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**SELF-REGULATION, EMOTION REGULATION, & SOCIAL PROBLEM-SOLVING:
COMMON & DISTINCT PATHWAYS TO DEPRESSION**

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A DISSERTATION

Submitted in Partial Fulfillment of the

Requirements for the Degree of

Doctor of Philosophy

(in Clinical Psychology)

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August 2022

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By Michelle L. Buffie

Dissertation Advisor: Douglas Nangle, Ph.D.

An Abstract of the Dissertation Presented
in Partial Fulfillment of the Requirements for the
Degree of Doctor of Philosophy
(in Psychology)
August 2022

The present study examined the relationships among three psychological constructs: self-regulation (SR), emotion regulation (ER), and social problem-solving (SPS), and their connection to depressive symptomology. SR, ER, and SPS arose from independent, well-established literature bases and each has demonstrated links to psychopathology. The theories underlying these constructs, however, suggest overlap in their operationalization and measurement. Despite these concerns, no empirical investigations to date have examined the measurement and predictive validity of measures of SR, ER, and SPS in the context of one another.

Undergraduate students aged 18-29 ($N = 592$) completed three self-report measures each of the constructs interest, as well as a measure of depressive symptoms. First, a confirmatory factor analysis (CFA) was conducted, and four rival CFAs reflecting differing levels of convergence and divergence were tested against one another. Then, the best fitting measurement model was used to test a latent variable structural equation model (SEM). Findings from the first-order CFA model indicated that seven out of nine measures loaded on to their intended factors. Contrary to prediction, the bifactor model was identified as the best-fitting CFA model. This suggests that each construct is comprised of distinct variance, as well as common

variance that is shared among all nine measures. Interestingly, only the common factor variance and distinct variance of ER significantly predicted depressive symptoms in the final SEM model.

This study was the first to demonstrate and explore the high levels of convergence among SR, ER, and SPS as commonly measured in practice. Overall, the results indicated a substantial amount of shared variance and offered a complicated picture of construct validity. It appears that measures often used to assess these constructs are capturing more common features than investigators may be aware of, which has notable implications for the interpretation of findings. Future investigations that include a multitrait-multimethod examination of common and distinct pathways from SR, ER, and SPS to depressive symptoms would serve to further clarify these relationships.

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CHAPTER I

FOUNDATIONS

The present study examined the relationships among the constructs of self-regulation (SR), emotion regulation (ER), and social problem-solving (SPS). These relationships and their connection to depressive symptomology were explored during emerging adulthood in a sample of undergraduate students. This chapter contextualizes later coverage of the targeted constructs by providing a foundation in development, psychopathology, and measurement. First, the developmental period of the present sample, emerging adulthood, is defined and discussed. Development specific to neurological, cognitive, emotional, and social domains is highlighted. Next, the onset and prevalence of psychopathology during emerging adulthood is described, with a focus on depression. The chapter concludes with a discussion of the measurement of psychological processes in relation to construct, convergent, and discriminant validity. In subsequent chapters, SR, ER, and SPS will be connected to development, psychopathology, and measurement with an emphasis on elements unique to each construct. Gender differences are highlighted throughout. Notably, significant gender differences have been found for some of the constructs of interest in the present study, particularly ER and depressive symptoms (e.g., Nolen-Hoeksema, 2012; Salk et al., 2017). Key for the present study was the degree to which these and any other identified gender patterns reflect differences in construct structure and/or differences in the relationship between the constructs and depressive symptoms.

Development

Defining the Developmental Period

The present study focused on the transition from adolescence to adulthood. This transition is marked by significant change across almost all domains of functioning. It represents

the maturation and junction of higher-order processes, including SR, ER, and SPS, and the underlying skills that comprise them (Blakemore & Choudhury, 2006; Taylor et al., 2015). Defining the transition from adolescence to adulthood is not as straightforward as it may seem. Some theorists conceptualize it as a continuous progression (e.g., Bynner, 2005), while others call for re-labeling it as a distinct developmental period (e.g., Arnett, 2000). Complicating the matter further are a variety of labels used to describe overlapping age ranges, such as ‘late adolescence’ (ages 15 to 20), ‘youth’ (ages 15 to 25), or ‘young adulthood’ (ages 17-28; Sawyer et al., 2018). Given this overlap in labels and the intended focus on the transition between adolescence and adulthood, the age range of interest for the present study was specified as 18 to 29 years old. This period is most closely captured by the term ‘emerging adulthood’ proposed by Arnett (2000). In order to provide a context for better understanding this developmental period, Arnett’s (2000) Theory of Emerging Adulthood is described next.

Arnett’s Theory of Emerging Adulthood

Twenty years ago, Arnett (2000) proposed the concept of emerging adulthood, a distinct period between adolescence and adulthood characterized by exploration of “love, work, and worldviews” (p. 469). The motivation behind this proposal stemmed from Arnett’s observation that individuals within this age range had drastically shifted in terms of demographics in the preceding fifty years (2000). In the past, the transition from adolescence to adulthood was associated with more cohesive trends: not as many individuals attended college, more people began long-term careers shortly after their secondary education was complete, and people were more likely to establish a family of their own. Instead, at the turn of the twenty-first century, young adults were encouraged to not feel pressured to fall into a particular role. This observation prompted Arnett (2000) to consider the alternative focus of this age group.

Arnett's theory emphasizes five characteristics that distinguish emerging adulthood from other developmental periods:

1. *Identity exploration*, answering the question "who am I?" and trying out various life options, especially in love and work;
2. *Instability*, in love, work, and place of residence;
3. *Self-focus*, as obligations to others reach a lifespan low point;
4. *Feeling in-between*, in transition, neither adolescent nor adult; and
5. *Possibilities/optimism*, when hopes flourish and people have an unparalleled opportunity to transform their lives (Arnett, 2015, p. 9).

In recognizing these distinguishing features, Arnett (2000) was one of the first to suggest that emerging adulthood represents a unique stage of the lifespan during which long-term trajectories are substantially influenced. From this perspective, emerging adulthood is characterized not solely as a transition, but as a starting place of possibilities. This begins with loosened role expectations, such that the encouragement to consider different roles (e.g., education, career, family) provides autonomy for the individual to influence their own trajectory (Arnett, 2015). Indeed, recent trends in role expectations have been shown to be far less rigid during emerging adulthood than during any other developmental period (Shulman & Nurmi, 2010).

Loosened expectations help to set the stage for emerging adults to explore their identity, particularly in terms of trying out different paths. Arnett (2015) compares this idea to Erik Erikson's theory of psychosocial development, which suggests that during the adolescent period, the individual is working through the stage of *identity versus role confusion* (Feldman, 2017). The major task of this stage is to recognize one's sense of self and the skills, qualities, or beliefs that one values as well as connect these features with long-term goals. Erikson also described an

extension of this period that he termed *psychosocial moratorium*, during which individuals had more freedom to experiment with different roles (Feldman, 2017). Both Arnett's (2015) perspective and this portion of Erikson's theory speak to the increased autonomy emerging adults often experience, which creates space for deepened identity exploration.

The transition out of the caregiving environment can look quite different across individuals, leading to varying degrees of instability (Arnett, 2015). For example, financial, familial, or other environmental influences might strongly impact an emerging adult's options during this period. In addition, trying out different paths likely contributes to overall feelings of instability, in that roles are assumed with the knowledge that they are trials or temporary in nature. Increased independence and loosened expectations also contribute to a self-focus during this time (Arnett, 2015). Upon leaving the caregiving environment, individuals are able to make decisions that primarily impact only themselves. Having this ability allows for consideration of what roles they want to pursue without putting others' needs before their own. It is likely that the variability in demographics and relative instability leads to emerging adults feeling in-between, as they might have passed some milestones on the transition to adulthood, but not others (Arnett, 2015). For example, an individual may have moved out of the caregiving environment but might remain financially dependent on caregivers.

The course and experience of emerging adulthood can also vary based on gender. It is important to note that the majority of psychological research on gender differences has been limited by a gender binary perspective and does not account for the existence of a gender spectrum (Hyde et al., 2019). In addition, the differences between biological sex and gender identity are often neglected. The present study utilized the term 'gender' for all related past research to reflect the influence of social and cultural norms. Indeed, the development of gender

identity and gender role socialization can have long-term impacts on the choices and trajectories of emerging adults (Cunningham, 2001; Halim et al., 2011). For example, some researchers have suggested that the development of autonomy is more encouraged for males in comparison to females (Sneed et al., 2006). This could underlie differences in trajectories after leaving the caregiving environment, as females have been found to be more family-oriented than males (Tsai et al., 2013). Evidence suggests that contact with family decreases for both males and females across emerging adulthood; however, it has been found to decrease at a faster rate for males as compared to females (Sneed et al., 2006). Males and females also differ in their response to stress; for example, females are more likely to lean on and foster social support networks (Fiori & Denckla, 2015). Considering these differences in combination, gender identity could have a potentially large impact on the trajectories initiated during emerging adulthood.

While the term emerging adulthood has become widespread, several developmental theorists disagree that this period signifies a unique stage of the lifespan. Specifically, some have argued that the proposed characteristics associated with emerging adulthood do not generalize to those 18- to 29-year-olds who do not pursue higher education (Bynner, 2005). Differences between students and non-students have been observed in the domains of occupation, finances, and parenthood; however, no differences seem to emerge regarding employment status or rates of marriage (Mitchell & Syed, 2015). Thus, it is likely there are several trajectories for emerging adulthood that differ across students, non-students, and graduates (Zorotovich & Johnson, 2019). As the present sample was specific to undergraduate students, distinguishing features of this population are described below.

Undergraduate Students as Emerging Adults

It is important to emphasize that the developmental period of emerging adulthood is not synonymous with a population of undergraduate students. That being said, a significant portion of emerging adults do engage in post-secondary education. Between the years of 2000 and 2017, the rate of enrollment in 2- or 4-year collegiate institutions for 18- to 24-year-olds increased from 35% to 40% (National Center for Education Statistics [NCES], 2019). The enrollment for individuals in this age range who identify as female has significantly increased. In 2017 the rate of enrollment for females was 44% as compared to 37% for males (NCES, 2019). Educational attainment for 25- to 29-year-olds has correspondingly increased at all levels across the last two decades: as of 2018, 93% of this age group obtained a high school diploma, 47% obtained an associate degree or higher, 37% obtained a bachelor's degree or higher, and 9% obtained a master's degree or higher (NCES, 2019).

The collegiate environment seems to foster the social norms necessary for the experience of emerging adulthood, including time and space for identity exploration, expansive opportunities for learning, and increased exposure to different social groups (McAdams & Guo, 2014). Additionally, aspects of this environment contribute to the instability and shifting demographics theorized to impact emerging adults (Arnett, 2015). First, the course of education for college students can differ dramatically; students might delay starting, take time off, or never complete their degree (Arnett, 2016). The ability to change majors also allows students to shift directions before committing to long-term careers. Second, the work/life balance across students is varied; for example, some students are required to support themselves financially, while others can accept unpaid internships. Third, residential arrangements are varied across students and across time; this period reflects the highest rate of moving as compared to other developmental

stages (Arnett, 2015). Fourth, the distance between the individual's residence and family of origin may vary widely, differentially impacting their supportive relationships. Finally, the opportunity for new relational experiences is increased, such that individuals are exposed to a wider range of possibilities for friendship or romance (Arnett, 2016).

Development in Emerging Adulthood

During emerging adulthood, development occurs across all domains, which substantially influences the maturation of SR, ER, and SPS. Before describing development in specific domains, two points are important to consider. First, it is critical to account for the influence of past development, such that biological and environmental events that impacted development in childhood and early adolescence indirectly influence development into emerging adulthood (Sroufe, 2007). Second, the cascade model of development highlights the importance of understanding connections and reciprocal influences between different domains of functioning (Masten & Cicchetti, 2010). For example, early cognitive development might have an impact on later social development through both direct and indirect influences. The accumulating nature of development and the cascade model are important to consider when examining the maturation of higher-order processes. This is because lower-order skills are the building blocks for higher-order processes, and because higher-order processes are often comprised of skills that involve multiple domains. As such, development across neurological, cognitive, emotional, and social domains related to the higher-order processes of SR, ER, and SPS is described in more detail in the following sections. Gender differences are also highlighted.

Neurodevelopment. With the increasing complexity of technology and corresponding advancement of neuroimaging, researchers are better able to understand the changes in neural development associated with the transition from adolescence to adulthood. Structurally, cortical

grey matter volume appears to decline, while cortical white matter volume increases through adolescence, with rates of change for both plateauing in the mid-twenties (Foulkes & Blakemore, 2018). This pattern corresponds with change in overall cortical thickness, surface area expansion, and alterations in underlying microstructure. These structural changes are facilitated by the neural processes of myelination, synaptogenesis, and synaptic pruning, which continue into emerging adulthood (Taber-Thomas & Pérez-Edgar, 2015; Taylor et al., 2015).

