a presentation may lead a person to believe that the member is laughing at him/her. However, the presenter can employ an ER strategy and instead interpret the situation differently, so that the audience member is laughing at something unrelated to the presentation; (d) Being in tune with internal cues. People can learn to recognize and understand physiological cues such as perspiration and increased heart rate and how they

relate to various, subjective emotional processes of the individual. Such recognition and understanding of these internal cues allows a person to prepare for an emotional reaction or alter it before it begins; (e) Access to coping resources. People regulate emotions by making internal and external resources of emotional support more available. Examples include going to friends and family when in distress or a child using a favorite toy to calm him or herself down; (f) Regulating the emotional demands of familiar settings. When regulating emotions, people can recall instances or settings that they have encountered before, and later can choose or create these similar environments. This provides a level of control in the emotions that will be felt in a situation; and (g) Selecting adaptive response alternatives. When they regulate emotions, people will choose a response that they know will have better consequences and will bring them closer to their goal (Thompson, 1994). Effective ER strategies can involve one or more of these regulatory processes.

Gross

Building on the work of Thompson (1994), Gross (1998; 2002) identified three more important aspects of ER. One, ER is not just about management of negative emotions. It can also involve increasing, maintaining, or decreasing positive emotions. Individuals have a natural desire to inhibit negative emotions, while enhancing positive ones. In other words, people are motivated to feel good and often want to alter their emotional expression in order to do so (Gross, 1998; 2002). This can result in a focus on the regulation of negative emotions, but sometimes, it is helpful to increase a negative emotion and inhibit a positive one. For instance, if an individual finds him/herself amused, which is typically considered a positive emotion, by something inappropriate, or at an inappropriate time, it would be beneficial to inhibit that feeling in order to better serve the situation. Two, ER can occur

consciously, such as choosing to end an upsetting conversation, or unconsciously (Gross, 1998; 2002). Three, Gross (1998; 2002) emphasizes the important point that ER should not be considered good or bad. It is simply one of the many processes at play during goal-oriented behavior.

Now that the essential components of ER have been established, it is important to discuss various strategies that can be employed during this process in order to successfully regulate emotional responses.

Werner

There are five essential strategies of ER that are discussed by Werner and Gross (2010). Execution of these can occur consciously or unconsciously and aid in the regulation of positive or negative emotions. These strategies are a component of ER that aid in goal achievement. Individuals can perform one or multiple strategies in order to better serve their emotional needs at the time and become closer to reaching a goal. The first strategy is situation selection, in which an individual chooses whether or not to engage with emotionally arousing stimuli or situations. Second is situation modification, where an individual changes the situation to change its emotional effect. The third strategy, attentional deployment, involves the choice of which aspects of an emotional stimulus to focus on, thereby holding the power to focus on a less eliciting component. Fourth is cognitive change, which is the way a person changes the meaning of a situation. An individual can choose how much or what type of meaning an aspect of a situation has for him or her. Finally, there is response modulation, in which an individual alters his/her response to emotional stimuli.

Consequences of ER Deficits

ER is becoming an increasingly important topic to understand due to the detrimental effects of deficits in successful regulation. Problems with ER are associated with a host of behavioral problems, as well as issues in academic, social, and familial functioning (Özbaran et al., 2018). Deficits are also harmful to an individual's physical health. For example, the strategy of suppression causes physiological responses to become more intense and creates greater negative consequences over long-term suppression (Gross, 2002). Our well-being and ability to engage in goal-oriented behavior is linked to our emotions, as well as how effectively we can regulate them. In some cases, unfortunately, ER processes are maladaptive, for example when efforts to modify emotional processes are used in the wrong context and, thus, do not result in the desired outcome (Werner & Gross, 2010). These maladaptive ER abilities are an essential component to what is arguably the most detrimental: the high association between ER and psychopathology. The ability to effectively regulate emotions is essential to mental health and well-being, as inefficient regulation can cause distress that prohibits day to day functioning, enjoyment, and ability to solve problems or reach goals (Gross, 1998). Emotion dysregulation is a symptom included in the criteria for over 75% of disorders in the *Diagnostic and Statistical Manual 5* (Werner & Gross, 2010; American Psychiatric Association [APA], 2013). Some examples of these disorders include borderline personality disorder, bipolar disorder, generalized anxiety disorder, social anxiety disorder, eating disorders, alcohol-related disorders, substance use disorders, major depressive disorder (Aldao, Nolen-Hoeksema, & Schweizer, 2010) and attention-deficit hyperactivity

disorder (Seymour, Chronis-Tuscano, Halldorsdottir, Stupica, Owens, & Sacks, 2012; Seymour, Chronis-Tuscano, Iwamoto, Kurdziel, & MacPherson, 2014).

The current thesis analyzed the relationship of ER to the symptoms of both ADHD and depression. Central to the current study hypotheses are possible developmental differences in ER, ADHD, and depression. As such, the review turns to a discussion of important developmental considerations of ER before overviewing the relationship between ER and each disorder, and the comorbid relationship between ADHD and depression.

Developmental Considerations

Much of the current research on the relationship amongst ER, ADHD symptoms, and depressive symptoms is focused on children and young adolescents (e.g., Seymour et al., 2012). It is, therefore, among the aims of the current study to explore this relationship in a population of emerging adults. There are a number of differences between these populations. Biological differences have been observed in the level of brain growth and emotional maturity, as well as observed changes in how children versus adults handle emotional stimuli (McRae et al., 2012). Environmentally and emotionally there are a wide variety of differences, including responsibility level and its effect on goal-oriented behavior (Diamond & Aspinwall, 2003). As the current thesis focused on a population of emerging adults rather than children, this section will explore these differences.

The most notable differences between youth and emerging adult populations are, arguably, in the realm of brain development. The prefrontal regions of the brain are mainly responsible for advanced cognitive processes, such as ER and goal-directed behavior, and they become more fully developed as individuals age (McRae et al., 2012). This would

suggest that as individuals age their ER skills improve based on this inherent brain development. McRae et al. (2012) looked at the relationship between ER development over time in a study which 38 participants (aged 10-22) completed an ER task that asked them to self-report on their negative affect after viewing an instruction word ('decrease' or 'look'), followed by a photo. Results from this study indicated a linear improvement between the ER strategy of reappraisal and age. There was, however, an observed difference in how older children and young adults engaged with stimuli when compared with adolescents, in that older children and young adults engaged various regions of the brain more strongly in response to emotional stimuli (McRae et al., 2012). These findings suggest that, despite the overall linear relationship, adolescents may process emotional stimuli differently than children or adults. It also suggests that, as individuals age and become more cognitively mature, so does their use of certain ER strategies. Results found no age-related differences in emotional reactivity, but there were linear and quadratic relationships in reappraisal ability and age, indicating that certain cognitive abilities related to ER, such as reappraisal, vary across age.

Other research has explored how adults regulate emotions differently than youth. Nolen-Hoeksema and Aldao (2011) conducted a study examining the relationship between age differences in both ER strategies and depression. Participants were 1312 people (aged 25-75) who completed a battery of measures. Results from this study indicated that older individuals were less likely to use the ER strategies of reappraisal, active coping, acceptance, and social support compared to younger individuals (Nolen-Hoeksema & Aldao, 2011). This suggests that, though the ability to regulate emotions improves with

age, the way that emotions are regulated changes as well, in that older adults tend to use more strategies considered maladaptive and draw support from a smaller range of people.

Besides biological differences in ER ability and strategies, there are a number of environmental and emotional differences between emerging adults and youths. For instance, Diamond and Aspinwall (2003) identified that children are more concerned with family relationships, whereas adults are more concerned with problems in work settings. A difference like this could suggest that, since adults often problem-solve and accomplish goals alone in settings of high responsibility (e.g. work or parenting), they are more efficient at ER and goal-oriented behavior than children, who receive emotional support more frequently from parents. The authors also suggested that adults are more aware of time limitations and that this causes them to identify emotional meaning, rather than reactivity, in order to better accomplish goals (Diamond & Aspinwall, 2003). This is critical for the process of ER, a component of which is analyzing the emotions felt in a situation and applying meaning to them.

This prior research identified a number of differences between a population of youth and a population of emerging adults. There are differences in brain development and cognitive abilities related to ER (McRae et al., 2012), use of ER strategies (Nolen-Hoeksema & Aldao, 2011), and in the environment (Diamond & Aspinwall, 2003) that make emerging adults an important population to investigate. It was, therefore, a goal of the current thesis to explore this population further.

ADHD, Depression, and ER

ADHD

One of the two target disorders in the present study is attention-deficit/hyperactivity disorder (ADHD). This is a highly prevalent, early-onset neurodevelopmental disorder characterized by inattentive and/or hyperactive-impulsive symptoms that affect the social, emotional, academic, and behavioral well-being of affected individuals (Biederman, 2004). In this section, an overview of the disorder will be provided, including symptom criteria and subtypes. Following this are comments about how the disorder presents in adults and extended notes on consequences of a diagnosis. Finally, the connection between ER deficits and ADHD symptoms is explained.

Commonly thought of as a childhood disorder, the symptoms of ADHD must be present and identified in a variety of settings (e.g., school and home), before a child or adolescent is sixteen years old, and for at least six months (APA, 2013). The disorder has a wide variety of symptoms and for that reason there are three predominant subtypes; predominantly inattentive, predominantly hyperactive impulsive, and combined presentation. Across these subtypes, common symptoms include daydreaming, difficulty focusing or completing tasks, excessive talking, fidgeting (Biederman, 2004), dislike of tasks that require a lot of mental focus, or not listening (APA, 2013). Specifically, predominantly inattentive subtype is characterized by symptoms of difficulty holding attention or with organization, and being distracted or forgetful (APA, 2013). Predominantly hyperactive impulsive subtype is characterized by symptoms of fidgeting, being “on-the-go”, trouble waiting turn, and interrupting (APA, 2013). People diagnosed

with combination ADHD meet symptom criteria of both subtypes (APA, 2013). Overall, ADHD is more commonly diagnosed in boys than girls (Aguiar et al., 2010).

ADHD is a prevalent and highly heritable disorder. Prevalence rates are about 5% in children and 2.5% in adults (Faraone et al., 2015), and heritability rates have been found to be as high as 76%, based on data from twin studies (Aguiar et al., 2010). Beyond genetic factors, pregnancy and delivery complications, such as low birth weight, fetal distress, and eclampsia, have also been linked to risk for ADHD (Biederman, 2004; Weis, 2018).

Though ADHD is more common in children, it can also persist or be diagnosed in adulthood (APA, 2013). Adult rates of a diagnosis are about 2.5%, however as many as 65% of adults meet criteria for partial remission by age 25 (Aguiar et al., 2010). In adult populations, the disorder can often be less overt, and instead more subjective to the individual, which can account for some of the decreased rates of diagnosis. For example, a child might show hyperactivity by leaving their seat in class, while a college student might feel very restless while waiting in line or during a lecture. Children with inattentive symptoms may not listen to parents or teachers, whereas an adult might forget to keep appointments (Weis, 2018). ADHD symptoms in children center around academic and social impairments, while in adults, there are more patterns of psychological, psychosocial, and psychiatric problems (Biederman, 2004). It is important to note that, while the symptom presentation and diagnostic rates are different between children and adults, adults with the disorder experience as much subjective distress as children (APA, 2013) and outcomes of the disorder are commonly demonstrated in diminished school or work performance and having fewer close friends (Barkley, Fischer, Smallish, & Fletcher, 2006).