Significant development occurs in the frontal and prefrontal regions through emerging adulthood (Schmithorst & Yuan, 2010; Taylor et al., 2015). Longitudinal studies have demonstrated an association among frontal lobe structural change, cortical maturation, and the improvement in neural functioning from puberty into emerging adulthood (Bava et al., 2010). Functional studies of the frontal and prefrontal regions suggest these areas are critical for executive functioning, reflecting changes in increased self-awareness and self-reflection (Blakemore & Choudhury, 2006; Taylor et al., 2015). Specifically, changes in neural activity have been connected to related shifts in cognitive, emotional, and social factors, including risk-taking, reward processing, and theory of mind (Crone et al., 2016; Moriguchi et al., 2007; Silverman et al., 2015).

The prefrontal regions are thought to mature last in terms of neurological development, which corresponds to the increase in goal-directed behavior and decrease in risk-taking behavior observed later in emerging adulthood (Taber-Thomas & Pérez-Edgar, 2015). Further, connections between the frontal and limbic regions are continuously developing during this time, such that the prefrontal cortex increases its regulatory influence on the limbic regions. This corresponds to increased integration of cognitive, emotional, and social functioning and is a key step in the shift to future-oriented behavior (Taber-Thomas & Pérez-Edgar, 2015).

Cognitive Development. Though the well-established theorist Jean Piaget suggested that cognitive development ends with the formal operational stage in adolescence (Feldman, 2017), others have suggested that cognitive processes continue to develop into emerging adulthood in a stage referred to as *postformal thought* (Despotović, 2014; Labouvie-Vief & Diehl, 2000). Adolescents develop the ability to think abstractly and engage in formal reasoning processes; however, these skills are not enough to problem-solve in dynamic and multifaceted environments (Feldman, 2017). Postformal thought is based on the increasing complexity of what right versus wrong might mean in a social and cultural context. Thus, logic and subjectivity are both required. Emerging adults must learn to integrate experiences, morals, and values into thought processes and be able to accept the incongruencies and ambiguities of social situations (Despotović, 2014). Postformal thought is posited to influence not only decision-making in conflict situations but also one's representation of the self, emotions, and values (Labouvie-Vief & Diehl, 2000).

Another key area of ongoing cognitive development in emerging adulthood is risk-taking behavior, or choosing the response with the most variability in potential outcomes (Crone et al., 2016). This involves behaviors such as substance use, sexual promiscuity, and adrenaline-related behaviors like fast driving or extreme sports. Risk-taking is thought to peak in late adolescence and early emerging adulthood (Pharo et al., 2011). Investigation of contributing factors to risk-taking have identified feelings of invulnerability and a bias towards optimistic thinking, or the perception that outcomes will be more favorable for oneself than for others (Lapsley & Hill, 2010). Comparisons of adolescents and emerging adults have revealed that feelings of invulnerability and perceptions of favorable outcomes were highest in emerging adulthood (Millstein & Halpern-Felsher, 2002).

Emotional Development. Given the inherent instability associated with emerging adulthood, it is not surprising that this developmental period is characterized by accompanying emotional insecurity (Zimmermann & Iwanski, 2014). Hormonal changes occurring during puberty contribute to a high level of emotional variability through late adolescence (Crone & Dahl, 2012). Adolescents might experience emotional highs and lows that rapidly change, and they might react more strongly to the experience of these emotions than adults would (Feldman, 2017). This variable experience of emotions is not yet stable upon entering emerging adulthood (Zimmerman & Iwanski, 2014). In addition, the experience of negative emotions, such as anger and sadness, increases through adolescence and then gradually declines through emerging adulthood (Galambos et al., 2006). Characteristics of the emerging adulthood stage, such as high rates of moving, role transitions, and ambiguous expectations, likely influence the increased experience of negative emotions and contribute to the instability of this age period (Arnett, 2015).

In addition to a high level of emotional insecurity, underlying mechanisms involved in processing emotional information are still developing into the early twenties (Ahmed et al., 2015). Sensitivity to rewards has been shown to increase through late adolescence and decline in the early twenties (Urošević, et al., 2012). The increasing control of the limbic system by the prefrontal cortex allows for better integration of social and reward information, serving to reduce the incentive for riskier rewards and increase the incentive for prosocial rewards (Taber-Thomas & Pérez-Edgar, 2015).

In addition, emotional insight, particularly awareness and identification of emotions in oneself and others, increases through emerging adulthood (Zimmerman & Iwanski, 2014). This ability is vital to the process of risk evaluation and decision making, as each possible response

option is associated with positive (approach) and negative (avoid) affective components (Rivers et al., 2013). When both the knowledge of nuanced emotional states and the experience in identifying them is lacking, as it is in late adolescence and emerging adulthood, making complex decisions is difficult and is more likely to lead to risky behaviors (Rivers et al., 2008).

Social Development. Erikson's theory of psychosocial development suggests that after individuals move through the *identity versus role confusion* stage, they move into the *intimacy versus isolation* stage, which focuses on developing close, intimate relationships with others (Feldman, 2017). Through emerging adulthood, social relationships increase in their complexity, intensity, and importance for mental health and well-being (Taylor et al., 2014). The transition to independence from the caregiving environment allows more flexibility to spend time with peers and bolsters dependence on close friendships and romantic relationships (Smits et al., 2011). In light of shifting environmental demands and ambiguous role expectations during this time, maintaining close relationships requires increased social competence (Arnett, 2015). Social competence refers to the use of skills and available social information to achieve desired outcomes (Taborsky & Oliveira, 2012). In emerging adulthood, this is reflected by being accepted by self-selected friends and having the ability to expand one's social network if desired (Shiner et al., 2002). To accomplish these goals, individuals must be able to understand others' perspectives and emotional experience.

The skills of theory of mind, or the ability to understand another person's perspective, and empathy, or the ability to understand another person's feelings or emotional experience, continue to undergo functional improvement into emerging adulthood (Dumontheil et al., 2010; Valle et al., 2015). Emerging adulthood presents new social challenges and requires the individual to take on multiple perspectives at once, moving towards a societal perspective

(Lapsley & Woodbury, 2016). This requires strong, flexible skills in self-understanding and the ability to separate oneself from others. In addition, empathy skills mature throughout this period, allowing the individual to better identify and relate to the emotional experience of others (Smits et al., 2011). Theory of mind and empathy abilities appear to improve and mature with accumulating experience and increased integration of cognitive, emotional, and social neural systems (Taber-Thomas & Pérez-Edgar, 2015).

Gender Differences in Development. Regarding gender differences during this period, large-scale analyses have demonstrated that, beginning in adolescence, differences between males and females are present across several indicators of brain-behavior relationships (Gur & Gur, 2016). This is thought to reflect differences in neural structure and connectivity. However, the authors noted that the differences were not large enough that male and female brains would be considered more different than alike (Gur & Gur, 2016). Cognitively, consistent findings indicate that males engage in higher levels of risk-taking than females; evidence suggests this may be because females are more likely to perceive a negative outcome than males (Figner & Weber, 2011). This is connected to higher levels of punishment sensitivity observed in females (Cross et al., 2011). In terms of emotional development, gender differences have been found in the expression and experience of emotion (Deng et al., 2016). In particular, females are more likely to exhibit internalizing emotions, whereas males are more likely to exhibit externalizing emotions (Garnefski et al., 2005). Gender differences have also been demonstrated in the trajectory of psychosocial development; for example, males and females move through stages of identity and intimacy development at different rates (Montgomery, 2005). Overall, this evidence of gender differences indicates a potential for gender role socialization and gender identity development to have cascading impacts across domains of development.

Psychopathology

Ongoing development across domains culminates in the maturation of higher-order processes in the late twenties, including SR, ER, and SPS. The solidification of these processes during an inherently instable period, such as emerging adulthood, creates an opportunity for things to go awry. That is, the long-term trajectories initiated during this time could function to accumulate negative consequences for the individual, potentially contributing to the onset of psychopathology. Aspects of general psychopathology during emerging adulthood will be discussed, with attention given to the influence of the undergraduate environment. Then, depression will be specifically highlighted.

Adjustment in Emerging Adulthood

Both positive and negative consequences can result from the unstructured and potentially turbulent course of emerging adulthood. Given that this period is characterized by inherent instability and a multitude of possible trajectories, some of those trajectories might include significant increases in the experience of personal hardship, interpersonal conflict, and resulting distress (Arnett, 2015). The accumulation of these experiences in combination with ongoing identity development can lead to confusion and isolation for emerging adults (Arnett et al., 2014). In addition, more opportunities for risk-taking behavior are available, which can have long-term implications spanning into adulthood (e.g., unprotected sex, addiction, incarceration). These factors can function to set the stage for psychopathology. For example, the experience of a stressful life event has been connected to the onset of multiple disorders (e.g., Horesh et al., 2008; Keyes et al., 2011), and stress during emerging adulthood is thought to contribute to an increase in symptoms that may have been subthreshold in adolescence (Schulenberg et al., 2004).

Substantial evidence has suggested that the age of onset for many forms of psychopathology occurs in the teens and twenties (Kessler et al., 2007). For emerging adults in the United States, the most notable diagnoses include mood, anxiety, and substance use disorders (Arnett et al., 2014). Twelve-month prevalence rates of psychological concerns for ages 18-25 are as follows: 17.7% severe psychological distress, 8.4% major depressive episode, 15.8% alcohol dependence or abuse, and 7.7% drug dependence or abuse (Adams, et al., 2014). These rates are lower for ages 26-34: 13.9% severe psychological distress, 7.1% major depressive episode, 11.4% alcohol dependence or abuse, and 4.2% drug dependence or abuse.

Psychopathology in Undergraduate Students

The circumstances for undergraduate students present unique influences on psychopathology during emerging adulthood. Although undergraduate populations have historically been considered ‘healthy’ samples (e.g., DeRight & Jorgensen, 2015), accumulating findings have raised questions regarding the overall mental health of today’s students (Conley et al., 2014). College students’ scores on clinical scales of the MMPI-2 assessing wide ranges of psychopathology have reportedly been increasing (Twenge et al., 2010). Studies focused on university counseling centers have observed increases in the frequency and severity of mental health concerns in student populations, including mood, anxiety, and perhaps most notable, self-harm and suicidal ideation concerns (Xiao et al., 2017). A recent study found the 12-month prevalence rate of any mental disorder for incoming freshman in the United States to be 27%, suggesting approximately one-fourth of students experience some form of psychopathology (Auerbach et al., 2018). Females have been found to experience higher levels of internalizing distress during undergraduate study, whereas males are more likely to exhibit externalizing symptoms (Conley et al., 2014).

In addition to the already tumultuous experience of emerging adulthood, undergraduate students enrolled in the academic years impacted by COVID-19 (2019-2020 and beyond) will have faced an added layer of uncertainty and stress. Given the disruption in daily life related to the widespread closing of universities and the potential consequences for health and safety, clinicians suggest the COVID-19 pandemic could substantially contribute to emotional distress and maladjustment (Fiorillo & Gorwood, 2020). Due to these concerns, a measure specifically addressing anxiety related to COVID-19 was included in the present study.

Depression

The present study sought to examine both the unique and shared influences of SR, ER, and SPS on depression due to its strong connections to these higher-order processes. Depression is cross-cultural, widespread, and functionally impairing (Kessler & Bromet, 2013). Symptoms can include depressed mood; anhedonia; changes in appetite, weight, or sleep; psychomotor agitation or retardation; feelings of worthlessness or guilt; a reduced ability to think or concentrate; low energy; and suicidal ideation (American Psychiatric Association [APA], 2013). These symptoms can be episodic or chronic in nature and cause impairment across domains of functioning. Depression is associated with lower quality of life, interpersonal disruption, and physical illness and mortality (Ingram et al., 2015).

Major depressive disorder in emerging adults is a significant concern, with 12-month prevalence estimates at 12.9% and lifetime prevalence estimates at 20.2% for 18- to 29-year-olds in the United States (Hasin et al., 2018). First-incidence rates during emerging adulthood have been found to be as high as during adolescence (Rohde et al., 2013). The transition out of the caregiving environment, increase in autonomy, and inherent instability of emerging adulthood can create an overwhelming and disruptive experience for some individuals (Edgerton et al.,

2019). One example of this could be the beginning of undergraduate study; for some individuals, starting college may represent a significant challenge that often must be faced without the same social support and resources available in the caregiving environment. Indeed, the concerning rate of depression holds true for undergraduate populations. In a sample of 14,371 undergraduate students across eight countries, major depressive disorder was the most prevalent disorder reported (Auerbach et al., 2018). Specifically, the 12-month prevalence was estimated to be 18.5%, and the lifetime prevalence was estimated to be 21.2% for students (Auerbach et al., 2018).