A diagnosis of ADHD can result in a number of adverse consequences for those affected. Children with ADHD are at a high risk for impairment in academic and social functioning, as well as parental conflict, substance use, delinquency (Biederman, 2004), and higher rates of injuries or motor vehicle accidents for those who drive (Spencer, Biederman, Wilens, & Faraone, 2002). ADHD is a highly comorbid disorder. Individuals with it are more likely to also be diagnosed with a substance use disorder, sleep disorder, a learning disability, oppositional defiant disorder, anxiety, conduct disorder, bipolar disorder, or depression (Aguiar et al., 2010; Weis, 2018). High levels of subjective distress and decreased self-esteem are also common (Biederman, 2004).

ADHD and ER.

Prior research finds a strong association between ER and psychopathology (Werner & Gross, 2010) and suggests that difficulties with ER can cause high levels of difficulty with accomplishing tasks (Gross, 1998). Some symptoms of ADHD are related to deficits in key components of ER. Individuals with this disorder have demonstrated difficulty in identifying negative emotions (Norvilitis, Casey, Brooklier, & Bonello, 2000) and are less likely to engage in mood repair than those without the disorder (Scime & Norvilitis, 2006). Factors such as these can make ER overall more difficult, as well as with strategies such as cognitive change or attentional deployment (Werner & Gross, 2010). Other ADHD symptoms of difficulty with being too impulsive or being unable to hold back emotional actions such as yelling led researchers to question whether ER was an important process in the development and presentation of this disorder. It has been found in prior research that it does (Bunford et al., 2018; Graziano & Garcia, 2016; Özbaran et al., 2018). To make clear this connection, two studies and one meta-analysis will be discussed that

identify a relationship between ER difficulties and ADHD symptoms in adolescent populations.

In a meta-analysis done by Graziano and Garcia (2016), research done between the years 1998-2015 regarding ADHD and ER was reviewed. They observed a large effect size between youth ER and ADHD (weighted *ES* of $d = .80$ (95% *CI* [.70, .92], $p < .001$). They also found no significant association of age between ADHD and ER, indicating that developmental considerations are not enough to alter the association between ADHD and ineffective ER skills (Graziano & Garcia, 2016). Interestingly, the self reports done in this meta-analysis found a larger effect size between ADHD and ER than the observational measures, indicating that who is reporting on symptoms of ADHD or ER skills is important when analyzing their relationship. This is important when considering study design.

In order to address which aspects of ER are different between children with or without ADHD, Özbaran et al. (2018) recruited 200 youth (aged 11-17 years) 100 of whom met diagnostic criteria for ADHD and 100 who did not. After parents and youth completed diagnostic questionnaires, results indicated that youth with ADHD had more overall difficulty in emotion regulation than those without the disorder (F [1, 198] = 35.34, p = 0.000, η^2= 0.151). Specifically, the sample of youths with ADHD had difficulty in accepting negative emotions, with emotional clarity, effective ER strategies, goal-directed behavior, and impulse control (Özbaran et al., 2018). These findings add to literature that supports a connection between ER abilities and psychopathology such as ADHD. They are also consistent with existing knowledge about the symptom criteria of ADHD, that includes challenges such as impulsivity or organizing tasks in order to accomplish goals

(APA, 2013). This study is valuable in understanding how ER and ADHD interact overall, as well as which specific aspects of ER are pertinent to a population of youth with ADHD.

Another study that further supports the results of the Özbaran et al. (2018) study was done by Bunford, Evans, and Langberg (2018). These researchers sought to investigate which components of ER varied between children with ADHD and a community sample of adolescents. This varies from Özbaran et al. (2018) study which was done in a clinical sample. Participants were 180 adolescents (aged 12-16 years) that were recruited from public middle schools and screened by licensed psychologists for ADHD symptoms. Results showed, overall, that adolescents with ADHD had ER difficulties related to lack of awareness and inattention to emotional responses, emotional inflexibility, difficulty in behavioral control when experiencing a negative emotion, and in knowing what a socially appropriate response would be (Bunford et al., 2018). Adolescent females with ADHD, specifically, were found to have a lack of confidence in the ability to regulate emotions when upset, while adolescent males with ADHD had a lack of knowledge and clarity about emotions they experienced. This supports prior research that identified a significant connection between multiple facets of ER difficulties and ADHD symptoms, both in clinical and community samples. This indicates that the processes involved in ER are essential in the development of ADHD symptoms in multiple populations.

This research makes clear the connection between ER and ADHD symptoms in children and young adolescents. What is less thoroughly researched is this connection in adult populations. This connection is essential to the current thesis, which will further examine the relationship between ER and ADHD symptoms in emerging adults.

Depression

The second of the targeted disorders in the present study is major depressive disorder (investigated as continuous symptoms of depression). This is a prevalent disorder that affects an individual's mood, world and self-perception, and well-being. In this section, an overview of the disorder will be provided, including symptoms and prevalence. Following are comments on how the disorder presents differently in children versus adults and extended notes on the consequences of a diagnosis. Finally, the connection between ER deficits and depressive symptoms is explained.

Depression is a disorder characterized generally as depressed mood, reduced interest or pleasure, feelings of worthlessness, and recurrent thoughts about death (APA, 2013). Symptoms of depression are extensive and include psychological, behavioral, and physical impairments. Common symptoms are, more specifically, insomnia or hypersomnia, fatigue, appetite or weight changes, difficulty concentrating, moving more slowly or more quickly than usual, feeling worthless or guilty, and excessive thoughts of death or suicide. These symptoms greatly affect information processing and individual perception of the world, self, and others (Grahek, Shenhav, Musslick, Krebs, & Koster, 2019). People diagnosed with depression report symptoms of increased difficulty withdrawing from negative stimuli, restraining irrelevant thoughts, and shifting attention between tasks. Each of these challenges creates increased difficulty in goal-oriented behavior and the ability to accomplish goals, as well as deficits in the ability to adapt to changing environments (Grahek et al., 2019).

Like ADHD, depression is a prevalent and highly heritable disorder. It is estimated that 10-15% of the general population will experience a depressive episode at some point in their lifetime (Lohoff, 2010). In contrast to ADHD, which is more commonly diagnosed

in boys, women are predicted to have a lifetime prevalence of depression of approximately 21%, while men are lower, at 13% (Cassano & Maurizio, 2002). Twin studies have identified a 40-50% heritability rate of depression and other family studies have found a two to three times greater chance of an individual developing the disorder if a parent or sibling also has it (Lohoff, 2010). Distress from health problems or biological abnormalities, and negative childhood experiences like social isolation or maltreatment have also been linked to depression (Danese et al., 2009).

Depression is most common in adults, however it is possible for children to be diagnosed, though there are notable differences in its prevalence within this population. Depression is the most frequently diagnosed mental health disorder in children and adolescents (Brown, Pearson, Braithwaite, Brown, & Biddle, 2012) with a rate of about 3.2% that can grow to as high as 6% by late adolescence (Centers for Disease Control and Prevention, 2019). Prior to puberty, there is little evidence to suggest gender differences, however the onset of puberty can mark a drastic increase in the risk of depression for girls, as much as double (Charles & Fazeli, 2017). Literature has suggested that the earlier the age of onset for depressive symptoms, the more likely they are to become increasingly severe with age (Charles & Fazeli, 2017). Childhood depression presents similarly in children as it does in adults, with changes in mood and thinking, as well as sleep or appetite changes, difficulty speaking positively about themselves, or increased temper tantrums (Charles & Fazeli, 2017).

Consequences of depressive episodes in adolescents and emerging adults are characterized by significant levels of subjective suffering, problems with social functioning, work or school difficulties, and greater levels of morbidity (Cassano &

Maurizio, 2002). Further consequences of a diagnosis are the increased chances of suffering from various physical health problems including coronary artery disease, angina, back problems, arthritis, diabetes, and hypertension (Cassano & Maurizio, 2002). Suicide is the biggest risk and consequence for people with depression. In the general population, the suicide rate is about 0.9%. However, due to the distress that affected individuals experience, the rate in this population significantly increases to 18%-21% (Cassano & Maurizio, 2002). According to a review done by a medical journal in 2017, depression accounts for 60% of suicides overall (Ng, How, & Ng, 2017).

Depression and ER.

ER ability is characterized by being able to consciously engage with and manipulate emotional responses (Gross 1998, 2002). In people with depression, the key difficulty comes with challenges in engaging, or even feeling, emotions or motivation to accomplish tasks (APA, 2013). People diagnosed with depression have difficulties with cognition and engaging in effective problem solving strategies, and increased research into the root of the deficits that come along with depression has found ER ability to be an important component; either in its overall function or in the execution of specific strategies. The following sections review three studies identifying connections between depression and ER difficulties.

Gonçalves et al. (2019) designed a longitudinal study examining ER deficits as a predictor of depressive symptoms in adolescents. Participants were 246 youths (aged 11-14) recruited from the community through fliers and mail. They attended four assessment sessions; initial, 6 months later, and once a year the following 2 years. At each session, participants completed two measures (Difficulties in Emotion Regulation Scale, Children's

Depression Inventory), and parents filled out a demographic questionnaire. Results indicated that increased difficulties with ER at time one was indicative of higher chances of the participant having depressive symptoms at initial testing and subsequent sessions (Gonçalves et al., 2019). At initial testing, ER difficulties were more strongly associated with increased depressive symptoms among girls. In subsequent analyses, results also indicated that girls' depressive symptoms increased over time while boys' symptoms decreased. In regards to the subsequent sessions, it was found that greater ER difficulty at initial testing was associated with greater depressive symptoms over time, indicating a linear effect in regards to the development of depressive symptoms. The longitudinal nature of this study is especially important when considering how depression develops. Symptoms of the disorder must be present for at least 2 weeks for a diagnosis to be made (APA, 2013), indicating that they are growing and developing for some time before reaching clinical levels. This study's finding that ER difficulties can aid in the progression of future depressive symptoms is important when looking at depression in the context of a person's life. It is also important in understanding foundational processes that lead someone to a diagnosis.

Just as with ADHD, some specific ER strategies are pertinent to depression specifically. Understanding of these challenges in a population of people with depression helps in further understanding of how ER plays a role and which specific aspects of it are laying the foundation for depressive symptoms. Aldao et al. (2010) performed a meta-analysis whose goal was to explore which ER strategies acted as risk or protective factors for psychopathology, specifically depression. They reviewed studies with data on depression between 1985 - 2008, along with keywords such as: acceptance, avoidance,

reappraisal, problem solving, rumination, suppression, emotion regulation, and depression. Results indicated that avoidance, suppression, and rumination were strategies positively associated with psychopathology (Aldao et al., 2010). In other words, increased use of these strategies led to higher chances of some form of psychopathology, indicating that these are maladaptive strategies. This was further supported in a correlation between increased use of these strategies and with higher chances of having depression, specifically. Conversely, problem solving and reappraisal were negatively associated with psychopathology. In other words, increased use of these ER strategies was associated with a decreased chance of having a disorder; they are adaptive strategies. These results indicate that effective or ineffective use of various ER strategies has the ability to affect depressive symptoms.

Joorman and Stanton (2016) conducted a review of the effects of ER on people with depression. They examined cognitive processes involved in ER that are characteristic of people with depression. Not unlike the results found in the analysis by Aldao et al. (2010), people with depression were found to use more maladaptive ER strategies, such as increased rumination (repetitive thinking about the meaning and impact of depressive symptoms) and decreased reappraisal (consciously assessing a stimuli in a different way), when responding to challenges. In other words, people with depression are more likely than those without it to have difficulties with the successful execution of various ER strategies. This study adds to prior literature that emphasizes the notion that ER is not only a foundational component of depressive symptoms, but also something that people with depressive symptoms continue to struggle with.

Like the connection between ER and ADHD symptoms, the relationship between ER deficits and depressive symptoms is a key component in the current thesis. The study hopes to expand on this literature to identify other ways that ER plays a role in depressive symptoms in emerging adults.

Comorbidity

ADHD and depression have been found to have a very high comorbidity rate which is associated with significantly more distress and dysfunction for those affected with both disorders (Biederman et al., 2008; Rohde, Clarke, Lewinsohn, Seeley, & Kaufman, 2001; Seymour et al., 2012). Researchers have begun to look at possible reasons for this high comorbidity to assess if certain symptomatology can predict later depressive symptoms in those with childhood ADHD. In this section, two studies, Meinzer et al. (2017) and Daviss (2008), that support the high comorbidity rates between these two disorders are reviewed. As ADHD is characterized as a childhood disorder, it is traditionally modeled as a precursor for later depressive symptoms. Following is a discussion of the associated impairment of a comorbid diagnosis and research that has investigated the possible reasons for this comorbidity.

Meinzer et al. (2017) designed a study to assess if a childhood history of ADHD predicts depression in emerging adulthood. Participants (N = 394) from the Pittsburgh ADHD Longitudinal Study were asked to complete the Centers for Epidemiological Studies Depression Scale, a self-report measure of depressive symptoms, four times between the ages of 18-25. Some of these participants had ADHD and some did not. Individuals with childhood ADHD had higher levels of depressive symptoms at each testing session than those participants without ADHD (Meinzer et al., 2017). This is vital

in considering the treatment of children with ADHD, as results such as these indicate that sustained impairment can lead to depression. Another important review was conducted by Daviss (2008), who determined that depression rates in youths with ADHD were 5.5 times higher than in those without it. Another study by Biederman et al. (2008) specifically noted effects on females with ADHD, who are five times more likely to meet criteria for depression than males. Finally, in their study identifying the connection between ADHD and various disorders, Elia et al. (2008) found comorbidity rates of 20.8% between ADHD predominantly inattentive subtype and depression, 19.4% in ADHD predominantly hyperactive impulsive subtype, and 22.7% in ADHD combination subtype (Elia, Ambrosini, & Berrettini, 2008). Prior research such as this makes clear the strong connection between ADHD and depression, both in diagnosis and in symptom presentation.

A comorbid diagnosis of ADHD and depression results in greater levels of impairment than either disorder alone. Individuals with both disorders require more intensive treatment, report higher stress levels, and have more psychosocial and relationship difficulties (Seymour et al., 2012). Males with this comorbidity are at an increased risk for bipolar disorder, psychosocial dysfunction, and psychiatric hospitalization (Biederman et al., 2008). Females with ADHD have been found to have earlier ages of depression onset, more severe episodes, and higher suicide rates than females with depression alone (Biederman et al., 2008). People with comorbid ADHD and depression are more likely to have recurrent depressive episodes than those with only depression (Rohde et al., 2001). A comorbid diagnosis of ADHD and depression also substantially increases healthcare costs compared to those with depression alone (Fishman,

Stang, & Hogue, 2007). Suicidality is a big risk factor in individuals with comorbid ADHD and depression. Previous research has identified that individuals with both disorders are three times more likely to successfully commit suicide than those with either disorder alone (James, Lai, & Dahl, 2004).

It is apparent that ADHD and depression are highly comorbid disorders that result in increased levels of distress and dysfunction. As such, researchers have begun to look into possible mediators of this relationship to explain the high rates and implications. Two studies have explored the relationship between ADHD and depression and possible reasons for their comorbidity (Ostrander & Herman, 2006; Powell et al., 2019). These studies aid in setting the foundation for the current study and are reviewed below.

The goal of the Powell et al. (2019) study was to assess if peer relationship and academic achievement mediated the relationship between ADHD and depression. Participants were 2161 individuals who were recruited from the Avon Longitudinal Study of Parents and Children, a study that followed development of children from birth via questionnaires and assessments. In the Powell et al. (2019) study, mothers completed an assessment of ADHD symptoms in their children, as well as a questionnaire that measured the strength of peer relationships. The focus participants completed a questionnaire to assess their depressive symptoms. Academic achievement was assessed by the students' results on end of year exams at age 16. Results of this study suggested that ADHD symptoms predicted the outcome of later depressive symptoms, adding to existing literature about these topics and indicating a longitudinal relationship between ADHD and depression (Powell et al., 2019). There was no significant relationship between ADHD symptoms and gender in assessing for depressive symptoms. Peer relationships were

assessed at age 16, and it was found that increased difficulties with peers and academic achievement mediated the relationship between ADHD and depressive symptoms. These results suggest that those individuals who experience greater levels of difficulty in school, whether with peers or with academics, become more vulnerable to psychopathology like depression.

Another notable study exploring the connection between the ADHD and depression comorbidity was done by Ostrander and Herman (2006), who explored whether behavior management and individual locus of control would mediate the relationship between ADHD and depressive symptoms. Participants of the study were 453 children, aged 6-11 years. Parents of the children completed a battery of measures. It was found that in older children (10 years or older) and middle children (8-9 years) locus of control and parent management mediated the relationship between ADHD and depression (Ostrander & Herman, 2006). However, in younger children (under 8 years), only parent management mediated the relationship between ADHD and depression. These results suggest that environmental conditions are important in the development of both ADHD and depression, and that chaotic or inconsistent family life could directly lead to depressive symptoms in children with ADHD.

Studies Relating ADHD, Depression, and ER

Prior to two studies done by Seymour et al. (2012; 2014), the relationship between ER, ADHD, and depression had not been explored in a single study. These authors noted the high rates of emotion dysregulation in both disorders and hypothesized that ER ability played a key role in mediating ADHD and depression in youths. The following section

contains an overview of both of these studies, as well as a discussion of their implications and connection to the current thesis study.

In the initial Seymour et al. (2012) study, the investigators hypothesized that ER was an important, underlying mechanism in the relationship between ADHD and depressive symptoms in youth. Participants were 69 youths, aged 10-14, who were recruited by sending mail to pediatricians, schools, and community centers. Participants had to meet full DSM-IV criteria for ADHD in order to be included in the ADHD group, and, conversely, could not have more than three symptoms to be included in the non-ADHD group. In order to assess symptoms initially, participants were screened over the phone, then brought in at which point parents completed a battery of measures to assess for ADHD and disruptive behavior symptoms, as well as demographic information. Youth completed the Difficulties in Emotion Regulation Scale. Results found positive correlations between ADHD and depressive symptoms, ADHD and ER difficulties, and depressive symptoms and ER difficulties. They also found that ER fully mediated the relationship between ADHD and depression, and that youth with ADHD had significantly higher levels of depressive symptoms and ER difficulties than youth without ADHD (Seymour et al., 2012). This study added to existing literature about youth with ADHD being more likely to have depressive symptoms, and was the first, to the researchers' knowledge, to identify ER ability as an underlying, mediating factor. This literature emphasizes the importance of ER in the development of both ADHD and depression, and provides helpful information when considering treatment for these comorbid disorders.

Following the initial study, Seymour et al. (2014) aimed to explore neurobiological relationships between ER, ADHD, and depression in a community sample. Participants in

this study were recruited through participation in a larger study. They were 277 children, aged 9-12, who were followed over three years. At three separate testing sessions, parents completed demographic questionnaires, as well as measures testing for ADHD symptoms and ER ability (Disruptive Behavior Disorders checklist and Emotion Regulation checklist) and children completed the Revised Child Anxiety and Depression Scales. The results of this study indicated a longitudinal relationship with these variables; the earlier the onset of ADHD symptoms, the higher the risk of ER deficits, which lead to higher levels of depression symptoms (Seymour et al., 2014). These results provide further support that ADHD and depression are mediated by ER in youth, and that it is an important mechanism in the symptomology and expression of both psychopathologies. The finding from the Seymour et al. (2012) study was important in setting up the foundation of this relationship, but this follow up study filled in a gap in the literature about how these comorbid disorders progress and which one comes before the other. While the results of this study were able to support hypotheses and offer an explanation, they also left another gap as to how this relationship would play out across different age groups.

Both of these studies represent important discoveries in better understanding the comorbid relationship between ADHD and depression. Due to the high levels of impairment that are associated with a comorbid diagnosis of ADHD and depression, it is becoming increasingly important for researchers to identify connections between the disorders in order to predict future outcomes for patients and better prepare effective treatments. The finding that ER plays a key role in the comorbid relationship is important in understanding which types of thought processes and emotional deficits should be targeted in order to effectively treat individuals with both disorders. It also is vital in

understanding the progression of these two disorders, and what could be a potential cause for their high levels of comorbidity. In an effort to learn more about how various forms of psychopathology develop, finding common, underlying functions, such as ER ability, are essential. These findings also suggest that the development of a comorbid disorder is not a random occurrence, but rather that there are driving factors to the progression of various forms of psychopathology. In this case, developing depression after being diagnosed with ADHD may not be random or due to entirely unrelated factors, but rather this common ability, or inability, to regulate emotion in people with ADHD leads to depressive symptoms. The current thesis hopes to expand on the work done by Seymour et al. (2012; 2014) to further aid in the understanding of this relationship. Specific goals of the current thesis and the proposed expansion will be discussed in the subsequent section.

Present Study

Prior evidence suggests strong relationships between difficulties with ER and ADHD symptoms, difficulties with ER and depressive symptoms, and ADHD and depression. However, most of the research done in these areas focus on samples of children and young adolescents, leaving a question as to whether or not the developmental changes between children/young adolescents and adults are powerful enough to change the relationship between ER, ADHD symptoms, and depressive symptoms. The current thesis, therefore, intends to expand on the literature exploring these connections in a population of emerging adults. Using a mediational model, the relationship among ER, ADHD symptoms, and depressive symptoms in a population of emerging adults will be investigated to see if the findings from Seymour et al, (2012, 2014) remain consistent.