It has been consistently demonstrated across diverse samples that females experience depression at a rate of 2:1 as compared to males (Salk et al., 2017). This gender difference has been shown to emerge around puberty and persist through emerging adulthood (Rohde et al., 2013; Salk et al., 2016). There are several theories regarding the underlying mechanisms driving this gender difference. Some evidence has suggested that females are more likely to report stressful life events prior to the onset of a depressive episode than males, and this difference was the most prominent during emerging adulthood (Harkness et al., 2010). Other evidence has found that emerging adults who experience depression report dissatisfaction with social support and a gradual loss of friendships (Martínez-Hernández et al., 2016). It is possible that differences in the experience of emerging adulthood, environmental stressors, and fluctuating social support impact depressive symptoms differentially for males and females during this period. Clearly, there are marked gender differences in depression prevalence in emerging adulthood. Of importance to the present study was whether the relationship between the common and/or distinct features of SR, ER, and SPS and depressive symptoms is impacted by gender.

Given the high prevalence rates and potential for severe long-term consequences, the examination of depression in emerging adults remains an important area of investigation. Some researchers have even suggested that the focus of depression research on adolescence may have caused a lack of focus on the equally important developmental period of emerging adulthood (e.g., Rohde et al., 2013).

Measurement

The present study examined the validity of SR, ER, and SPS and took steps toward clarifying their measurement in practice, particularly in relation to depressive symptoms. The first goal of the study was to assess the construct validity of SR, ER, and SPS by conducting a confirmatory factor analysis (CFA) based on three measures of each construct. The second goal was to examine convergent and discriminant validity of the constructs by testing a series of CFA models that reflect different possibilities for the underlying structure of the observed variables. The third goal was to use the best-fitting CFA model to assess how the common versus distinct features of SR, ER, and SPS relate to depressive symptoms. The purpose of the following discussion is to place these three interrelated goals in the context of psychological assessment. Specifically, relevant definitions will be provided and selected approaches to the assessment of construct, convergent, and discriminant validity in the present study will be summarized. General issues regarding the assessment of SR, ER, and SPS will also be highlighted. This will help to contextualize discussions in Chapters II, III, and IV, in which common approaches to measurement for each construct will be reviewed. Three measures for each construct were selected for the present study based on the following criteria: (1) aim to capture the overall construct, (2) connection to theory, and (3) frequency of use in the field.

Construct Validity

Psychological *constructs* represent a collection of behaviors, characteristics, or traits that together form a distinct entity (Cronbach & Meehl, 1955). The sum of this entity is thought to reflect more than the individual contributions of each component. For instance, depression may be conceptualized as including the symptoms of depressed mood, anhedonia, sleep disturbance, etc., but depression encompasses more than this collection of symptoms. Constructs can be considered from three levels: theory, operationalization, and measurement (Haynes et al., 2011). At a theoretical level, constructs are proposed based on a series of observations, qualities, or laws that comprehensively describe the construct, referred to as a *nomological net* (Cronbach & Meehl, 1955). This set of principles functions to explain the construct and is used to inform its operationalization and measurement.

A considerable obstacle in assessment arises from the fact that many constructs, as well as the behaviors, characteristics, or traits that comprise them, are largely unobservable or characterized as *latent* (Haynes et al., 2011). As such, latent constructs must be *operationalized*, or connected to observable variables. These variables need to either directly assess a component of the construct (e.g., in the case of depression, assessing mood) or a related construct that has been identified as a contributing factor (e.g., in the case of depression, assessing sleep disturbance). Observable elements of a construct are required in order to assess variance in the construct and connect it to outcomes of interest (Cronbach & Meehl, 1955). Once a construct can be tied to observable variables that are adequately representative of the construct, a measure can be developed.

The development of a measure necessitates an examination of how well the measure captures the theorized construct. At a broad level, *validity* addresses the question of whether

variation in scores on a measure is indicative of variation in the variable being assessed (Haynes et al., 2011). More specifically, the process of determining whether variation in the measure reflects variation in a latent construct is what Cronbach and Meehl (1955) referred to as *construct validity*. While there is no direct test of construct validity, there are several approaches that can provide evidence that measures are functioning as intended (Cronbach & Meehl, 1955). One approach that provides a portion of this evidence is factor analysis (Thompson & Daniel, 1996).

Factor analysis is a statistical technique that can be used to assess the extent to which observed variables are generated by latent constructs (Byrne, 2016). This is accomplished through examination of *factor loadings* (i.e., regression paths) that reflect the strength of the relationship between variation in observed variables and variation in latent constructs (Byrne, 2016). *Confirmatory factor analysis* (CFA) is used when theory can help to inform these relationships (Keith, 2019). CFA involves proposing a model that is thought to reflect the underlying factor structure of the observed variables based on theory (Keith, 2019). In the present study, SR, ER, and SPS were considered the latent constructs, while the measures used to assess these constructs were considered the observed variables. Because the measures selected for the present study were designed with the intention of capturing specific constructs based on theory, CFA was used to examine the extent to which the measures accomplish this goal (Thompson & Daniel, 1996). Ultimately, this provided evidence relevant to the construct validity of commonly used measures of SR, ER, and SPS and addressed the first goal of the study.

Convergent & Discriminant Validity

Another aspect of validity assessment involves examination of the relations and lack of relations between measures of the construct of interest and other constructs (Cronbach & Meehl,

1955). *Convergent validity* demonstrates that the construct (as measured) is related to other constructs as would be expected based on theory (Foster & Cone, 1995). This could be reflected in correlations between two measures intended to tap the same construct (e.g., two measures of depression) or between two measures intended to tap closely related constructs (e.g., depression and anxiety). Measures should also demonstrate *discriminant validity*, which indicates that the construct is not related to or can be distinguished from other constructs (Foster & Cone, 1995). This could be reflected in two measures of unrelated constructs (e.g., depression and specific learning disorder) or in two related but distinct constructs (e.g., depression and anxiety).

Convergent and discriminant validity fall along a spectrum, such that measures should be able to demonstrate associations with related constructs, yet also be able to differentiate distinct constructs, even if they are related (Foster & Cone, 1995). If measures are not able to distinguish between related constructs, it suggests there is redundancy in the theoretical or operational levels of the construct. Redundancy in constructs warrants consideration of the construct's purpose. If two constructs are reflective of the same nomological net, it is inefficient to measure and interpret them as unique constructs (Cronbach & Meehl, 1955). Further, if the groundwork has not been put in to demonstrate adequate convergent and discriminant validity for measures of closely related constructs, then all subsequent interpretations based on these measures may be flawed (Foster & Cone, 1995). That is, if it is unclear what construct a measure is capturing, making claims about the connection between that measure and outcomes could be inaccurate or misleading.

CFA can be utilized to examine convergent and discriminant validity (Keith, 2019). This is accomplished through testing rival models that represent different possible relationships between the observed variables and the latent constructs (Thompson & Daniel, 1996). In other

words, models can be proposed that reflect convergence of observed variables (e.g., all observed variables load on to one common factor) or divergence of observed variables (e.g., observed variables load on to distinct factors), as well as possibilities in between (Credé & Harms, 2015). How well these rival models fit the data can then be assessed through examination of fit indices to determine which model fits best (Keith, 2019). This provides evidence relevant to the convergent and discriminant validity of measures of SR, ER, and SPS and addressed the second goal of the study.

The task of examining convergent and discriminant validity is influenced by the notion of *shared method variance*, which suggests that demonstrated relationships between constructs may be due to similar measurement formats rather than an underlying relationship between the constructs themselves (Campbell & Fiske, 1959). This becomes a concern when attempting to interpret relationships between latent constructs (Williams & McGonagle, 2016). This can also be a concern in considerations of convergent validity, such that the goal of assessing how closely two measures are related could be inflated by shared method variance. This also applies to discriminant validity, such that two measures might not be related due to differing methods. Given these concerns, using multiple methods to examine relationships is considered a more thorough approach. That more thorough approach, however, also comes with the burdens of increased time, effort, and resources, making the process more challenging. Thus, the present study considered convergent and discriminant validity within the context of a shared method.

General Issues in SR, ER, & SPS Assessment

For any construct, the pathway from theory to measurement can proceed in many different directions. Researchers investigating the same construct may work from different theory bases. Those agreeing on theory may differ in operationalization. The development of

measures adds another layer of variability. A whole other set of problems arises when investigators pursue a given construct in isolation without adequate consideration of closely related or competing constructs. Maintaining consistency within a construct or distinctions between related constructs on the path from theory, to operationalization, to measurement is one of assessment's major challenges. When the constructs themselves are complex, as is the case with SR, ER, and SPS, this task is particularly daunting.

While the examination of these three constructs has progressed along separate tracks, they appear to share a significant amount of theoretical overlap, both in underlying mechanisms and functional outcomes (Nigg, 2017). In addition, the operationalization of each construct is varied and sometimes overlapping, for instance the same executive functioning tasks are often used as indicators of both SR and ER (e.g., Bridges et al., 2004; Duckworth & Kern, 2011). Considering this overlap, the extent to which SR, ER, and SPS are distinct constructs and are being measured as such is unclear. In fact, calls for clarification in the measurement of these constructs have been numerous (e.g., Eisenberg et al., 2011; Weems & Pina, 2010; Zhou et al., 2012).

Given the theoretical similarities among SR, ER, and SPS, a certain amount of convergence in their measurement is to be expected. However, as noted, concerns arise if too much convergence across measures exists, such that the distinct constructs of SR, ER, and SPS are not being captured. Discriminant validity should also be demonstrated to indicate that although overlap exists, measures of SR, ER, and SPS do indeed represent three distinct constructs. High convergence and low discrimination between measures calls into question whether the three constructs need to be conceptualized as distinct entities. Rethinking their underlying structure may provide more efficiency in their measurement and application.

Overlap in the measurement of SR, ER, and SPS not only impacts efficiency, but also has substantial implications for the interpretation of findings. In order to draw connections between observed variables and outcomes, fully understanding what the measure captures is critical. For example, if a frequently used measure of ER mostly captures elements common to ER, SR, and SPS rather than elements that are unique to ER, then the relationship between that measure and outcomes will likely be misinterpreted. This is particularly worrisome when a measure is being used to predict psychopathology, as empirical findings are often used to inform prevention and intervention approaches. It is rare that measurement concerns are raised when discussing the limitations of studies. Instead, results are interpreted as ‘ER predicts depressive symptoms,’ even though the measure of ER might be capturing common features shared with other constructs, rather than capturing primarily distinct features that are unique to ER.

These concerns were the premise of the third goal of the study, which was addressed by using the best-fitting CFA model to predict depressive symptoms in a latent variable structural equation model (SEM). SR, ER, and SPS have been identified as significant contributors to depressive symptoms (Anderson, et al., 2009; Joormann & Stanton, 2016; Strauman, 2017). Based on the possibility that measures used to assess SR, ER, and SPS may not be capturing unique constructs as intended, it is possible their previously established relationships with depression could be flawed. Using CFA to inform latent variable SEM allowed for the examination of differences in the common and distinct features of SR, ER, and SPS and their connection to depressive symptoms. These methods will be described in more detail in Chapter VI.

CHAPTER II

SELF-REGULATION

Decisions made throughout daily life often require more complex processing than one might think. Each decision can impact personal goals, and this impact can ripple across contexts. In order to maintain progress toward goals, individuals must consider both the short- and long-term consequences associated with each decision. Given the number of decisions made each day, balancing these consequences becomes a key process required for adaptive functioning. This chapter provides an overview of the process of *self-regulation*, or the ability to monitor, evaluate, and adjust one's behavior to achieve desired outcomes and avoid undesired outcomes (Bandura, 1991; Barkley, 1997a). First, the definition, mechanisms, and functions involved in self-regulation are described. Next, two theoretical models that have been influential in the study of self-regulation are presented. In the final section, key aspects of development, psychopathology, and measurement specific to the process of self-regulation are reviewed. Gender differences are highlighted throughout.

Definition & Theory

Defining SR

Broadly defined, regulation refers to the adaptive modulation of behavior, cognition, or emotion (Nigg, 2017). When this process is facilitated by forces other than the individual, it is referred to as *extrinsic regulation* (Thompson, 2011). An example of this is when children rely on caregivers to provide support through modeling or shaping responses to meet environmental expectations, such as a caregiver helping a child maintain focus on a homework assignment (Bernier et al., 2010). As the child gets older, the process of modulating responses becomes increasingly internal and directed by the self, referred to as *self-regulation* (SR). SR does not

represent a single skill or system, but rather a collection of related skills and systems that allow the individual to adapt to changes in the environment while maintaining progress toward goals (Nigg, 2017).

The complexity of this process has led to the investigation of SR across several areas of study within the field of psychology. SR has prolific literature base foundations within social cognitive (e.g., Bandura, 1991), personality (e.g., Hoyle, 2010), developmental (e.g., Rothbart et al., 2003; Mischel et al., 1989), educational (e.g., Zimmerman, 1990), and clinical (e.g., Barkley, 1997b; Strauman, 2017) areas of psychology. Due to its widespread application, SR has been theorized, operationalized, measured, and interpreted in numerous and diverse ways. According to a review by Nigg (2017), terms used to describe aspects of SR or overlapping constructs include, but are not limited to: self-control, effortful control, cognitive control, emotion/mood/affect regulation, executive functioning, delay of gratification, behavioral inhibition, response inhibition, impulsivity, and risk-taking.