Hypotheses

First, with respect to mean differences, females are expected to have significantly higher levels of depressive symptoms than males. This is based on past investigations that cite higher prevalence rates of depression in females (Cassano & Maurizio, 2002). Further, males are expected to have significantly higher levels of ADHD symptoms than females, based on prior research that has found higher rates of ADHD in males (Aguiar et al., 2010). Regarding ER, it is also expected that females will have significantly higher ER difficulties than males. This is based on prior research that cites girls having difficulties with ER (Nolen-Hoeksema & Aldao, 2011).

As tested via correlations, based on what is known about the role ER plays in both ADHD symptoms and depressive symptoms, it is expected that higher difficulties in ER will be associated with higher ADHD symptoms, and that higher difficulties in ER will be associated with higher depressive symptoms. Since it is established that ADHD and depression are highly comorbid disorders, we also hypothesize that ADHD symptoms and depressive symptoms will be positively correlated.

Finally, a mediation analysis will be used to test the relationship between ER ability, ADHD symptoms, and depressive symptoms. We predict that the changes in brain structure and ER ability across age may be enough to result in changes in mean level differences, but that the overall mediation will hold. Therefore, we hypothesize that the findings from Seymour et al. (2012, 2014) will be replicated, such that higher ADHD symptoms will indirectly lead to higher depressive symptoms through higher difficulties in ER. In other words, ER will mediate the relationship between ADHD and depressive symptoms in a population of emerging adults.

METHOD

Archival Dataset

This study utilized data collected in 2018 (IRB approval #2018-03-12) from the University of Maine. These data were collected as part of a larger project investigating self-regulation more generally, as well as problem-solving abilities and adjustment in emerging adulthood.

Participants

Participants were University of Maine undergraduate students (N = 401), aged 18-25 years (M = 18.70, SD = 0.99). They participated through the Psychology Department Sona system, a web-based program in which students can sign up for and complete psychological studies conducted at the university.

Participants in the study had the following distribution of gender: 65.8% female, 32.8% male, 1.1% female to male transgender, and 0.3% non-binary. Regarding racial composition, the sample was: 86.3% White, 5.5% multiple identities, 3.3% Black, 2.5% Asian, 1.6% Latino/a, 0.5% American Indian/Native American/Alaska Native, and 0.3% Middle Eastern.

Procedure

All participants were informed they would be answering questions about their regulation, problem-solving abilities, and psychological functioning. No identifying information was collected and participants were informed they would remain anonymous. All participants received one Sona credit for participating. Participants completed a battery of questionnaires via Qualtrics, a secure survey-based website used to facilitate data

collection. Completion of questionnaires took approximately 60 minutes; the questionnaires were presented in randomized order across participants. To begin the survey, participants responded to questions about basic demographic information (i.e., age, gender, race). The questionnaires completed in this study included the Difficulties in Emotion Regulation Scale (DERS), Center for Epidemiologic Studies Depression Scale-Revised (CESD-R), and the Adult ADHD Self-Report Scale (ASRS).

Measures

Difficulties in Emotion Regulation Scale (DERS)

Emotion regulation was measured using the Difficulties in Emotion Regulation Scale (DERS; Gratz, 2004), a 36-item self-report scale intended to assess emotion dysregulation. It asks participants how often emotion statements, such as "I have difficulty making sense out of my feelings," and "When I'm upset, I become out of control," apply to them. It is scored on a Likert scale, ranging from 1 (*almost never*) to 5 (*almost always*). The scale yields a total score of emotion dysregulation that is a sum of scores on six subscales: (1) lack of emotional awareness, (2) lack of emotional clarity, (3) impulse control difficulties, (4) difficulty in engaging in goal-directed behavior, (5) nonacceptance of emotional responses, and (6) limited access to strategies. Higher scores are an indication of increased difficulties with emotion regulation.

The DERS demonstrated acceptable psychometric properties in a prior study with undergraduates (Gratz & Roemer, 2004). Using a community sample of undergraduate psychology students (N=357) Gratz and Roemer found the DERS to have strong internal consistency ($\alpha = .93$) overall, as well as across the six subscales ($\alpha > .80$ for each). Results of test-retest reliability for the overall DERS score was found to be reliable ($p_1 = .88$, $p <$

.01). In regards to construct validity, significant correlations in the expected directions between overall DERS score and measures of constructs of interest (i.e., generalized expectancy for Negative Mood Regulation Scale, experiential avoidance, emotional expressivity) were found. To assess for predictive validity, the DERS was correlated with two types of behavioral outcomes associated with emotion dysregulation (frequency of self-harm and frequency of partner abuse). Correlations between the DERS overall score and each of these outcomes were significant and in the expected directions. This study supports that the DERS has high internal consistency, strong construct and predictive validity, and good test-retest reliability. Internal consistency in the current study was α = .95.

Adult ADHD Self-Report Scale (ASRS)

ADHD symptoms were measured using the Adult ADHD Self-Report Scale (ASRS; Kessler et al., 2005), an 18-item self-report scale that is designed to assess symptoms of ADHD in adults (18 years or older). Participants respond on a 5-item Likert Scale ranging from 0 (*never*) to 4 (*very often*). Example questions include: "How often do you fidget or squirm with your hands or feet when you have to sit down for a long time?" and "How often do you interrupt others when they are busy?" A total summed score is used to assess for ADHD symptoms, with higher scores indicating a higher frequency of symptoms.

The ASRS was found to have acceptable psychometric properties in a clinical sample of college students (Gray, Woltering, Mawjee, & Tannock, 2014). First, researchers compared scores between self-report and reports from significant others of ADHD symptoms. This correlation was found to be significant (r = .46, p < .001), indicating that

reporting of ADHD symptoms was relatively the same between self-report and report from a significant other. These results indicate that adults are able to accurately self-report on their ADHD symptoms. To assess the ASRS against other measures of cognition and executive functioning, it was compared to the Barkley Deficits in Executive Functioning Scale-Short Form (BDEFS EF), a measure of everyday executive functioning, and the Cognitive Failures Questionnaire (CFQ), a measure of everyday failures in cognitive functioning. It was found that the ASRS overall score was positively correlated with both the BDEFS EF ($r = .62$, $p < .001$) and the CFQ ($r = .74$, $p < .001$). These findings indicate that the ASRS is effective in assessing for functional impairment and aspects of ADHD symptoms. Internal consistency for the current study was $\alpha = .89$.

Center for Epidemiologic Studies Depression Scale - Revised (CESD-R)

Depressive symptoms were measured with the Center for Epidemiologic Studies Depression Scale - Revised (CESD-R; Eaton, Smith, Ybarra, Muntaner, & Tien, 2004), a 20-item self-report measure that assesses how often a participant experienced different feelings in the past two weeks. There are five response options: *not at all or less than 1 day, 1-2 days, 3-4 days, 5-7 days, and nearly every day for 2 weeks*. Sample questions include: "I did not feel like eating; my appetite was poor" and "I felt hopeful about the future." The total score of the CESD-R is a sum of responses to the 20 items. A score of 16 or higher indicates that the individual is at risk for depression.

The CESD-R was found to have acceptable psychometric properties in a study with undergraduates, as well as theoretically consistent correlations between measures of positive affect and negative affect ($N = 245$; Van Dam & Earleywine, 2011). Specifically, CESD-R negatively correlated with the Positive and Negative Affect Schedule-Positive

Affect (PANAS-PA), a measure of positive affect (r = -.26, p < .01), and the Positive and Negative Affect Schedule-Negative Affect (PANAS-NA), a measure of negative affect (r = .58, p < .01). In regards to divergent validity, the CESD-R was evaluated with the State-Trait Inventory for Cognitive and Somatic Anxiety (STICSA), a measure of anxiety, and the Schizotypal Personality Questionnaire-Brief, (SPQ-B), a schizotypal personality questionnaire. It was found that the CESD-R was positively correlated with the STICSA (r = 0.65, p < 0.01) and SPQ-B (r = .44, p < 0.01). These correlations suggest that the CESD-R has strong psychometric properties and is useful in evaluating depression. Internal consistency for the current study was α = .95.

RESULTS

Assumptions

Standard assumptions for independent *t* tests, Pearson correlations, and mediational analysis were considered met prior to conducting analyses. The data were checked for univariate outliers; scores were considered outliers at three standard deviations above or below the mean (Tabachnick & Fidell, 2013). Among the three variables, only one participant score was found to be an outlier and it was winsorized. Histograms for each variable were examined; all distributions were considered to be normally distributed. To further assess skewness and kurtosis, descriptive statistics were run for each variable. After adding/subtracting two times the standard error of the statistic, it was found that none of the variables were skewed or kurtotic on either end. Scatterplots between all variable combinations were examined; all relationships were found to be linear in nature. Regarding collinearity, correlations between variables that exceeded .90 were considered too highly correlated; none of the variables, however, exceeded this .90 cutoff (*r*'s ranged from .47 - .65, $p < .001$; Tabachnick & Fidell 2013). Six participant scores were considered multivariate outliers (identified as scores above (2k+2)/n [.16 for the current sample] for regression leverage and +/- 2 studentized deleted residual) and were removed from the mediational analysis. Only participants who responded to all items on the measures were included in the analyses.

Descriptive Statistics

The final sample ($N = 361$) had participants aged 18-24 ($M = 18.70$, $SD = 0.99$). Descriptive statistics are presented in *Table 1*.

According to the criteria suggested by the developers of the ASRS (Kessler et al., 2005), continuous ADHD symptoms were separated into categories of diagnostic likelihood. As per these criteria, individuals who scored 0 to 16 were considered unlikely for a diagnosis of ADHD, 17 to 23 likely for a diagnosis, and greater than 24 highly likely for a diagnosis. In the current sample, 35.8% were found to be unlikely to have a diagnosis, 45.1% were found to be likely to have a diagnosis, and 19.1% were found to be highly likely to have a diagnosis (Table 2). According to the criteria suggested by the developers of the CESD-R (Eaton et al., 2004), continuous depressive symptoms were separated into categories of diagnostic likelihood. As per these criteria, individuals who scored less than 16 were considered unlikely for a diagnosis of depression and greater than 16 considered at risk for depression. In the current sample, 59.6% were found to have no clinical significance and 40.4% were found to be at risk for depression (Table 3). In the present thesis, these categories were used only for descriptive purposes. All analyses were run using the full range of continuous symptoms.

Table 1

Descriptive Statistics

	Possible Minimum	Possible Maximum	Observed Mean	Standard Deviation
Emotion Regulation (DERS)	0	180	85.35	25.37
ADHD Symptoms (ASRS)	0	72	31.98	11.33
Depressive Symptoms (CESD-R)	0	80	17.09	15.83

Table 2

Likelihood of ADHD Diagnosis

	Score on Measure	Percentage of Participants
Diagnosis Unlikely	0-16	35.8%
Diagnosis Likely	17-23	45.1%
Diagnosis Highly Likely	>24	19.1%

Note: Cutoffs of these scores are based on criteria given by the developers of the ASRS (Kessler et al., 2005).

Table 3

Likelihood of Depression Diagnosis

	Score on Measure	Percentage of Participants
No Clinical Significance	<16	59.6%
At Risk	>16	40.4%

Note: Cutoffs of these scores are based on criteria given by the developers of the CESD-R (Eaton et al., 2004).

Independent *t* tests

Mean-level differences between genders were assessed using independent *t* tests. Females (M = 86.95, SD = 25.51) reported significantly higher ER difficulties than males (M = 80.73, SD = 23.29), $t(359) = -2.25$, $p = 0.03$. No significant difference in ADHD symptoms was found between males (M = 31.08, SD = 11.59) and females (M = 32.15, SD

= 11.03), $t(359) = -0.85$, $p = 0.40$. Females ($M = 17.97$, $SD = 15.85$) reported significantly higher depressive symptoms than males ($M = 14.22$, $SD = 13.99$), $t(359) = -2.25$, $p = 0.03$.

Pearson Correlations

Correlations between ER, ADHD symptoms, and depressive symptoms were run to assess bivariate relationships. All correlations were significant and in the expected directions (Table 4). Higher emotion regulation difficulties were associated with higher ADHD symptoms ($r = .47$, $p < .001$). Higher emotion regulation difficulties were associated with higher depressive symptoms ($r = .65$, $p < .001$). Higher ADHD symptoms were associated with higher depressive symptoms ($r = .49$, $p < .001$).

Table 4

Correlations

	ER	ASRS	CESD-R
Emotion Regulation	-		
ADHD Symptoms	.47*	-	
Depressive Symptoms	.65*	.49*	-

Note: * indicates significance at the 0.001 level.

Mediational Analysis

A mediational model can be considered in three distinct pathways (Path A, Path B, and Path C), as well as in a final, overall pathway. This type of model explains a

relationship in which an "Influence" variable has an indirect effect on an "Outcome" variable through a third, "Mediator" variable (Figure 1). This model implies a causal relationship, in which the "Influence" causes the "Outcome" through the "Mediator." In the current model, ADHD symptoms are the "Influence," depressive symptoms are the "Outcome," and ER ability is "Mediator" (Figure 2).

A mediational analysis was run using the PROCESS package of SPSS Statistics software v26 (Field, 2014). ADHD symptoms explained approximately 22% of the variance in difficulties in ER, R^2 = .22, b = 1.05, p < 0.001 (Path A; Figure 1). Without considering difficulties in ER, ADHD symptoms significantly predicted depressive symptoms, explaining 22% of the variance, R^2 = .22, b = 0.64, p < 0.001 (Path C; Figure 1). When all variables were considered together, the model explained 44% of the variance in depressive symptoms, R^2 = .44, p < 0.001. ADHD symptoms significantly predicted depressive symptoms in the model, b = .30, p < 0.001 (Path C'; Figure 1). Difficulties in ER also significantly predicted depressive symptoms in the model, b = .33, p < .001 (Path B; Figure 1). There was a significant indirect effect of ADHD symptoms on depressive symptoms through ER, b = .35, 95% BCa CI [0.24, 0.46]. This indirect effect accounted for 25% of the variance, b = .25, 95% BCa CI [0.19, 0.33]. Therefore, ADHD symptoms had an indirect effect on depressive symptoms through ER. This finding supports the main study hypothesis that the findings from Seymour et al. (2012; 2014) would be replicated in a population of emerging adults; ER mediated the relationship between ADHD and depressive symptoms.

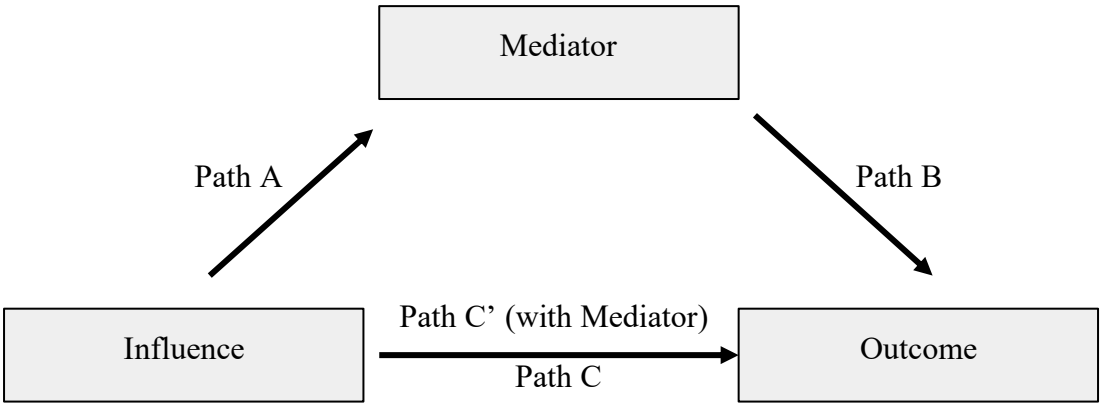

Figure 1: Mediation Model (Keith, 2014, p.180)

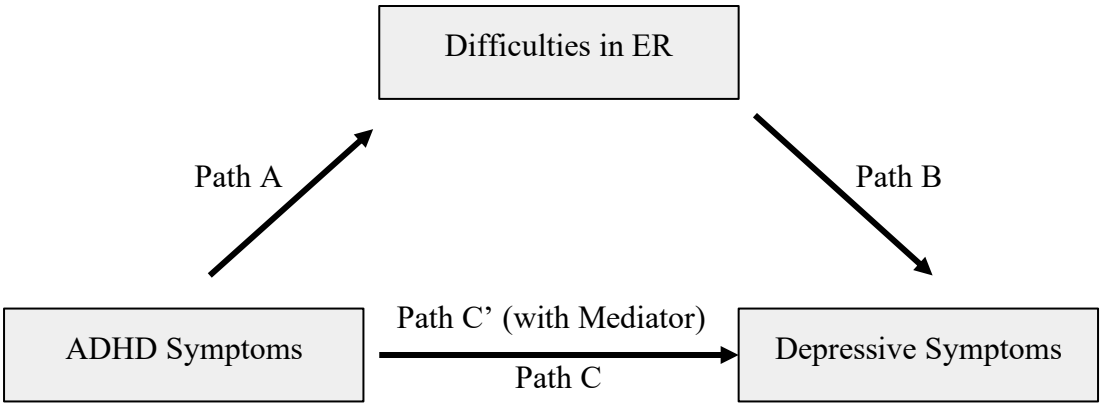

Figure 2: Current Mediation

DISCUSSION

The purpose of the current thesis was to explore and analyze the relationship among ER, ADHD symptoms, and depressive symptoms. There is a plethora of prior research that has supported strong connections between these variables separately. Specifically, ER and ADHD symptoms have been found to be strongly correlated, such that higher ER difficulties are associated with higher ADHD symptoms (Bunford et al., 2018; Graziano & Garcia, 2016; Özbaran et al., 2018). ER and depressive symptoms have also been found to be strongly correlated, such that higher ER difficulties are associated with higher depressive symptoms (Aldao et al., 2010; Gonçalves et al., 2019; Joorman and Stanton, 2016). Finally, there are well-established high comorbidity rates between ADHD and depression (Meinzer et al., 2017; Ostrander & Herman, 2006; Powell et al., 2019). Identified connections between these variables led to an important, previous study by Seymour and colleagues that found that ER fully mediated the relationship between ADHD and depressive symptoms in a sample of youth, both concurrently in a clinical population (Seymour et al., 2012) and longitudinally in a community sample (Seymour et al., 2014). Both of these studies supported past research in regards to the individual connections between these variables, as well as had strong implications in the continued understanding of how the comorbid relationship between ADHD and depression develops.

The current thesis attempted to replicate the findings from the Seymour et al. (2012; 2014) studies in a sample of emerging adults, thereby supporting and expanding past literature that has investigated the relationships between ER, ADHD symptoms, and depressive symptoms. Results indicated the following significant mean level differences: females reported significantly higher ER difficulties than males and females reported

significantly higher depressive symptoms than males. Unexpectedly, there were no significant differences in ADHD symptom levels between females and males. All correlations were significant and in the expected directions; higher ER difficulties were associated with higher ADHD symptoms and with higher depressive symptoms, and higher ADHD symptoms were associated with higher depressive symptoms. In regards to the replication of the Seymour et al. (2012; 2014) studies, it was found that ER mediated the relationship between ADHD and depressive symptoms in a sample of emerging adults. In other words, there was a significant indirect effect of ADHD symptoms on depressive symptoms through ER.

With regard to gender, females reported significantly higher ER difficulties than males. A small amount of prior research has found that females report higher ER difficulties than males, for example Nolen-Hoeksema and Aldao (2011). They analyzed gender differences in maladaptive ER strategies, and found that females were more likely to use maladaptive strategies than males. However, literature review seemed to indicate inconsistent research as to the gender differences in ER ability. The finding from Nolen-Hoeksema and Aldao (2011), in combination with the overall lack of observed gender differences in regards to ER ability, led to the hypothesis that females would have higher ER difficulties than males. It was also hypothesized that females would report significantly higher depressive symptoms than males, as it is well established through prior literature that depression is more commonly diagnosed in females (Cassano & Maurizio, 2002). Unexpectedly, however, there was no significant difference in ADHD symptoms between males and females. This was not in line with prior research that supports ADHD being more common in males (Aguiar et al., 2010). This was a self-report study, meaning that

subjective distress from the presence of any ADHD symptoms could be influenced by alternative factors. For example, an individual undergoing stress may feel as though they are experiencing increased difficulties focusing, or an individual diagnosed with the disorder may have forgotten to take his/her medication, therefore making symptoms more pronounced. These subjectivities in reporting could have contributed to a lack of significant differences. Though this was a sample with a fair distribution of ADHD symptoms and diagnoses likelihoods, the fact that it was self-report implies that there is no way to be sure of accurate reporting on symptoms. A second possible reason for the lack of significant difference between males and females could have been the distribution of the study in regards to the participant proportion of males and females. As established, there was not an evenly distribution of males and females in this project, and while it was not drastic enough to create skewed or kurtotic data, it could have been enough to limit a lack of significant difference in regards to ADHD symptoms. This could be controlled better with a more even distribution of participants during study recruitment. Finally, a possible reason this could have occurred is because of the age of the sample. Prior research suggests that, as individuals age, the ratio of ADHD symptoms between males and females decreases ("Gender in ADHD epidemiology", n.d.). This indicates that, as sample age increases, a greater symptom power would be needed in order to create significant gender differences. As this was a community sample, the threshold level of symptoms was likely not high enough to create the expected gender differences.