The present study will adopt Nigg's (2017) definition of SR. Nigg's (2017) definition accomplishes clarity that is missing from other conceptualizations in that it is comprehensive enough to capture the complexity of SR, but also differentiates it from other constructs. Pertinent to the present study, Nigg (2017) goes beyond defining SR and also provides definitions for related constructs (Table 1) that help illustrate the theoretical uniqueness of each construct. Establishing this differentiation is particularly important in light of the present study's goal, namely examining the construct validity of SR, ER, and SPS through an assessment of convergent and discriminant validity. To better assess differences at the measurement level, common and distinct features must be clarified at the theoretical level. Specifically, SR will be defined as:

Table 1*Term Definitions for Constructs Overlapping with SR*

Term	Definition
Self-control	The capacity to resist temptation, inhibit a dominant response, or activate a subdominant response (top-down SR).
Effortful Control	A dispositional trait that represents the tendency to be able to employ top-down control to self-regulate (trait level of cognitive control; equivalent to low-level EFs).
Cognitive Control	The ability to flexibly adjust behavior in the context of dynamically changing goals and task demands (equivalent to low-level EFs).
Emotion Regulation	Adjustment of emotional state or expression to meet goals or to maintain homeostatic or allostatic state; intrinsic and extrinsic.
Executive Functions	Top-down cognitive functions involved in the control of behavior, emotion, and cognition; support goal-directed behavior.
Delay of Gratification	Trait-level ability to postpone the immediately rewarding option in order to obtain a delayed or future reward.
Behavioral Inhibition	The bottom-up interruption of a behavior in response to novel, ambiguous, or threatening stimuli.
Response Inhibition	The top-down ability to intentionally or effortfully suppress a triggered behavior to sustain behavior toward a goal.
Impulsivity	Nonreflective stimulus-driven action when a later-rewarding goal-relevant response was also available.
Risk-Taking	Selection of rewarding behavioral option in the face of high probability of loss.

Note. Adapted table and term definitions sourced from Nigg (2017, pp. 363-364). EF = executive functions. Delay of gratification definition was added from Mischel et al. (1989).

“The intrinsic processes aimed at adjusting mental and physiological state adaptively to context. Encompasses cognitive control, emotion regulation, and top-down and bottom-up processes that alter emotion, behavior, or cognition to attempt to enhance adaptation (or to achieve an explicit or implicit goal or goal state).” (Nigg, 2017, p. 364)

Three important aspects of Nigg’s (2017) definition will be highlighted in the following sections. First, SR includes bottom-up and top-down processes. This distinction separates components of regulation that are environmentally driven from those that are driven by the individual. For example, ceasing eating potato chips after seeing a gym advertisement on television (bottom-up)

is different than proactively removing all snack food from the house (top-down; Shah & Kruglanski, 2003). This distinction is important when considering the overlap of SR, ER, and SPS, because different components of ER and SPS align with bottom-up versus top-down SR. Second, SR includes behavioral, cognitive, and emotional components (Nigg, 2017). The pervasiveness of SR across modalities is also mirrored in the processes of ER and SPS. Third, the function of SR is to achieve a goal state. Specifically, the goal is to maximize the balance of consequences in the short- versus long-term (Barkley, 1997a). In the above example, this might involve balancing the satisfaction of eating potato chips (immediate reward) with the long-term goal of being healthy (delayed reward). This balance is integral to the present discussion, as the functional outcomes of adaptive versus maladaptive SR represent the connection between SR and psychopathology.

Bottom-up vs. Top-down SR. Conceptualizations of SR begin with dual-process models, which suggest that cognitive processes operate on two levels: the first is stimulus-driven or autonomous, often referred to as *bottom-up*; the second is effortful or deliberate, often referred to as *top-down* (Evans & Stanovich, 2013). Bottom-up processes include innate or reflexive behavior, habituated behaviors, and approach/avoidance behaviors. These are typically the targets of SR, as they reflect motivation to pursue short-term rewards (Shulman et al., 2016). For example, an individual's bottom-up response to stress may be to self-soothe by biting their fingernails. If they set a goal to reduce this behavior, they will have to focus their SR abilities on this habituated response. Bottom-up processes can also be regulatory, for instance they can prime top-down processes (Bargh & Ferguson 2000; Barkley, 1997a) or provide information related to goals based on learned associations (Nigg, 2017). If an individual identifies staff meetings as an

environmental stimulus for nail-biting, they can use this information to employ effortful SR specifically during meetings.

Top-down processes serve to restrain impulses driven by the environment and instead respond to mental representations, namely goals (Shulman et al., 2016). Top-down processes include both lower-order executive functions (i.e., response inhibition, attention) that are utilized in more simple, immediate contexts, as well as higher-order executive functions (i.e., reasoning, planning) that are utilized in future-oriented contexts (Hofmann et al., 2012). Top-down SR represents an effortful process engaged by the individual to serve the function of goal attainment (Nigg, 2017). In the nail-biting example, strategies to adjust behavior could come in several forms, for instance wearing gloves to block nails, engaging in coping thoughts, or using distress reduction techniques such as deep breathing. All of these possibilities involve an active, intentional effort by the individual to adjust behavior to counter the immediate reward (self-soothing) and work toward the delayed reward (reducing nail-biting).

Modalities of SR. SR encompasses the domains of behavioral action, cognition, and emotion, both as targets of regulation and as components of the process itself. When the target of SR is motor control, it is referred to as *behavioral regulation* (Barkley, 1997a). Behavioral regulation is often investigated in the context of impulse-control disorders (e.g., Houben & Wiers, 2009; Wodka et al., 2007). When the target of SR is attention, memory, or decision-making, it is referred to as *cognitive regulation* (Hutcherson et al., 2012). Cognitive regulation is a primary focus of addiction and dieting literature (e.g., Johnson et al., 2012; Naqvi et al., 2015). Finally, when the target of SR is one's expression and experience of emotions, it is referred to as *emotion regulation* (ER; Gross, 1998). ER has emerged as a well-established, transdiagnostic construct of interest (e.g., Sloan et al., 2017) and will be discussed in Chapter III. When SR is

conceptualized as the overarching construct that encompasses these three subdomains (i.e., behavioral, cognitive, emotional), it is referred to as *domain-general* SR (Nigg, 2017).

In addition to serving as the targets of SR, behaviors, cognitions, and emotions are integrated within the underlying skills that comprise SR. Each component may be involved in the process, regardless of the target of SR (Nigg, 2017). For instance, regulating one's emotional response to negative feedback might involve the behavioral component of inhibiting the initial expressive response, the cognitive component of evaluating alternative response options, and the emotional component of attenuating the experience of frustration (Gross, 2014).

Say, for example, an employee receives negative feedback from their boss and the employee's long-term goal is to hold this position for the next several years. When the employee receives the negative feedback, they would need to inhibit the initial expression of emotion, as becoming overly upset or saddened in front of one's boss would likely have negative consequences. After inhibiting the initial response, the employee might take deep breaths to help regulate the emotional experience of sadness or frustration. Then, the employee would need to consider what the best way to respond is; perhaps they could acknowledge the feedback and ask for action steps. SR is the total process of incorporating these components to reach desired outcomes (i.e., maintaining employment) and avoid undesired outcomes (i.e., being fired).

Functions of SR. Theorists in the clinical literature have placed particular emphasis on the function of SR, as that aspect is intricately related to the development and maintenance of psychopathology (Strauman, 2017). Specifically, SR serves to change an individual's likelihood of engaging in a subsequent response, thereby changing the likelihood of related consequences (Barkley, 1997a). For example, if an individual makes a to-do list the night before a busy workday, that could serve to increase the likelihood of completing the task list. By flexibly

adapting one's behavior and altering subsequent responses, an individual is able to work toward desired outcomes and avoid undesired outcomes related to personal goals (Strauman, 2017).

However, this process is more complex than simple goal-attainment, as each possible response option is associated with both immediate and delayed outcomes. SR aims to maximize future outcomes such that a balance is achieved between short- and long-term consequences for the individual (Barkley, 1997a). To achieve this balance, individuals must engage in an ongoing process of monitoring, evaluating, and adapting their behavior. For example, if an individual smokes cigarettes when feeling down but wants to quit, they would need to monitor the antecedents and consequences of situations in which they smoke, weigh the immediate reward of reduced negative affect with the long-term reward of quitting, and implement the adjustments flexibly across situations (e.g., alternatives to smoking might look different at home versus at work). Further complicating this process are the influences of intrapersonal biases, interpersonal tendencies, and the greater social context (Fitzsimons & Finkel, 2010). Perhaps the individual negatively appraises their ability to find alternative response choices, they might frequently smoke with friends and do not want them to be disappointed, or they may not be convinced of the negative health effects of smoking.

Overall, SR is a complicated process that requires several moving pieces to accomplish. In the following section, the ways through which the underlying mechanisms of SR interact to achieve the functional outcomes of SR are described. This is accomplished through the integration of two complimentary models of SR.

Models of SR

As mentioned, the investigation of SR has spanned several areas of study, which has contributed to different theoretical approaches to understanding SR (Strauman, 2017). Some

models focus on the underlying mechanisms that comprise SR, others focus on the functional aspects of SR, and yet others focus on how the mechanisms and functions of SR connect to psychopathology. In the present discussion, two models of SR will be utilized to describe the underlying mechanisms and functions of SR. First discussed is Barkley's (1997a; 1997b) model, which emphasizes the underlying skills and mechanisms of SR, with a focus on executive functioning. Second is Bandura's (1991) social cognitive theory of SR, which emphasizes the functional aspects and introduces ways through which intrapersonal biases and interpersonal tendencies can impact SR.

Barkley's Model of Self-Regulation. Barkley's model suggests that the underlying mechanisms of SR are comprised of executive functions (EFs). EFs can be thought of in this context as self-directed actions that serve to regulate behavior (Barkley, 1997a; Nigg, 2017; see [Table 1](#)). Several other lines of research have provided support for the idea that individual EFs comprise the overall ability to self-regulate (e.g., Duckworth & Kern, 2011; Hofmann et al., 2012). For example, evidence suggests that monitoring one's own behavior relies on attentional control (Rueda et al., 2005), evaluating consequences relies on working memory (Hofmann et al., 2008), and adjusting behavior relies on planning and sequencing motor movements (Sniehotta, 2009). Notably, the sum ability of regulating behavior is greater than individual EFs, as it requires higher-order, simultaneous integration of multiple skills and systems (Nigg, 2017).

Though other researchers have identified additional EFs that contribute to SR (i.e., attention or task switching), Barkley's (1997a) model highlights five EFs that work together to influence an individual's behavior. These include: (a) response inhibition, (b) working memory, (c) internalization of speech, (d) self-regulation of affect/motivation/arousal, and (e) reconstitution (Barkley, 1997a). Each component is described in detail in the following sections.

Response Inhibition. The first component of the model is *response inhibition*. Barkley conceptualized this component as inhibiting or stopping an initial response to a stimulus (1997a). The initial response is referred to as the *prepotent* response, or the one that has been previously associated with immediate reward or reinforcement (e.g., biting nails or eating potato chips). For example, if an individual enters a stressful staff meeting (i.e., the stimulus) and feels an urge to bite their nails (i.e., the prepotent response), stopping this initial response would be considered response inhibition. Barkley (1997a) identified response inhibition as a higher-level ability that affects all subsequent EFs. This is because inhibiting the initial response provides a delay period between the stimulus and response, which allows for the other four EFs to be employed.

Without the delay period, behavioral responses to stimuli would be controlled only by bottom-up processes and not effortful control. In the nail-biting example, stopping the prepotent response of nail-biting allows the individual to consider alternative options, such as taking deep breaths, that would help work toward the goal of reducing nail-biting behavior. If not for response inhibition, the individual would only be able to respond to stressful situations with nail-biting. The individual eating potato chips would continue to do so until an environmental stimulus (i.e., the gym advertisement) interrupts their behavior (which is referred to as *behavioral inhibition*; see [Table 1](#)). According to Barkley, individuals are unable to maximize both short- and long-term consequences if they have already acted to maximize the short-term (1997a). If the individual has already bitten their nails or eaten the potato chips, they cannot consider those actions in the context of their long-term goals. This ability to pause and reflect on how one's actions fit in with goals is thought to be an integral component of adaptive, human functioning (Bandura, 1991; Barkley, 1997a). The four EFs that are employed during the delay period in service of goal attainment are described next.