ER proved to be a process that is associated with both ADHD and depressive symptoms levels. All analyzed correlations were found to be significant and in the expected directions. First, results indicated that ER and ADHD symptoms were positively correlated;

higher ER difficulties were associated with increased ADHD symptoms. Prior research supports a connection between ER and ADHD symptoms, for example Özbaran et al. (2018) found that youth and adolescents with ADHD had more overall difficulties with ER than people without it, specifically with accepting negative emotions, with emotional clarity, effective ER strategies, goal-directed behavior, and impulse control. Given many characteristics of ADHD, such as difficulty focusing, organizing, or completing tasks (Biederman, 2004), it is unsurprising that ER, which involves focusing on the regulation of emotional responses to accomplish goals (Dolan, 2002; Gross, 2002; Thompson, 1994) would also be a challenge for people with the disorder. Furthermore, impulsivity is a component of what is measured when assessing overall ER ability (Gratz, 2004), as well as is a part of the symptomatology of ADHD (APA, 2013). ADHD causes distress and dysfunction in a variety of settings, such as at school or in social situations (APA, 2013), and this finding in conjunction with previous literature could suggest that difficulties extend to the realm of emotional functioning. It would be understandable that emotional challenges would accompany the existing behavioral and cognitive ones, and that these emotional challenges would exacerbate ADHD symptoms. For example, if an individual with ADHD has problems with impulsive behavior and speaking, it is possible that this same child could have problems with impulsive emotional reactions. Just as he/she would have challenges controlling behavioral responses, there could be challenges controlling emotional ones. This correlational finding supports existing literature about the connection between ER and ADHD symptoms, and aids in the development of the overall mediational model.

The connection between ER and depressive symptoms has also been well established, for example with Gonçalves et al. (2019) who found that higher difficulties with ER at initial testing led to a higher likelihood of depressive symptoms at subsequent sessions. Considering the challenges associated with increased difficulties in ER, these findings are not surprising. Poor ER leads to challenges in academic and social functioning (Özbaran et al., 2018), as well as in difficulties accomplishing goals (Gross, 1998). Over time, this repeated occurrence of not being able to fully or successfully finish tasks in one's personal, academic, or social life could lead an individual to feeling bad about his/herself, having a negative world view, or feeling like there is no point in trying. This lack of motivation, interest, and excitement is also characteristic of depression (APA, 2013). Furthermore, as depression is typically diagnosed in adults (Cassano & Maurizio, 2002; Lohoff, 2010) these challenges associated with ER deficits would likely occur across a lifetime, therefore allowing the opportunity for eventual depressive symptoms.

The connection between ER and depressive symptoms can also be thought of in the context of depressive symptoms. Overwhelmingly, this disorder is characterized by feelings of depressed mood, lack of interest, and lack of pleasure (APA, 2013). People with depression also report having difficulty withdrawing from negative stimuli and restraining irrelevant thoughts (Grahek et al., 2019), both of which are components involved in ER as well (Özbaran, Kalyoncu, & Koöse, 2018; Thompson, 1994; Gross, 1998). These similar areas of difficulty indicate that ER difficulty in and of itself could be considered a depressive symptom, and adds further theoretical support to their high association rate found in the current thesis. The relationship between ADHD symptoms and depressive symptoms was additionally analyzed. Previous literature has identified high comorbidity

rates between these disorders. Meinzer et al. (2017) found that individuals with ADHD had higher levels of depressive symptoms at continuous, subsequent testing sessions. Daviss (2008) identified that depression rates are 5.5 times higher in youth with ADHD than in youth without ADHD. Elia et al. (2008) found rates between the three subtypes of ADHD and depression ranging from 19.4%-22.7%.

It was hypothesized that, in line with previous literature, ADHD symptoms and depressive symptoms would be positively correlated; higher ADHD symptoms would lead to higher depressive symptoms. Results supported this hypothesis. Consequences of an ADHD diagnosis can lead to outcomes like impairment in academic and social functioning, delinquency (Biederman, 2004), a comorbid diagnosis with a number of other disorders (Aguiar et al., 2010; Weis, 2018), and high levels of subjective distress (Biederman, 2004). It is understandable, then, that a child or adolescent experiencing high levels of distress and dysfunction associated with his/her ADHD symptoms would then begin to experience the feelings of failure and lack of motivation to try to do better that are also present in depression symptomatology. These findings add to extensive previous literature that supports high rates of comorbidity between ADHD and depression.

Mediating Relationship

The main goal of this thesis was to replicate findings from two studies done by Seymour et al. (2012; 2014) that found that ER fully mediated the relationship between ADHD and depressive symptoms in youth, both concurrently and longitudinally. This finding was important in further understanding of the comorbid relationship between ADHD and depression, as well as in suggesting that development of a comorbid relationship is not necessarily a random occurrence, but can be as a result of difficulties in

another factor, in this case ER. These findings were novel and influential, however they left a gap in literature as to whether this relationship would hold across development. As such, the current study hoped to expand on this literature by examining this potential mediating relationship concurrently in a sample of emerging adults.

There are a number of developmental differences between youth and emerging adults that should be considered. McRae et al. (2012) explored the relationship between ER and age, and found an overall linear relationship, suggesting that, in general, ER ability improves with age. This study also found results to suggest that, despite this overall linearity, older children and young adults process emotional stimuli differently. These findings suggest that there is some improvement of ER ability as individuals age, but what is more prevalent is a difference in the types or number of ER strategies that are employed within different age groups. There did not seem to be substantial previous evidence suggesting strong improvements of ER ability as individuals age, and it was therefore hypothesized that the developmental differences between youth and emerging adults in regards to ER ability would not be enough to change the overall mediational model found in Seymour et al. (2012; 2014).

Results of the current thesis supported this hypothesis, and found that ER mediated the relationship between ADHD symptoms and depressive symptoms in emerging adults. That is to say, ADHD symptoms caused an indirect effect on depressive symptoms through ER. These findings may not be surprising, given the strong correlations between the variables individually, however the key point to a mediation model is that the indirect effect between the "Influence" variable and the "Outcome" variable is present in conjunction with the "Mediation" variable (Keith, 2014). The relationship only holds true through the

presence of this third mediation variable, in this case ER. This relationship implies causation (Keith, 2014), suggesting that it can create justified answers to questions about the comorbid relationship between ADHD and depression, as well as a linear explanation to how such a relationship develops.

There could be a number of possible explanations for this relationship. Perhaps the development of ADHD symptoms impacts the emotional growth of the individual. Symptomatology of this disorder lends itself to ER difficulties, for example with impulsivity, which is a symptom of ADHD and a component of ER ability (APA, 2013; Gratz, 2004). Just as people with ADHD have a hard time with calming their hyperactivity or impulsivity in goal-achievement (Biederman, 2004), so do people with ineffective ER have difficulty controlling emotional responses to accomplish their goals (Gross, 1998). Overtime, subjective difficulties with restlessness, impulsivity, and the detriments of ineffective emotional control could take their toll on an individual and lead to feelings of helplessness. Furthermore, the combination of dysfunction from ADHD symptoms, as well as the distress from poor ER would affect the day to day functioning of the individual (Özbaran et al., 2018). Conflicts of any sort, whether environmental (e.g., dealing with frustration such as running late during a traffic jam), social (e.g., getting in an argument with a close friend), or internal (e.g., being unsure as to a decision about which job offer to accept), would likely be intensely difficult for an individual with ADHD symptoms and poor ER. These sorts of conflicts can arise frequently and unexpectedly, and the challenge of working through them while handling ADHD symptoms and ER in general perhaps becomes too distressing. After a lifetime of struggling with behavioral and emotional responses to stimuli, an individual could feel as though there is no point in trying; no matter

his/her efforts, tasks and goals take too great of difficulty to be achieved or are not achieved at all. This could bring about depressive symptoms through continued experiences of being unable to efficiently or successfully accomplish goals. Functionally, the individual would now need to handle the consequences of ADHD symptoms, ER difficulties, and depressive symptoms. This would only increase the distress of day to day functioning, as well as the difficulty of accomplishing tasks that make an individual feel worthwhile. Depressive symptoms and the difficulty with goal achievement that accompany them would further exacerbate these overall subjective distress and dysfunction of the individual (Biederman, 2004; Cassano & Maurizio, 2002; Özbaran et al., 2018; Seymour et al., 2012), causing this cycle to continue.

This cycle of ADHD symptoms exacerbating ER difficulties and leading to depressive symptoms could be categorized as somewhat inherent. The mediational model holds true in a population of emerging adults, indicating that despite age and developmental differences, the relationship between these variables is significant enough to remain consistent across time. Perhaps this is due to poor ER. This in combination with ADHD symptoms could create overwhelming distress for individuals and lead to depressive symptoms. It is also possible that this relationship rests on the foundation of ADHD. ADHD symptoms may bring about poor ER through the struggles with hyperactivity and impulsivity. If these symptoms are too strong and too distressing for an individual to overcome, it can be hypothesized that the consequences of high ADHD symptoms and poor ER would only get worse as he/she ages and more responsibility is expected. As the individual feels more internal distress from the symptoms and external distress from others who are affected by the symptoms, depressive symptoms can arise. Perhaps this mediation

rests on ER. It could be perceived as odd that ADHD, a disorder that is characterized by excessive movement or talking, difficulty staying still or focusing, and overall hyperactivity, would bring about depression, a disorder characterized by anhedonia and lack of interest. There would need to be some process that can overcome initial ADHD hyperactivity to bring about depressive anhedonia. The mediation model may suggest that poor ER skills, in combination with ADHD symptoms, are powerful enough to transform those initial symptoms and bring about an entirely new disorder and symptom presentation. Or perhaps this is not the case. Maybe ER is not enough to overcome the ADHD symptoms, and rather individuals that fall into this model are tasked with the handling of the diverse ADHD and depressive symptoms at the same time. Such a presentation could certainly be confusing for the individual, as well as those close to him/her. Regardless of the possible explanations for such a relationship, it is key that it remains consistent across ages. This speaks to its importance and foundation in the comorbid and complicated relationship of ADHD and depressive symptoms. The results of this study are important in expanding on literature pertaining to the mediational relationship between these variables, the comorbid relationship between ADHD symptoms and depressive symptoms, as well as the individual correlations between the variables, as discussed previously. They have strong implications as to the foundational and essential nature of ER across psychopathology, but specifically in regards to ADHD and depression. Furthermore, as this was a replication study, they provide increased validity to the findings from Seymour et al. (2012; 2014), while expanding literature by looking at a different population. Finally, they are important when considered in the context of this non-clinical sample, suggesting that even the subjective presence of symptoms of these disorders is enough to create this strong, causal relationship.

Limitations

While these results offer support for the findings of previous studies and a new look at the relationship between ER, ADHD symptoms, and depressive symptoms, they should still be considered with an understanding of certain limitations.

One limitation of the current study was the overall lack of diversity. Specifically the unequal distribution between males and females, and among races. This study was predominantly White (86.3%) and female (65.8%). These differences were not, however, enough to create skewed or kurtotic data, they fell under a normal curve, and they are representative of the area from which participants were drawn from. This study took place in Maine, a predominantly white and female state, with a demographic distribution of 51% female to 49% male and 94.48% White to 5.52% non-White (Maine Population 2020). It is therefore not surprising that the population of the current thesis follows a similar distribution. While this study may have been stronger with a more equal distribution of gender and races, the fact that it is representative of the area from which it took place still indicates its legitimacy. Furthermore, since the initial data were not skewed or kurtotic, these findings are still relevant to the population of emerging adults overall. A more diverse population would allow the suggestion of increased generalizability of the findings and allow further assumptions to be made as to how they would hold across a combination of gender, race, and age.