Working Memory. *Working memory* is the ability to hold events in mind and manipulate them for later recall (Barkley, 1997a). Barkley emphasizes the self-directed senses of ‘seeing to oneself’ and ‘hearing to oneself’ as the major contribution of this component; however, all senses can be engaged in this process (Barkley, 1997a). The ability to hold sensory information in mind helps the individual to either replay or imagine possible scenarios attached to different behavioral sequences in order to evaluate future outcomes. Working memory could assist the individual in imitating another person’s behavior or generate a novel sequence of behavior. For example, bringing to mind instances that previously triggered nail-biting (e.g., staff meetings) and playing out scenarios of different options (e.g., imagining wearing gloves versus taking deep breaths) would help the individual determine how to adjust their behavior in the future. Barkley posits that the internal information gained from this component helps the individual to be more self-aware and better organize their behavior over time (1997a).

Internalization of Speech. The second and closely related component of Barkley’s model, *internalization of speech*, refers more specifically to the process of verbal working memory and is conceptualized as the ability to self-talk (Barkley, 1997a). This is differentiated from ‘hearing to oneself,’ which would refer more to the re-sensing of verbal stimuli generated from an extrinsic source. Instead, this component reflects engaging in a dialogue with oneself. For example, an individual thinking, “Stop! Don’t bite your nails. Remember you are trying to not bite them,” would reflect internal self-talk. This ability to engage in a conversation with oneself is particularly important for the evaluative function of SR, such that it helps the individual to reflect on possible outcomes of their choices (Barkley, 1997a). It allows the individual to think through alternative ways of responding that align with their goals. This is also a key area in which internal biases, intrapersonal biases, and the greater social context can influence SR. For

instance, thinking, “Don’t bite your nails. Remember you have that important interview coming up” brings in an element of social desirability.

Affect/Motivation/Arousal. The third component of Barkley’s model, the self-regulation of *affect/motivation/arousal*, encompasses the interrelated construct of ER (Table 1). One key aspect of this component is the ability to inhibit the prepotent, emotional response (Barkley, 1997a). This mirrors the function of response inhibition, such that the ability to inhibit the initiated emotional expression or response allows for a delay period in which effortful ER processes can be employed (Barkley, 2015). This allows the individual to take a more objective stance and consider other people’s perspectives, which helps to integrate the greater social context into behavioral decisions (Barkley, 1997a). The process of effortful ER will be described in more detail in Chapter III.

This component of Barkley’s (1997a) model additionally encompasses self-directed emotions, including elements of motivation and arousal (Barkley, 1997a). Motivation is a relevant construct in discussions of SR, as maintaining an underlying drive to reach goals is essential for focus on delayed rewards and long-term goal attainment (Baumeister & Vohs, 2007). If an individual did not hold a desire to reduce nail-biting behavior, SR would not be required. Barkley (1997a) notes this element is particularly important in the absence of tangible, external rewards. That is, when rewards are abstract or delayed (e.g., to cease a habit), it is harder to prioritize them over concrete, immediate rewards (e.g., to self-soothe). Levels of arousal, or physiological states of activation, are woven into the emotional experience and can function to motivate action (Barkley, 1997a). Arousal can serve to inhibit or dampen other EFs, thereby contributing to SR. For instance, arousal has been connected to attentional focus and memory processing (Kaplan et al., 2012).

Reconstitution. The final EF component of Barkley's (1997a) model is *reconstitution*, or the ability to analyze and synthesize behavioral responses. This ability is particularly important for problem-solving, which requires previous behavioral sequences that were unsuccessful solutions to be broken down so that each component can be evaluated. Then, the behavioral chain is put back together in a way that generates a novel response with the goal of successfully solving the problem (Barkley, 1997a). Reconstitution is also critical in that it allows the individual to adapt to dynamic social environments. Though past behavior sequences might have been successful in maximizing future consequences for the individual, new social contexts may create additional challenges.

Say, for example, an individual's goal was to be more assertive at work. They might attempt to ask a coworker for a report that was due several weeks ago; perhaps the co-worker is apologetic in the moment, but still does not send the report. The individual would then need to consider the elements of the plan that were successful (e.g., talking to the coworker directly) versus not successful (e.g., failing to hold the coworker accountable). Perhaps the individual talks again with the coworker and asks for the report by the end of the day, leading to a successful outcome. This is the function of reconstitution: to disassemble behavior chains and put them together in sequences that are more likely to be successful.

The components of Barkley's (1997a) model are arranged in a hierarchical order, such that response inhibition is conceptualized as a higher-level ability that is required for the other four EFs to function effectively. This is due to the need for a delay period between stimulus and response. These five EFs work then together to ultimately influence a component labeled *motor control/fluency/syntax*. This component represents the outcome of SR: an orderly, goal-directed behavior sequence that is controlled by the individual rather than a behavioral response to

environmental stimuli (Barkley, 1997a). In other words, this outcome represents effortful, top-down responses, rather than reactive, bottom-up responses. This means that all EFs included in Barkley's (1997a) model are considered top-down processes. This distinction is important when considered from the perspective that EFs are intentionally employed by the individual in service of goal attainment, or in other words, in service of adaptive SR.

Bandura's Social Cognitive Theory of SR. Unlike Barkley's (1997a) model of SR, Bandura's (1991) model focuses less on the mechanisms of SR and more on the functional aspects of SR. Bandura conceptualized SR as being instrumental to human behavior. He posited that individuals contemplate goals, consider whether different paths might lead them toward or away from goals, and determine best routes of action (Bandura, 1991). This coincides with Barkley's conceptualization of the function of SR; however, whereas Barkley focused on how SR occurs, Bandura focused more so on what is actually occurring. In particular, Barkley described underlying skills that comprise the ability to monitor, evaluate, and adjust behavior. Bandura described why each of these steps is necessary to achieve desired outcomes (Bandura, 1991; Barkley, 1997a). Bandura's social cognitive theory of SR divides the process into three interrelated sub-functions: (a) self-observation, (b) judgement, and (c) self-reaction, that map on to the ideas of monitoring, evaluating, and adjusting behavior (1991). Each of these sub-functions is summarized below.

Self-observation. The observation sub-function of SR involves the ability to attend to the antecedents and consequences of one's own behavior across contexts (Bandura, 1991). This process is impacted by an individual's cognitive schemas, goal sets, and social priorities; these factors influence which behaviors are given more awareness or attention. This sub-function is key to the process of SR as it provides the necessary data for evaluating and adapting one's

behavior to be in line with desired outcomes (Bandura, 1991). Without being aware of different outcomes that behaviors can lead to across contexts, achieving desired consequences becomes difficult, if not impossible. For example, an individual identifying that they often isolate when feeling sad or down would provide valuable information when working toward social goals. Self-observation allows an individual to identify recurrent patterns and to experiment with different behaviors and their relation to desired outcomes. This process ultimately provides direction for subsequent judgement and self-reactive processes (Bandura, 1991).

Judgement. After the behavior is observed, it must be judged as either positive or negative based on personal and social standards (Bandura, 1991). This step is necessary for the individual to determine whether the behavior needs to be adjusted or if it will lead to the desired consequences. The standards utilized to judge one's behavior are constructed by the individual and are based on several sources of information (Bandura, 1991). That is, how an individual appraises situations (e.g., social events are viewed as a time to see friends versus a potential situation for embarrassment to occur) might influence how they judge behaviors (e.g., comical or embarrassing). Additional factors beyond personal and social standards that influence how a behavior is judged include how valued the individual perceives the activity or goal to be as well as the individual's locus of control. If the individual views the cause of their success as internal or self-driven, they will be more likely to monitor and evaluate their own behavior (Bandura, 1991). Conversely, if they view their success as being externally or environmentally caused, they may be unmotivated to adjust behavior.

Self-reaction. The self-observation and judgement processes provide the necessary information to determine whether a behavior should be continued, adjusted, or ceased. Then, self-reactive influences intervene to regulate behavior (Bandura, 1991). Motivation and self-

incentive play a major role in this process, because if an individual is not motivated to obtain a certain goal, then the likelihood of them adjusting their behavior accordingly is minimal. This is true for both desired consequences and undesired consequences, such that both serve to motivate behavioral adjustment (Bandura, 1991). This component of Bandura's (1991) model maps on to the motor control/fluency/syntax model of Barkley's (1997a) model in that it reflects the outcome of goal-directed behavior.

An important aspect of the social cognitive theory is the emphasis on the goals and motivations of the individual. According to Bandura, self-efficacy involves an individual's belief in their ability to influence or control their functioning as well as events that impact their lives (Bandura, 1991). Being aware of one's own thought processes (i.e., metacognition [Zimmerman, 1995]) and consideration of the potential consequences of behavior (i.e., forethought [Bandura, 1991]) are not sufficient to initiate the regulation of behavior. Rather, both self-efficacy and a personal sense of agency are required in order to set goals and to maintain motivation long-term (Zimmerman, 1995).

SR Models Summary. When considered together, these models illustrate the range of skills and systems involved in the ability to regulate behaviors, cognitions, and emotions. Each step of Bandura's (1991) model relies on the skills described in Barkley's (1997a) model to potentiate. That is, the steps of observation, judgement, and reaction employ the skills of response inhibition, working memory, and reconstitution. While other conceptualizations of SR exist across areas of study, these two models have been influential in the investigation of SR as a clinical construct (e.g., Strauman, 2017). Combined, these models have been cited by over 15,000 published articles as of 2020 and continue to be drawn from in specialized applications of SR (e.g., Bridgett et al., 2015; Friedman & Miyake, 2017). Pertinent to the present study, these

models serve as the foundation for later integration of models of ER and SPS and their combined influence on psychopathology in Chapter V.

Development

The ability to regulate one's behavior, cognitions, and emotions emerges in the first years of life and continuously evolves across the lifespan. It is important to emphasize that SR is a capacity that develops rather than an inborn trait that is fixed (Sroufe, 2007). Genetic inheritance plays a role, but early experiences and person-environment interactions serve to shape the capacity of SR beginning in infancy (Kopp, 1982). SR should thus be viewed as a process that develops in a similar context to other processes; in other words, the same genetic influences, early experiences, and person-environment interactions that influence SR development also impact neurological, cognitive, emotional, and social development and, potentially, the development of psychopathology (Berger et al., 2007; Sroufe, 2007). The development of these domains during emerging adulthood, as well as the influence of gender on SR, will be described next.

SR in Emerging Adulthood

Importantly, the underlying skills and overall capacity for SR continue to develop through adolescence and are not considered fully mature until adulthood, which corresponds to the trajectory of frontal lobe development (Bava et al., 2010; Berger et al., 2007). Evidence suggests that lower-order EFs, such as response inhibition and working memory, reach maturity in late adolescence, whereas higher-order EFs, such as sequencing and planning, do not reach maturity until adulthood (Nigg, 2017). This mirrors the observed increase in goal-directed behavior and future-oriented thinking in emerging adulthood, which are key aspects of adaptive SR (Taber-Thomas & Pérez-Edgar, 2015).

Elements of cognitive, emotional, and social development during emerging adulthood are interwoven with the development of SR. Cognitively, the transition from formal operations to postformal thought helps the individual progress from rigidly applying rules (i.e., control) and allows for a higher level of reasoning needed to flexibly apply social rules and expectations (i.e., regulation; Despotović, 2014; Labouvie-Vief, & Diehl, 2000). This is particularly important given the increasingly complex social environment characteristic of emerging adulthood (Taylor et al., 2014). Balancing consequences becomes complicated when ‘right’ versus ‘wrong’ decisions become grey, as is the case with complex social environments. For effective SR in this context, heightened theory of mind and empathy skills are required in order to hold multiple perspectives at once. The individual must be able to link outcomes not only to personal goals, but also to interpersonal expectations and moral principles (Posner & Rothbart, 2000).

In addition, risk-taking and reward sensitivity decline through emerging adulthood, both of which influence the outcome evaluation component of SR (Pharo et al., 2011; Urošević et al., 2012). Reward sensitivity strongly influences an individual’s desired balance between short- and long-term consequences as well as the degree to which regulation is required (Barkley, 1997a). These functions are all impacted by an increasing maturation of the connection between the prefrontal cortex and limbic system during emerging adulthood, which allows the individual to more effectively integrate social, emotional, and reward information (Taber-Thomas & Pérez-Edgar, 2015). In other words, over time, it becomes easier for individuals to work towards delayed rewards rather than always opting for immediate rewards.

Based on evidence from multiple levels of analysis, the developmental trajectories of the subdomains of SR (i.e., behavioral, cognitive, emotional) converge at maturity in the mid-twenties (Bridgett et al., 2015). As such, emerging adulthood appears to be a critical

developmental period during which the capacity for adaptive SR and related processes are reaching integration and stability. For undergraduate students, heightened educational demands, challenges with work/life balance, and variable access to support systems foster an environment that requires adequate SR abilities to be successful (Arnett, 2015). Given ongoing development of SR abilities during emerging adulthood and the environmental expectations of undergraduate students, the present sample sought to represent a range of maturing SR abilities that are actively engaged as a result of a dynamic environment.

Gender Differences in SR

Investigations of gender differences in domain-general SR demonstrate mixed findings, particularly in studies of adults (Hosseini-Kamkar & Morton, 2014). In terms of the underlying mechanisms of SR, little evidence is suggestive of clear gender differences in EF (Grissom & Reyes, 2019). Some studies have found advantages for males versus females on certain EF tasks, but no systematic pattern of advantage. Rather than differences in EF or SR ability, some differences have been identified in the motivation behind behavioral adjustment or strategy use (e.g., risk-taking, punishment sensitivity; Cross et al., 2011; Grissom & Reyes, 2019). Other evidence of possible differences has come from developmental studies, which demonstrate a slight advantage in SR abilities for females as compared to males, particularly in terms effortful control and delay of gratification, which does not appear to differ as a function of age (Kochanska et al., 2000; Raffaelli et al., 2005). However, a meta-analysis of 33 studies found that the effect size for gender differences in delay of gratification across samples was quite small ($r = .06$; Silverman, 2003). Another meta-analysis of 277 studies found no gender differences in EF, a small advantage for females in effortful control ($d = .08$), and stronger differences in punishment sensitivity as well as risk-taking (Cross et al., 2011).

Overall, these findings suggest that while gender differences may exist in components that contribute to SR (e.g., motivation, strategy use), no clear pattern of gender differences in underlying ability (e.g., EF) or overall SR have been consistently demonstrated. In particular, the lack of differences identified in EF indicate a lack of differences in the underlying structure of SR across genders. That is, even if there are small differences in contributing factors or strength of abilities, findings do not suggest that the underlying structure of SR is different across genders.

Psychopathology

SR is a critical component of adaptive functioning across domains. In particular, the ability to monitor, evaluate, and adapt behavior to be in line with goals has implications for academic (Nota et al., 2004), occupational (Porath & Bateman, 2006), and social functioning (Murphy et al., 2004). In addition to direct effects, SR deficits can have a cascading impact, such that negative effects in one domain can spread to other domains across development (Masten & Cicchetti, 2010). The accumulation of impairment across domains can lead to increased levels of stress and challenges with coping. Indeed, the cascading impact of SR deficits has a notable impact on psychological well-being and overall adjustment (Ryan et al., 1997; Strauman, 2017). While SR can have a substantial impact, it remains a process that develops alongside other processes (Sroufe, 2007). This perspective helps to shift the focus away from SR deficits as a causative factor and instead focuses on the questions of 1) how do SR deficits connect to psychopathological trajectories and 2) how does the process of SR vary when other features are present?

SR is considered a transdiagnostic construct, or a construct that is involved in the onset and maintenance of multiple psychological disorders (Santens et al., 2020; Sauer-Zavala et al.,

2017). SR has consistently been connected to both internalizing (i.e., directed toward the self) and externalizing (i.e., directed toward the environment) forms of psychopathology, including but not limited to mood disorders (e.g., Larson et al., 2005; Strauman, 2017), substance use disorders (e.g., Zucker et al., 2011), and neurodevelopmental disorders (e.g., Barkley, 1997b; Nathalie, 2011). The present study focused on a widespread form of psychopathology with a well-established connection to SR deficits, depression.

SR & Depression

Strauman (2017) presented a model of depression that suggests the onset of a depressive episode may follow a failure in goal attainment due to deficits in SR. This could be a single failure to reach a goal that was highly valued or important to the individual (Street, 2002) or a repeated failure in domains connected to intrinsic motivation for approach-related goals (Winch et al., 2015). For example, repeated failures to achieve a promotion at work might continuously diminish the individual's motivation to devote time and energy toward future promotion opportunities. According to Strauman (2017), this failure to reach a goal sets the individual up for a 'downward spiral,' such that with repeated instances of failure to reach goals, the consequences (physiological, cognitive, and interpersonal) increase in severity and pervasiveness across contexts. For instance, repeated failure to achieve a promotion may lead to maladaptive thought patterns (e.g., "I am not qualified," or "What is the point in trying anymore?"). In addition, continuous, negative events at work could lead to fatigue (Gross, et al., 2011), which then might impact the individual's motivation to be social after work. These consequences that originated in the occupational domain could thus have negative effects on other domains of functioning, leading to novel, pervasive consequences across contexts.

Failure in goal attainment across time has negative impacts on the mechanisms of SR, thereby increasing the potential for subsequent depressive episodes (Strauman, 2017). This could be related to several factors, such as expectancy of failure, low self-efficacy, or prolonged negative affect, all of which have been found to impair SR abilities (Bandura & Locke, 2003; Bridgett et al., 2013; Rasmussen et al., 2006). Overall, Strauman's (2017) model posits SR deficits could serve to both initiate and maintain a depressive episode. Indeed, SR has been consistently identified as a contributing factor to depressive symptoms across several levels of investigation (Acuff et al., 2019; Carver et al., 2008; Papadakis et al., 2006; Strauman, 2002).

SR, Gender, & Depression

Many investigations have focused on the regulation of emotion in terms of gender and depressive symptoms, but the evidence for gender impacting the relationship between domain-general SR and depression remains unclear (e.g., Nolen-Hoeksema et al., 2004). That is, in the context of gender and depression, SR is investigated when the target or regulation is emotion, for example in studies of rumination, stress management, or substance use (e.g., Thayer et al., 1994; Udo et al., 2009). As a result of this focus, these studies are more informative of the relationships among ER, gender, and depression rather than domain-general SR. One study found that together, the perception that one is failing to achieve a valued goal and a ruminative coping style interacted to exacerbate depressive symptoms for females (Papadakis et al., 2006). This finding might suggest that elements of domain-general SR (e.g., non-emotional goal attainment) and ER (e.g., rumination) interact to influence depressive symptoms; however, this sample investigated these relationships only in females. The lack of examination of this intersection may be due to the inconsistent gender differences found for domain-general SR previously noted or due to the focus of investigations on aspects of SR or closely related constructs (e.g., focusing on ER or EF

components). Overall, past research is not suggestive of a significant impact of gender on the relationship between domain-general SR and depressive symptoms.

Measurement

The measurement of SR is complicated given that most of the elements that comprise SR occur covertly and are thus challenging to observe (Barkley, 1997a). Added complexity stems from the overlap in related constructs (Table 1) and the wide range of components involved, which has led to a lack of cohesion in the operationalization of SR. Duckworth and Kern (2011) commented on this issue and noted that instead of ongoing debate within the field regarding the construct validity of SR, research groups tend to focus on assessment tools that align with their adopted theoretical approach. This often occurs in isolation without a nuanced consideration of closely related constructs.

As previously described, the underlying mechanisms of SR (e.g., EFs) are often conceptualized separately from the functions of SR (e.g., goal attainment). This makes a comprehensive assessment of SR challenging. In light of this challenge, few assessment approaches attempt to capture the entirety of SR in one measure. Instead, investigations of SR often include assessment of either the underlying mechanisms or the overall ability to regulate behavior. Commonly, these assessments are accomplished through the use of behavioral EF tasks and self-report measures, respectively. Each of these approaches is reviewed below. Then, the measures to be utilized in the present study will be specified.

Behavioral EF Tasks

Investigations of SR often include assessments of the individual EFs thought to comprise SR. Typical assessment of an EF involves a performance, or behaviorally-based task. These tasks require the individual to perform some action in order to demonstrate an underlying function.

Meta-analyses have identified the following EFs as being commonly assessed in the context of SR investigations: behavioral or response inhibition, working memory, planning/sequencing, and task-switching (Duckworth & Kern, 2011; Hofmann et al., 2012). Tasks frequently used to measure these functions include, but are not limited to, the following:

1. Inhibition
 - a. Go/No-Go Task (Newman et al., 1985)
 - b. Stop Signal Task (Logan, 1994)
 - c. Stroop Task (Stroop, 1935)
2. Working Memory
 - a. Operation Span Task (Turner & Engle, 1989)
 - b. Backwards Digit Span (Wechsler, 2014)
3. Planning/Sequencing
 - a. Tower of London Task (Shallice, 1982)
 - b. Porteus Maze Task (Porteus, 1942)
4. Set-Shifting
 - a. Wisconsin Card Sort Test (Berg, 1948)
 - b. Trail Making Test-Part B (Partington et al., 1949)

These tasks have been included in varied investigations of SR (e.g., Amodio et al., 2008; Sarkis et al., 2005; Stevens et al., 2002; Todd & Mullan, 2013). Despite the widespread use of these tasks as indicators of SR, several theorists have raised concerns regarding this practice. Barkley (2001) argues that the current approach to measuring EFs reflects restricted constructs that do not account for the adaptive motivations behind the function. That is, an EF employed intentionally in the service of SR reflects a higher-order effort by the individual to serve some purpose, which is not captured when isolating the behavior itself (Barkley, 2001). Similarly, Nigg (2017) suggests that the combination of individual EFs does not equate to the overall ability to regulate behavior. This is evidenced by interventions that seek to train EFs that do not consistently generalize to overall behavior change (e.g., Allom et al., 2016; Shipstead et al., 2010). These perspectives suggest that even investigations that include all the above tasks of EF

might still be missing the larger picture, let alone investigations that include only a sub-set of these tasks.

Further concerns arise when considering that measures of EFs are often imperfect in their reliability (e.g., Paap & Sawi, 2016) and validity (e.g., Duckworth & Kern, 2011). Paap and Sawi (2016) found that reliability and validity were higher for tasks assessing EFs when only a single indicator of performance, such as response time, was used; however, this led to a narrowed, or ‘impure’ conceptualization of the EF itself (p. 88). Conversely, when multiple indicators are used, such as difference scores, lower reliability and validity estimates are found (Paap & Sawi, 2016). Regarding validity, Duckworth and Kern (2011) conducted a meta-analysis of 282 studies that used different approaches to SR assessment, namely EF tasks and self-report measures, and found the lowest levels of convergent validity for tasks of EF. This is likely influenced by the variety of underlying functions assessed (i.e., measures of response inhibition, working memory, delay of gratification), but is worrisome when considering that, when combined, the tasks are intended to measure a cohesive construct of SR (Duckworth & Kern, 2011).

Reliability and validity considerations are particularly relevant when behavioral tasks of EF are used to inform patterns of psychopathology. Evaluating the adequacy of the psychometric properties for measures that are used to represent an underlying construct is important when considering construct validity (Byrne, 2016). More specifically, if a collection of tasks that measure EF is presumed to represent SR, the inference inherent in this practice introduces the need to evaluate whether the EF tasks are capturing the construct of SR as intended. If the tasks are already an imperfect measure of the observed variables (i.e., EF), using them to inform an underlying construct could serve to exacerbate validity concerns. This is critical to consider when using observed variables to characterize the relationship between a latent construct and an

outcome, for instance using EF tasks to make statements about the relationship between SR and depression. If issues of reliability and validity are not considered, a significant amount of error may be embedded in the relationship that is not appropriately addressed or interpreted.

Self-Report Measures of SR

An alternative approach to assessing individual EFs as indicators of SR is to use self-report measures that assess the ability to regulate behavior. In contrast to behavioral EF tasks, self-report measures are better able to assess different components of SR simultaneously. This often includes questions related to behavioral, cognitive, and emotional components of SR as well as the outcome of goal attainment (e.g., Carey et al., 2004; Moilanen, 2007). Of note, in part due to the range of theories and operationalizations of SR, as well as the alternative use of behavioral tasks to assess EFs, relatively few self-report measures of SR are universally administered or considered “widely used” (Duckworth & Kern, 2011). Rather, individual research teams often use measures that are more specific to their theoretical foundations (e.g., temperament researchers use SR measures grounded in temperament theory; Evans & Rothbart, 2007). With this in mind, the most common approaches to the self-report assessment of SR are described below, including measurement of overall SR ability, top-down SR, and executive functions.

Given the complexity of the construct, not many measures attempt to assess the overall ability to regulate behavior. However, within the clinical literature, two measures have emerged that aim to accomplish this feat: the Self-Regulation Questionnaire and the Adolescent Self-Regulatory Inventory. The Self-Regulation Questionnaire (Brown et al., 1999) was developed based on Miller and Brown’s (1991) model of SR in the context of addictive behaviors. Since then, the measure has been adapted to a short form (SSRQ; Carey et al., 2004) and used in a

variety of contexts to assess domain-general SR (e.g., Brown et al., 2015; Durand-Bush et al., 2015; Hong, 2013).

The second measure that aims to capture a comprehensive picture of SR is the Adolescent Self-Regulatory Inventory (ASRI; Moilanen, 2007). This inventory was specifically developed based on Barkley's (1997a) model of SR. Similar to the SSRQ, the ASRI is designed to assess multiple aspects of SR, including behavioral, attentional, emotional, and cognitive domains (Moilanen, 2007). The ASRI has demonstrated good psychometric properties and has been used in investigations of undergraduate populations (e.g., Moilanen, 2007; Moilanen, 2015; Moilanen & Manuel, 2017; Ramli et al., 2018). Though this measure fills a gap in the literature by aiming to capture the overall ability to regulate behavior based on Barkley's (1997a) model of EF, it has not gained widespread use in the field.