Another limitation was that this was not a clinical sample. However, results found a high distribution of both ADHD and depressive symptoms. The measures completed by participants assessed for clinical risk of both disorders. In ADHD, 45.1% were found to be likely to have a diagnosis and 19.1% were found to be highly likely to have a diagnosis. In

depression, 40.4% were found to be at risk. Participants were University of Maine undergraduates who willingly participated through the online SONA system. Therefore, there was the possibility of not having an "at-risk" sample to conduct analyses. However, the distribution of participants who were considered either "likely" or "highly likely" to be "at-risk" for a diagnosis of ADHD or depression was substantial (Eaton et al., 2004; Kessler et al., 2005). Therefore, while this study was not a clinical sample, it was not entirely a convenience sample either. Though this study only analyzed symptoms of both ADHD and depression, the distribution of participants considered "at-risk" aid in support of the legitimacy of the findings by recognizing that there was still a prevalent amount and array of symptoms for both disorders. If this were a clinical sample, it would be able to be concluded that diagnosed ADHD indirectly affects diagnosed depression through ER, suggesting strong implications in fields of treatment and functioning of individuals already diagnosed. However, in the current sample, this indirect relationship can only be analyzed in the context that symptoms of these disorders are related through ER. Nonetheless, even in those individuals that do not meet diagnostic criteria but experience some level of distress or dysfunction related to ADHD or depression, ER appears to be a powerful component of healthy, overall functioning.

Also in regards to study design, this project utilized self-report measures. While these measures have been reviewed and found to have strong reliability and validity (Gratz & Roemer, 2004; Gray et al., 2014; Van Dam & Earleywine, 2011), self-report measures open up the possibility of bias. For one thing, a participant may not be able to accurately report on their symptoms or ER ability. Perhaps he/she misunderstands the question, inaccurately recalls the frequency of symptoms or true ER ability, believes his/her

symptoms to be more frequent than reality and responds in such a way, or is experiencing stress on the day of participation that causes the reporting of measures to change. It is also possible that an individual would be inaccurately reporting symptoms on purpose, therefore affecting data as well as the conclusions that are able to be drawn from this population. The current thesis may have found connections based more on the fact that all self-report measures were used, rather than because of the relationships themselves. A clinical sample would have been able to analyze the relationships between true symptoms of either disorder, as opposed to the assessment of possible symptoms by the individual. A more stringent assessment process, including structured interviews and multiple reporters might have reduced such biases. Despite these possible areas of bias, thesis design ensured the use of measures that have been found to be accurate, self-report measures.

This study used measures designed to assess for the frequency, not severity of ADHD symptoms and depressive symptoms (Eaton et al., 2004; Kessler et al., 2005). It is possible that using a rating scale to assess for symptom severity as well could further strengthen this relationship, or find a different relationship in mild versus severe cases. However, as discussed earlier, this study was sure to use legitimate and accurate measures of reporting to assess the mediational model, and still found a strong relationship, despite not being able to assess for symptom severity.

Finally, this study could also be strengthened with the use of a longitudinal design, which can help to prevent biases that may occur in cross-sectional designs (Maxwell & Cole, 2007). It was found in Seymour et al. (2014) that this mediating relationship holds up longitudinally. Furthermore, due to what has been established about the general time frame of symptoms for ADHD and depression (ADHD is typically in children, depression

is typically in adults), it would make theoretical sense to analyze this relationship longitudinally, to follow this general time frame. Such a design would also help to strengthen the results, in that they would have been able to make assumptions as to the longitudinal relationship between these variables in a population of emerging adults. However, time restrictions of the current project prevented a longitudinal design, and the results were still found to be significant and indicate support of prior research from Seymour et al. (2012; 2014). Results support the mediational relationship of these variables, despite an inability to make claims about it across time.

Future Directions

The important findings from this study open opportunities for multiple new areas of research, specifically with diversifying the demographics of the participants, looking at this relationship in a variety of different populations, and narrowing in on specific aspects of the mediation to explore their longitudinal nature.

First, a future study would be strengthened by utilizing a more diverse population and subsequently analyzing the relationship among ER, ADHD symptoms, and depressive symptoms across gender or race. In other words, it would be important to analyze how this relationship differs specifically between males and females or between races. This area of future research would be especially interesting in terms of the relationship found between ADHD symptoms in males and females, as this thesis found an unexpected lack of significant difference here. It is possible that the small number of males in the current thesis contributed to this, and therefore a study utilizing a more equal distribution could find different results in line with previous literature. It could also be explained by the nature of ADHD symptoms, that often become less overt or easier to manage across age. As this was

a population of emerging adults and a community sample, there could have been fewer significant differences because there were simply fewer or less severe ADHD symptoms. Future research could explore this relationship further in an effort to uncover alternative explanations for this finding. In regards to exploring this relationship across races, it would also be interesting for future research to analyze the relationship between ER, ADHD symptoms, and depressive symptoms across races, to examine how racial or socioeconomic differences play a role in ER ability.

This study replicated overall findings from Seymour et al. (2012; 2014), which utilized a youth population. A future replication study based from the current project offers many options. First, there were strong implications as to the legitimacy of the mediating relationship ER has on ADHD symptoms and depressive symptoms, however the current thesis was unable to use a longitudinal design. As ADHD and depression symptoms typically occur in different age cohorts, and therefore clinical diagnosis typically occurs at different times as well, it would be beneficial to explore the mediation in emerging adults longitudinally. Doing so would add further justification to the theoretical linear relationship between these variables, as well as to support and add to results from Seymour et al. (2014). Future studies could also work to replicate these findings again in a population of mature adults or in old age to create a picture of how these variables interact across a lifetime. Such research would additionally aid in further understanding of ADHD symptoms in adults, as well as the development of depressive symptoms. Finally in regards to replication, future work could look at these variables clinically, to analyze differences in the variables of interest between community and clinical samples. A study done clinically would assist in exploring whether the biases of self-report alter results as well.

The mediational model suggests a linear relationship, in that the presence of ADHD symptoms, in conjunction with inefficient ER abilities, causes depressive symptoms. Analyzing this relationship in this linear fashion creates questions as to how these variables could be moved around or manipulated. In other words, do ADHD symptoms have to come first? What if someone is born with poor ER skills which leads to these forms of psychopathology? What if a child is given a very early diagnosis of depression and that brings about poor ER and subsequently ADHD as well? In light of these questions, it would be interesting for future research to break down the components of the mediation model and explore in what ways it can be manipulated. For instance, it would be important to explore if individuals are born with or in an environment that results in poor ER that brings about ADHD symptoms. Conversely, future research could try to determine if the symptoms of ADHD bring about poor ER. Alternatively, research could look at the other side of the mediation. Does a lifetime of inefficient ER lead to depressive symptoms, or do the presence of initial depressive symptoms cause ER to become worse? How can these three variables be interchanged and what new relationships may they form? Furthermore, ER was found to play a key role in the comorbidity between ADHD and depressive symptoms, but what other symptoms of psychopathology may it play a role in? Future research could explore other comorbidities using ER as a mediator to examine its role in psychopathology as a whole.

Finally, it would be justified to look more closely at the relationship between ER and gender. As discussed previously, it was hypothesized that females would have higher ER difficulties than males due to the prevalence rates of depression in the population of interest. In forming this hypothesis, a lack of research specifically focusing on ER and

gender was noticed, suggesting that there may not be significant differences in ER ability, overall, across gender. However, future research could search for more definite answers to this question, and analyze ER within genders in either community or clinical populations, as well as in various age groups. Such research would help to justify results found in the current project, that females reported significantly higher ER difficulties than males.

Conclusions

To our knowledge, this is the first study that analyzes the relationship among ER, ADHD symptoms, and depressive symptoms in a sample of emerging adults. Results from this study support previously discussed prior literature about the relationships, individually and in conjunction, among ER, ADHD symptoms, and depressive symptoms. The results from this thesis also expand on prior knowledge about the mediating relationship ER has on ADHD symptoms and depressive symptoms by looking at it in this previously unexplored population of emerging adults. There are many implications of this finding, that will be subsequently discussed.

Results found that the relationship among ER, ADHD symptoms, and depressive symptoms maintained the hypothesized mediational model, despite developmental differences between youth and emerging adults. This suggests that, despite an individual's inherent ER ability based on age, efficient regulation of emotion is essential enough to the foundation of comorbidity between ADHD symptoms and depressive symptoms that age is not a factor. In other words, no matter how old a person is, poor ER skills are a detrimental occurrence that result in continued expression of psychopathology symptoms.

Furthermore, as this mediating relationship has held up in three studies, results from the current thesis emphasize the importance of efficient ER skills in preventing two forms

of very prevalent psychological disorders. This suggests that it is a core component of successful human functioning; that without advanced ER skills, the likelihood of distress or dysfunction in many areas of life (i.e. academic or social) greatly increases. One implication of this is the importance of teaching this process to children. It is well established that better ER skills prevent psychopathology, and therefore the earlier it can be taught and used, the better chance a child has for success.

Another important implication of this study pertains to the comorbidity between ADHD and depression. It is well established, and has been discussed previously, the high comorbidity rates between ADHD and depression, both in symptoms alone and in clinical cases. It is also well established the increased rates of negative outcomes associated with a comorbid diagnosis. Such a diagnosis is associated with increased levels of other comorbidities (Biederman et al., 2008), increased health care costs (Fishman, Stang, & Hogue, 2007), and a three times higher likelihood of successfully committing suicide than in either disorder alone (James, Lai, & Dahl, 2004). Such high levels of distress and dysfunction have brought on questions about why ADHD and depression are so comorbid. Results from this thesis offer a possible explanation to the high comorbidity rates between ADHD and depression in emerging adults; inefficient ER. In other words, preventing poor ER can help to alleviate the symptoms of these disorders. It is clear through this model that ER is a core component of both disorders, and plays a key role in the progression of worse ADHD symptoms, and eventual depressive symptoms.

This study also had implications in the context of treatment. With a better understanding about the foundations of the comorbidity of ADHD and depression, as well as the knowledge that this relationship holds true in a variety of ages, it is easier for

clinicians to find target areas of treatment during intervention. It is well established that the comorbidity between ADHD and depression creates more significant levels of distress and dysfunction for those individuals affected (Biederman et al., 2008; Fishman, Stang, & Hogue, 2007; James, Lai, & Dahl, 2004). Being aware that ineffective ER skills are more likely to bring about depressive symptoms in people with ADHD, allows target areas for intervention that can help to alleviate current ADHD symptoms as well as prevent future depressive symptoms and the extra challenges that accompany a comorbid diagnosis. Within clients as well, it offers a new understanding of a diagnosis of one or both of these disorders, as well as what is at play in the development of symptoms.

Arguably most beneficial is the implication in regards to the replication aspect of this study. The mediational relationship is important in establishing a foundation or possible explanation for the comorbidity between ADHD and depression, as well as in providing a predictive framework for the challenges associated with ADHD symptoms, depressive symptoms, and poor ER both individually and in combination with each other. The implications of understanding how this relationship develops are further emphasized and appreciated in that it has been found to hold true in populations of both youth and emerging adults. This suggests that the relationships between these variables are a core component of their progression and presentation, regardless of the age of the individual. They suggest that poor ER is a detriment no matter the age, and that it can be the gateway to future comorbidities if not handled properly. This thesis has helped to reassure the findings from past literature about the mediational relationship, and it has also helped to generalize the findings across age. This is no longer a relationship that is only present in a certain population, but rather one that is present across a large portion of human

development. Through this, these results now open the door for extensive future research about the further generalizability of these findings, as well as which other comorbid relationships ER plays a key role in.

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APPENDICES

APPENDIX A: IRB APPROVAL

APPLICATION FOR APPROVAL OF RESEARCH WITH HUMAN SUBJECTS
Protection of Human Subjects Review Board, 400 Corbett Hall

PRINCIPAL INVESTIGATOR: Michelle L. Buffie **EMAIL:** michelle.buffie@maine.edu
FACULTY SPONSOR: Douglas W. Nangle **EMAIL:** dnangle@maine.edu
(Required if PI is a student):
TITLE OF PROJECT: An Exploratory Analysis of Self-Regulation
START DATE: ~~3/30/18~~ 4/10/2018 **PI DEPARTMENT:** Psychology
FUNDING AGENCY (if any): N/A

STATUS OF PI: FACULTY/STAFF/GRADUATE/UNDERGRADUATE GRADUATE STUDENT

1. If PI is a student, is this research to be performed:

- ☐ for an honors thesis/senior thesis/capstone?
- ☐ for a master's thesis?
- ☐ for a doctoral dissertation?
- ☐ for a course project?
- X other (specify) New study for the social interaction and adjustment lab

2. Does this application modify a previously approved project? N (Y/N). If yes, please give assigned number (if known) of previously approved project:

3. Is an expedited review requested? Y (Y/N).

Submitting the application indicates the principal investigator's agreement to abide by the responsibilities outlined in Section I.E. of the Policies and Procedures for the Protection of Human Subjects.

Faculty Sponsors are responsible for oversight of research conducted by their students. The Faculty Sponsor ensures that he/she has read the application and that the conduct of such research will be in accordance with the University of Maine's Policies and Procedures for the Protection of Human Subjects of Research. REMINDER: if the principal investigator is an undergraduate student, the Faculty Sponsor MUST submit the application to the IRB.

Email this cover page and complete application to UMRIC@maine.edu

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FOR IRB USE ONLY Application # 2018-03-12 Review (F/E): E Expedited Category:
ACTION TAKEN:

- X☐ Judged Exempt; category 2 Modifications required? Yes Accepted (date) 4/10/2018
- ☐ Approved as submitted. Date of next review: by Degree of Risk:
- ☐ Approved pending modifications. Date of next review: by Degree of Risk:
  Modifications accepted (date):
- ☐ Not approved (see attached statement)
- ☐ Judged not research with human subjects

FINAL APPROVAL TO BEGIN 4/10/2018
Date

01/2017

APPENDIX B: DIFFICULTIES IN EMOTION REGULATION SCALE (DERS)

Difficulties in Emotion Regulation Scale (DERS)

Please indicate how often the following statements apply to you by writing the appropriate number from the scale below on the line beside each item.

1----------2----------3----------4----------5

almost never	sometimes	about half the time	most of the time	almost always
(0-10%)	(11-35%)	(36-65%)	(66-90%)	(91-100%)

_____ 1) I am clear about my feelings.
_____ 2) I pay attention to how I feel.
_____ 3) I experience my emotions as overwhelming and out of control.
_____ 4) I have no idea how I am feeling.
_____ 5) I have difficulty making sense out of my feelings.
_____ 6) I am attentive to my feelings.
_____ 7) I know exactly how I am feeling.
_____ 8) I care about what I am feeling.
_____ 9) I am confused about how I feel.
_____ 10) When I'm upset, I acknowledge my emotions.
_____ 11) When I'm upset, I become angry with myself for feeling that way.
_____ 12) When I'm upset, I become embarrassed for feeling that way.
_____ 13) When I'm upset, I have difficulty getting work done.
_____ 14) When I'm upset, I become out of control.
_____ 15) When I'm upset, I believe that I will remain that way for a long time.
_____ 16) When I'm upset, I believe that I will end up feeling very depressed.
_____ 17) When I'm upset, I believe that my feelings are valid and important.
_____ 18) When I'm upset, I have difficulty focusing on other things.
_____ 19) When I'm upset, I feel out of control.
_____ 20) When I'm upset, I can still get things done.
_____ 21) When I'm upset, I feel ashamed at myself for feeling that way.
_____ 22) When I'm upset, I know that I can find a way to eventually feel better.
_____ 23) When I'm upset, I feel like I am weak.
_____ 24) When I'm upset, I feel like I can remain in control of my behaviors.
_____ 25) When I'm upset, I feel guilty for feeling that way.
_____ 26) When I'm upset, I have difficulty concentrating.
_____ 27) When I'm upset, I have difficulty controlling my behaviors.
_____ 28) When I'm upset, I believe there is nothing I can do to make myself feel better.
_____ 29) When I'm upset, I become irritated at myself for feeling that way.
_____ 30) When I'm upset, I start to feel very bad about myself.
_____ 31) When I'm upset, I believe that wallowing in it is all I can do.
_____ 32) When I'm upset, I lose control over my behavior.
_____ 33) When I'm upset, I have difficulty thinking about anything else.
_____ 34) When I'm upset I take time to figure out what I'm really feeling.
_____ 35) When I'm upset, it takes me a long time to feel better.
_____ 36) When I'm upset, my emotions feel overwhelming.

Reverse-scored items (place a subtraction sign in front of them) are numbered 1, 2, 6, 7, 8, 10, 17, 20, 22, 24 and 34.

Calculate total score by adding everything up. Higher scores suggest greater problems with emotion regulation.

SUBSCALE SCORING:** The measure yields a total score (SUM) as well as scores on six sub-scales:

1. Nonacceptance of emotional responses (NONACCEPT): 11, 12, 21, 23, 25, 29
2. Difficulty engaging in Goal-directed behavior (GOALS): 13, 18, 20R, 26, 33
3. Impulse control difficulties (IMPULSE): 3, 14, 19, 24R, 27, 32
4. Lack of emotional awareness (AWARENESS): 2R, 6R, 8R, 10R, 17R, 34R
5. Limited access to emotion regulation strategies (STRATEGIES): 15, 16, 22R, 28, 30, 31, 35, 36
6. Lack of emotional clarity (CLARITY): 1R, 4, 5, 7R, 9

Total score: sum of all subscales

**"R" indicates reverse scored item

REFERENCE:

Gratz, K. L. & Roemer, L. (2004). Multidimensional assessment of emotion regulation and dysregulation: Development, factor structure, and initial validation of the Difficulties in Emotion Regulation Scale. *Journal of Psychopathology and Behavioral Assessment, 26,* 41-54.

APPENDIX C: ADULT ADHD SELF-REPORT SCALE

Adult ADHD Self-Report Scale (ASRS-v1.1) Symptom Checklist

Patient Name		Today's Date					
Please answer the questions below, rating yourself on each of the criteria shown using the scale on the right side of the page. As you answer each question, place an X in the box that best describes how you have felt and conducted yourself over the past 6 months. Please give this completed checklist to your healthcare professional to discuss during today's appointment.			Never	Rarely	Sometimes	Often	Very Often
1. How often do you have trouble wrapping up the final details of a project, once the challenging parts have been done?							
2. How often do you have difficulty getting things in order when you have to do a task that requires organization?							
3. How often do you have problems remembering appointments or obligations?							
4. When you have a task that requires a lot of thought, how often do you avoid or delay getting started?							
5. How often do you fidget or squirm with your hands or feet when you have to sit down for a long time?							
6. How often do you feel overly active and compelled to do things, like you were driven by a motor?							
							Part A
7. How often do you make careless mistakes when you have to work on a boring or difficult project?							
8. How often do you have difficulty keeping your attention when you are doing boring or repetitive work?							
9. How often do you have difficulty concentrating on what people say to you, even when they are speaking to you directly?							
10. How often do you misplace or have difficulty finding things at home or at work?							
11. How often are you distracted by activity or noise around you?							
12. How often do you leave your seat in meetings or other situations in which you are expected to remain seated?							
13. How often do you feel restless or fidgety?							
14. How often do you have difficulty unwinding and relaxing when you have time to yourself?							
15. How often do you find yourself talking too much when you are in social situations?							
16. When you're in a conversation, how often do you find yourself finishing the sentences of the people you are talking to, before they can finish them themselves?							
17. How often do you have difficulty waiting your turn in situations when turn taking is required?							
18. How often do you interrupt others when they are busy?							
							Part B

APPENDIX D: CENTER FOR EPIDEMIOLOGIC STUDIES DEPRESSION SCALE

Center for Epidemiologic Studies Depression Scale – Revised (CESD-R)

Below is a list of the ways you might have felt or behaved. Please check the boxes to tell me how often you have felt this way in the past week or so.	Last Week				Nearly every day for 2 weeks
	Not at all *or* Less than 1 day	1 - 2 days	3 - 4 days	5 - 7 days	
My appetite was poor.	0	1	2	3	4
I could not shake off the blues.	0	1	2	3	4
I had trouble keeping my mind on what I was doing.	0	1	2	3	4
I felt depressed.	0	1	2	3	4
My sleep was restless.	0	1	2	3	4
I felt sad.	0	1	2	3	4
I could not get going.	0	1	2	3	4
Nothing made me happy.	0	1	2	3	4
I felt like a bad person.	0	1	2	3	4
I lost interest in my usual activities.	0	1	2	3	4
I slept much more than usual.	0	1	2	3	4
I felt like I was moving too slowly.	0	1	2	3	4
I felt fidgety.	0	1	2	3	4
I wished I were dead.	0	1	2	3	4
I wanted to hurt myself.	0	1	2	3	4
I was tired all the time.	0	1	2	3	4
I did not like myself.	0	1	2	3	4
I lost a lot of weight without trying to.	0	1	2	3	4
I had a lot of trouble getting to sleep.	0	1	2	3	4
I could not focus on the important things.	0	1	2	3	4

REFERENCE: Eaton, W. W., Smith, C., Ybarra, M., Muntaner, C., Tien, A. (2004). Center for Epidemiologic Studies Depression Scale: review and revision (CESD and CESD-R). In ME Maruish (Ed.). *The Use of Psychological Testing for Treatment Planning and Outcomes Assessment* (3rd Ed.), Volume 3: Instruments for Adults, pp. 363-377. Mahwah, NJ: Lawrence Erlbaum.

AUTHOR'S BIOGRAPHY

Hannah C. Meidahl was born in Doylestown, Pennsylvania in 1998. She graduated from Central Bucks High School East in 2016, and subsequently moved to Maine, her father's home state. Majoring in Psychology and minoring in Biology, Hannah was an active member on the University of Maine campus. Throughout her college career, she held three leadership positions as a member of Alpha Omicron Pi, was Vice President of the UMaine Photography Club for three years, and was a volunteer in the Mind Spa for three years.

Upon graduation, Hannah plans to move to Salt Lake City, Utah to explore job opportunities in the field of psychology. She plans to begin exploring graduate programs on the western side of the state, or internationally, and subsequently pursue forensic psychology.