Another approach to SR assessment is to focus specifically on the top-down components of SR. In particular, this involves measurement of related constructs such as 'effortful control' or 'self-control' (Table 1). One of the most recognized measurements of effortful control is a subscale of the Adult Temperament Questionnaire (ATQ; Evans & Rothbart, 2007). The effortful control subscale of the ATQ (ATQ-EC) assesses three related components: inhibitory control, activation control, and attentional control (Evans & Rothbart, 2007). The ATQ-EC has demonstrated good psychometric properties and has been used in several studies across adult populations (Santens et al., 2020; Waegeman et al., 2014).

Several measures have been developed to assess the overlapping construct of self-control, such as the Self-Control Questionnaire (Brandon et al., 1990), the Self-Control Schedule (Rosenbaum, 1980), and the Brief Self-Control Scale (Tangney et al., 2004). These measures assess the ability to resist temptation and engage in effortful responses. Example items on these measures include, "I wish I had more self-discipline," and "I usually plan my work when faced

with a number of things to do.” The Self-Control Questionnaire is focused more so on health-related behaviors than domain-general SR (Brandon et al., 1990). Similarly, the Self-Control Schedule is somewhat restricted in that it includes several items focused on somatic symptoms and addictive behaviors (Rosenbaum, 1980).

The Brief Self-Control Scale (BSCS; Tangney et al., 2004) was designed in response to this lack of domain-general self-control scales. The BSCS has been used in several studies since its development; however, recent examinations of the scale have brought to light concerns regarding its unidimensional factor structure. Specifically, two factors were identified, restraint and impulsivity (Maloney et al., 2012). Subsequent investigations have demonstrated that despite this multidimensional factor structure, the total score of the BSCS remains the most powerful in predicting outcomes (Lindner et al., 2015). The BSCS has demonstrated good psychometric properties and has been used in several investigations with undergraduate samples (Manapat et al., 2019; Tangney et al., 2004).

The final approach to the self-report assessment of SR is through the assessment of EF via questionnaire. Some of these measures include the Frontal Systems Behavioral Scale (Grace & Malloy, 2001), the Dysexecutive Questionnaire (Wilson et al., 1996), the Behavior Rating Inventory of Executive Function (Roth et al., 2005), and the Webexec (Buchanan et al., 2010). Though self-report measures of EFs may seem like a viable alternative to behavioral EF tasks, several researchers have raised concerns regarding the construct validity of self-report EF measures. Buchanan (2016) found that self-report EF measures and behavioral EF tasks did not correlate as expected, leading to questions of what the self-reports actually measure. Meltzer and colleagues (2017) echoed this concern that self-report measures are not tapping the same constructs as behavioral EF tasks. When considering these concerns in combination with the

previously mentioned interpretation and error that can already be introduced when using EFs as indicators of SR, using self-report measures of EF may be problematic, depending on the specific research aims.

Summary of SR Measurement

Importantly, comparative studies of these two forms of assessment have indicated that behavioral EF tasks and self-report measures do not demonstrate strong overlap and appear to measure different aspects of SR (Allom et al., 2016; Friedman & Banich, 2019). While this may be expected given what is known regarding shared method variance (e.g., Campbell & Fiske, 1959), it presents a challenge for investigators interested in capturing a comprehensive picture of an individual's SR capacity. Self-report versus behavioral tasks intended to measure SR demonstrate different levels of reliability (Enkavi et al., 2019), validity (Duckworth & Kern, 2011), and real-world predictability (Eisenberg et al., 2019).

Regarding reliability, Enkavi and colleagues (2019) conducted a meta-analysis of 154 studies and found that test-retest reliability was higher for self-report measures than for behavioral EF tasks. The authors suggested this was likely due to the much higher within-subject variability with behavioral EF tasks (Enkavi et al., 2019). As such, they concluded that self-reports are better suited for assessing individual differences than behavioral EF tasks. This indicates that self-reports are likely more appropriate when assessing long-term, trait-like processes involved in psychopathology.

Regarding validity, Duckworth and Kern (2011) conducted a meta-analysis of 282 studies and found that convergent validity was higher for self-report measures than for behavioral measures. In fact, the authors described self-report measures as having “dramatically stronger evidence for convergent validity” (p.11). Given this finding, the authors recommended that any

researchers facing budget, time, or other resource restraints should opt for self-report measures of SR (Duckworth & Kern, 2011). This is because behavioral EF tasks often require more equipment and in-person time, but do not appear to give an added benefit of validity.

Finally, Eisenberg and colleagues (2019) conducted a data-driven analysis and found that self-report measures predict real-world outcomes better than behavioral EF tasks. The authors used a data-driven procedure to connect both self-report measures and EF tasks to the outcomes of substance use, diet and exercise, income/life milestones, and mental health. They found that behavioral EF tasks were much less able to predict these outcomes than self-report measures. They reasoned this could be due to overlap between the higher-order aspects of functioning captured in the self-reports and the outcomes that are not captured in the narrowed focus on a behavioral function with EF tasks (Eisenberg et al., 2019). They also noted the lack of predictive ability could be due to the ‘contrived nature’ of EF tasks; on the other hand, the stronger connection between self-reports and outcomes could be due to shared method variance (Eisenberg et al., 2019). Regardless of the explanation, these findings suggest that connections between EF tasks and real-world outcomes should be interpreted based on the amount of variance explained rather than reaching statistical significance.

Present Study Measures of SR

In considering these advantages regarding reliability, validity, and real-world prediction in addition to the cost, time, and resource benefits, the present study utilized self-report measures to assess SR. As previously specified, three measures of each construct were utilized based on the criteria of (1) aim to capture the overall construct, (2) connection to theory, and (3) frequency of use in the field. The SR measures included in the present study were the SSRQ (Brown et al., 1999; Carey et al., 2004), the ASRI (Moilanen, 2007), and the BSCS (Tangney et al., 2004). The

SSRQ and ASRI were selected based on their goal of assessing the overall ability to regulate behavior. The ASRI in particular was chosen based on its theoretical foundation in Barkley's (1997a) model of SR. Finally, the SSRQ and BSCS were selected based on their widespread use in clinical investigations of SR. All three measures have demonstrated good psychometric properties and have been utilized in undergraduate populations. They will each be described in more detail in Chapter VI.

CHAPTER III

EMOTION REGULATION

Emotions are an integral part of human functioning. It is widely acknowledged that emotions likely evolved to cue adaptive response sets (e.g., Nesse & Ellsworth, 2009). That is, emotions provide valuable information that can be used to guide behavior across contexts. While emotions are often beneficial, it has also been recognized that elements of the emotional experience can disrupt adaptive functioning (Gross, 2014). This potential for disruption creates a need for individuals to be able to monitor, evaluate, and adapt emotional responding, a process referred to as *emotion regulation* (ER; Thompson, 1994). The present chapter provides an overview of the process of ER and speaks to its overlap with SR. First, a brief foundation for understanding emotions is provided. Then, the definition, mechanisms, and functions of ER are described. Next, a theoretical model of ER is presented and connected to Bandura's (1991) and Barkley's (1997a) models of SR. In the final section, key aspects of development, psychopathology, and measurement specific to the process of ER are reviewed. Gender differences are highlighted throughout.

Definition & Theory

Understanding Emotions

Conceptualizations of emotion have shifted drastically since the assumption that emotions were subjective interpretations of physiological reactions (James, 1884). It is now understood that emotions are ways of responding to stimuli in the environment that serve to cue subsequent adaptive response sets (Nesse & Ellsworth, 2009). Specifically, emotions are thought to have evolved as a way to coordinate behavioral, cognitive, and physiological responses to common situations. Ekman (1992) described these common situations as 'fundamental life

tasks,' such as dangers, achievements, or losses, to which certain ways of responding have been more successful, evolutionarily speaking, than others.

Although significant debate remains regarding the universality of emotions (Nelson & Russell, 2013), most theorists agree that emotions tend to differ along the dimensions of valence and intensity (Nesse & Ellsworth, 2009). *Valence* refers to the negative versus positive qualities of an emotion that prompt approach or avoidance behaviors; this is also congruent with the dimension of pleasure versus pain (Barrett, 2006). *Intensity* refers to the degrees or gradations of emotion that could range from none to a maximum that varies across individuals (Reisenzein, 1994). Differences in the valence and intensity of emotions serve as the basis of information needed for a particular response set (i.e., behavioral, cognitive, and physiological responses) to be cued and coordinated. For instance, low levels of joy cue a different response set than high levels of anger.

Relevant to considerations of SR, emotions are inherently goal-directed (Ochsner & Gross, 2014). This is because whether a stimulus is appraised as personally relevant triggers the experience of emotions. An individual seeing a tiger in a cage may not provoke fear; however, seeing an uncaged tiger running toward them increases its personal relevance and likely triggers the experience of fear. In many situations, emotions function to direct behavior such that positive states are increased, and negative states are decreased (Nesse & Ellsworth, 2009). For example, an individual may be motivated to decrease anxiety by declining an invitation to speak at an event. It is important to note, however, that goal states are subjective (Ochsner & Gross, 2014). For instance, if the individual wants to be a performer, they may seek out events to speak at. Gross (2014) emphasizes the idea that emotions are tied to the meaning behind situations, such

that if the situation or the meaning behind the situation changes in terms of the individual's goals, the emotion changes as well.

A critical component of emotions is that they initiate impulses to act or not act (Gross, 2014). This could involve surface level behavioral actions, such as facial expressions, vocalizations, or changes in posture, as well as internal, physiological reactions, such as changes in heart rate, breathing pace, or metabolic support for motoric action. However, as noted, emotions depend on personal goals, which can change based on situational meanings (Gross, 2014). Thus, the cued response that may have been evolutionarily adaptive may not be adaptive in the context of personal goals (Thompson, 1994). This discrepancy between evolutionary-driven emotional responses and personal goals is particularly relevant in dynamic social contexts. As such, individuals need to be able to modulate the experience of emotions across behavioral, cognitive, and physiological domains, giving rise to the need for ER (Gross, 2014).

Defining ER

Domain-general regulation refers to the adaptive modulation of behavior, cognition, or emotion (Nigg, 2017). It is referred to as *emotion* regulation when the target of regulation is emotion. ER involves the ability to adjust or maintain the strength of the experience or expression of emotion (Davidson, 1998). Like domain-general regulation, the process of ER is considered extrinsic if it is facilitated by forces other than the individual. This occurs in early stages of development when children rely on caregivers to regulate their emotions, for example when a caregiver soothes a crying infant (Thompson, 1994). The process of ER becomes increasingly internalized as the child gets older, following a parallel trajectory to SR (Rothbart et al., 2011). Given that multiple modalities (i.e., behavioral, cognitive, physiological) are involved in the experience of emotions, ER correspondingly includes these domains.

More so than with the investigation of SR, the investigation of ER has progressed in two complimentary directions of study: the study of wellness and the study of psychopathology. Studies of ER in the context of wellness often examine mechanisms related to the maximization of positive emotions and the minimization of negative emotions (e.g., Quoidbach et al., 2010), which has led to a well-established bridge between ER and positive psychology (Tamir & Gross, 2011). In addition, increasing recognition of the social aspects of ER has prompted theorists to outline a framework for a distinct form of coping with emotions, referred to as *interpersonal* ER (Zaki & Williams, 2013). Similar to SR, ER has also been investigated from social cognitive (e.g., Ochsner & Gross, 2008), personality (e.g., Stanton et al., 2016), developmental (e.g., Cole, 2014), and clinical (e.g., Sloan et al., 2017) perspectives.

Despite similarities between the widespread investigation of SR and ER, the construct of ER has suffered less from overlapping terms and definitions than the construct of SR, but the issue remains. Some have described this as “conceptual and definitional chaos” (Buck, 1990, p. 330, as cited in Gross, 2014). Perhaps one of the most influential theorists in the study of ER has been James Gross, who has worked to form a cohesive understanding of the construct of ER and its relation to other constructs (Gross, 1998, 2014; [Table 2](#)). Though other theorists have suggested comparable definitions of ER, the present study adopted Gross’s definition, which is specified as follows:

“Emotion regulation refers to the processes by which individuals influence which emotions they have, when they have them, and how they experience and express these emotions. Emotion regulatory processes may be automatic or controlled, conscious or unconscious, and may have their effects at one or more points in the emotion generative process” (Gross, 1998, p. 275).

Multiple aspects of this definition are worth noting. First, like SR, ER can be automatic or controlled, also referred to as bottom-up or top-down ER (Gyurak et al., 2011). For example, an individual looking away from a frightening scene in a movie would be considered reactive, or bottom-up ER, whereas an individual choosing to watch a heart-warming movie to lift their mood would be considered effortful, or top-down ER. Second, ER involves modulation of the ‘what,’ ‘when,’ and ‘how’ of emotions, which Thompson (1994) describes as influencing the dynamics of the emotion itself. These might include the onset, rise time, intensity, duration, and recovery from the emotion (Thompson, 1994). Finally, the element of time is an integral component of ER; this aspect will be described later in this chapter in the context of Gross’s (1998, 2015) model of ER. One important aspect that this definition does not capture is the function of ER, which is to allow flexible emotional responding across contexts. More detail regarding the bottom-up versus top-down components, emotion dynamics, and function of ER is presented next.

Bottom-up vs. Top-down ER. The same dual-process principles that govern bottom-up versus top-down SR also apply to ER (Gyurak et al., 2011). Bottom-up ER can be reflexive or habituated, prime top-down ER, and provide useful information related to goals. Top-down ER reflects an effortful process by the individual to engage regulation abilities in service of goal attainment (Gross, 2014). Unlike SR, ER is unique in that emotions can serve as both the target of regulation and the modality of regulation (Gross, 2014). Bottom-up and top-down processes can be involved in both the generation of emotions and the regulation of emotions (McRae et al., 2012; Ochsner et al., 2009). As a target, emotions can be reactive, such that a stimulus is presented in the environment that cues an emotional response (McRae et al., 2012). For example, an individual might experience sadness when a co-worker does not acknowledge them.

Table 2*Term Definitions for Constructs Overlapping with ER*

Term	Definition
Affect	Superordinate term for valanced states; encompasses emotions, stress responses, and mood.
Emotion	Includes both negative and positive affective states; involves whole-body responses to significant events; elicited by specific objects and gives rise to behavioral response tendencies relevant to these objects.
Mood	Includes negative and positive affective states that last longer than emotions; more diffuse than emotions; may give rise to broad action tendencies such as approach or withdrawal; biases cognition more than biases action.
Stress	Includes negative (but otherwise unspecified) affective states; involves whole-body responses to significant events.
Affect Regulation	Superordinate term for regulating valanced states; encompasses emotion regulation, mood regulation, coping, and defense mechanisms.
Emotion Regulation	Process of influencing which emotions one has, when one has them, and how one experiences or expresses these emotions.
Mood Regulation	Concerned with altering emotion experience rather than emotion behavior.
Coping	Primary focus on decreasing negative emotions; effortful processes; emphasis on longer periods of time than emotion or mood regulation.
Defense Mechanisms	Primary focus on decreasing negative emotions; occur unconsciously; stable individual differences rather than processes.

Note. Term definitions sourced from Gross (1998, p. 273; 2014, pp. 5-6).

Conversely, emotions can also be generated by the individual, for example recalling an experience of loss could lead to sadness. In a similar sense, emotions can be regulated via reactive or effortful processes (Gross, 2014). An individual might turn to walk the other direction to avoid experiencing anxiety if they unexpectedly run into their boss at the grocery store (bottom-up ER) or they might choose to go for a run if they are experiencing anger (top-down ER). Evidence suggests that emotions generated by top-down processes are better regulated by top-down processes, and vice versa (McRae et al., 2012).

Modalities of ER. ER involves monitoring, evaluating, and adjusting the ‘what,’ ‘when,’ and ‘how’ of emotions (Gross, 2014). The first element, the ‘what’ of emotions, refers to what emotion is being expressed or experienced, such as anger, fear, joy, or sorrow, among many other possibilities (Nesse & Ellsworth, 2009). The expression and experience of an emotion involves processes across modalities, including but not limited to cognitive factors, physiological arousal, executive function activation, and behavioral action tendencies (Thompson, 1994). In this sense, ER matches SR in its pervasiveness across modalities. An example of ER impacting the ‘what’ of an emotion might be a caregiver attempting to inhibit boredom and instead feign interest in a child’s soccer game. The caregiver would need to maintain attention, cognitively reappraise the situation by reminding themselves things like, “It will be over soon,” and engage in relevant actions such as clapping and cheering at the appropriate times. By coordinating these responses, ER works across modalities to facilitate an adaptive response relative to the individual’s goals (Gross, 2014).

The second element, the ‘when’ of emotions, involves the onset of the emotional experience (Thompson, 1994). This is closely related to an EF described in the process of SR: response inhibition. Being able to inhibit the prepotent emotional response can be adaptive in a variety of contexts (Barkley, 2015). For example, inhibiting the initial response of laughter when a child is misbehaving and waiting to laugh until the child is out of earshot. This will be discussed more in the context of Barkley’s (1997a) model later in this chapter.

The third element, the ‘how’ of emotions, refers to altering the way the emotion is expressed (Gross, 2014). An individual might express anger in a variety of ways, including initiating a physical fight, yelling, or destroying property. In many cases, these expressions may be maladaptive; to regulate this emotional response, an individual might inhibit the initial

tendency, and instead take three deep breaths. Adjusting the format of emotional expression is a particularly important aspect of social functioning, among other domains (Thompson, 1994).

The remaining emotion dynamics describe the course of the emotional experience. That is, how long does it take for an emotion to reach its maximum (rise time), where does it plateau (intensity), how long does it last (duration), and how quickly does it return to baseline (recovery; Thompson, 1994). Each element of an emotion's trajectory is reflective of individual differences (Kuppens & Verduyn, 2015). How quickly an individual becomes angry, what maximum anger looks like for them, and how long it takes for them to move past the stimulus that triggered the anger are all subjective variables connected to trait-like, emotional tendencies. Further complexity stems from the fact that individuals can vary on each dynamic dimension both across emotions (i.e., different courses for anger versus sadness) and within emotions (i.e., quick rise time for anger in some situations but slow rise time in others; Davidson, 1998).

Other factors that influence the course of emotions include relevance of the stimulus to personal goals and values (Verduyn et al., 2013), as well as characteristics of the situation, including stimulus frequency, intensity, and duration (Verduyn et al., 2012). These factors, in combination with the individual differences in emotion dynamics mentioned above, help to set thresholds for emotional experience and expression as well as thresholds for when ER abilities are engaged (Davidson, 1998).

Functions of ER. As previously stated, emotions are goal-directed in that they serve to cue adaptive responses (Ochsner & Gross, 2014). However, while the cued response may have been evolutionarily adaptive in the context of a fundamental life task (e.g., danger, achievement, loss), it may no longer be adaptive (Thompson, 1994). Nesse and Ellsworth comment on this discrepancy by noting, "Emotions are often elicited in situations in which they are useless" (p.

133). Beyond uselessness, Thompson (1994) argues that emotions can be inappropriate in guiding behavior and thus maladaptive. These points highlight the potential mismatch between an emotion and a future goal. The mismatch might stem from situational factors, such that with dynamic social environments, adaptive responses that align with goals may shift over time. Another possibility is that the mismatch stems from person-specific goals (e.g., evolution or learning principles might lead to a fear of heights, yet an individual's goal may be to become a tree trimmer). This discrepancy between response and goal generates a need for the individual to engage ER abilities (Gross, 2014).

The process of ER provides humans with a higher-order, future-oriented skill set that is able to supersede prepotent emotional responses to facilitate goal attainment (Nesse & Ellsworth, 2009). Such goals may be related to a desired increase in positive or decrease in negative emotions, or they may be connected to non-emotional goals (Tamir, 2016). Examples might include feigning excitement about a gift to protect a friend's feelings, attempting to remain calm when driving in a snowstorm, or persevering through frustration after hitting a writer's block. Theorists who view ER from the perspective of utility in general goal pursuit recognize its fundamental connection with the process of SR (e.g., Tamir, 2009, 2016). In other words, ER and SR converge when ER is employed in service of non-emotional goals associated with delayed, rather than immediate rewards.

In order to be adaptive in dynamic environments, emotional responding needs to be flexible, specific to the situation, and overall helpful for the individual (Thompson, 1994). Responding reactively based solely on stimulus-response tendencies does not help the individual work toward long-term goals. For this flexibility to be accomplished, the emotion needs to be regulated from several different points and perspectives. The ways through which ER

successfully modulates emotional responding is described next through discussion of Gross's (1998, 2015) model of ER.

Models of ER

Gross's (1998, 2015) theoretical and empirical work has been a notable catalyst in the exponential growth of ER research beginning in the 1990s. While other models of ER are also prominent (e.g., Gratz & Roemer, 2004; Thompson, 1994) and are incorporated into the present study's conceptualization of ER, no other model is as detailed a framework or widely investigated as Gross's process model (1998) and extended process model (2015) of ER (Tull & Aldao, 2015). In the present discussion, Gross's (1998) process model will be described first, followed by the extended process model (Gross, 2015). The overlap between Gross's (2015) model of ER and Bandura's (1991) model of SR will be highlighted. Then, ER will be placed in the context of Barkley's (1997a) model of SR and connected to EF.

Gross's (1998) Process Model of ER. Discussion of Gross's (1998) model of ER first necessitates an overview of the modal model of emotions. This refers to the sequence of an emotional experience from situation, to attention, to appraisal, to response, that occurs across time (Gross, 2014; left column of [Table 3](#)). First, the situation relevant to an emotion occurs, which could be external or internal. Next, the situation serves to capture attention if it is deemed relevant to personal goals. Then, the attention-grabbing stimulus is appraised as either positive or negative in connection to the individual's goals. Finally, a response is cued across behavioral, cognitive, and physiological domains.

Table 3*Process Model of Emotion Regulation (Adapted from Gross, 2014)*

	Stage of Emotional Experience	Corresponding ER Strategy
← Time	Prior to emotional experience	Situation Selection
	Situation	Situation Modification
	Attention	Attentional Deployment
	Appraisal	Cognitive Change
	Response	Response Modulation

The original process model of ER (Gross, 1998) emphasizes that each component of the modal model of emotion, in addition to selecting the situation itself, can be the targets of ER abilities. Gross (2014) describes these as ‘families’ of ER strategies. These include situation selection, situation modification, attentional deployment, cognitive change, and response modulation (Gross, 1998, 2014; right column of Table 3). Other than the target itself, the main component that differentiates these ER processes is the element of time. For instance, situation selection would occur prior to the experience of emotions, situation modification would occur at the beginning of the emotional experience, and so on (Gross, 2014). Each of the five families of ER strategies will be briefly described next.

Situation selection operates by altering the probability of experiencing or not experiencing an emotion by choosing situations based on their likely emotional impact (Gross, 2014). This might involve aiming to increase positive emotions, such as scheduling a spa day after a difficult exam, or decrease negative emotions, such as putting off a tax appointment.

Situation modification refers to altering aspects of the situation in order to adjust the associated emotional impact (Gross, 2014). For example, if an individual is unable to avoid attending a dinner party at their in-laws, bringing a bottle of wine could help to alleviate distress. This can be contrasted with situation selection, which would involve declining the invitation to attend in the

first place. *Attentional deployment* refers to directing attention toward or away from an emotional stimulus in order to alter the emotional experience. Gross (2014) describes a specific strategy within attentional deployment, referred to as *distraction*, that involves replacing the emotional stimulus with a different stimulus (Gross, 2014). This could be distraction from an external stimulus (e.g., focusing on eating candy during a particularly frightening part of a movie) or an internal stimulus (e.g., watching television if nervous about an upcoming job interview).

Cognitive change refers to altering thought patterns connected to an emotional experience. A specific ER strategy within this family, referred to as *reappraisal*, has become one of the most well-studied ER strategies (e.g., Diedrich et al., 2016; Milyavsky et al., 2019). Reappraisal can involve rethinking an aspect of the situation itself, such as reframing a stressful exam as a ‘learning opportunity,’ or rethinking the interpretation of the situation, such as changing the thought, “If I do poorly on the exam, I must be stupid,” into “If I do poorly on the exam, it is not a reflection of me as a person,” (Gross, 2014). Another specific strategy in this family is *rumination*, or repetitive focus on thoughts, feelings, and behaviors related to internalizing distress (Nolen-Hoeksema et al., 2008). Although the distress is cognitively focused on during rumination, active strategies regarding how to address the emotion or problem itself are not generated or enacted. This leaves individuals in a prolonged state of negative affect and is not considered an adaptive ER strategy (Nolen-Hoeksema, 2012).

The final ER strategy family is *response modulation*, which includes strategies that are engaged during the latest stages of the emotional experience, after a response tendency has been triggered (Gross, 2014). Response modulation refers to changing something about the response itself; this can occur across behavioral, cognitive, or physiological domains. This ER strategy activates the process of inhibition. Emotional response inhibition overlaps with another

commonly studied ER strategy, referred to as *suppression* (e.g., Ehring et al., 2010; Goldin et al., 2008). Whereas inhibition refers more generally to inhibiting a prepotent response, suppression specifically involves inhibiting responses associated with emotional behaviors, which could include facial expressions, vocalizations, gestures, or body posture (Goldin et al., 2008). All five ER strategy families are frequently used both on their own and in combination with each other throughout daily life (Gross, 2014).

Gross's (2015) Extended Process Model of ER. While the original (1998) process model focuses on the importance of ER strategies, the extended model includes the critical role of valuation, that is, the worth or level of meaning assigned to a situation based on the individual's goals (Gross, 2015). Gross's proposed (2015) model includes a series of interrelated levels of valuation that interact to influence the process of ER. Although this was a necessary and beneficial addition to the original model, it is grounded in cybernetic/control systems theory and is beyond the scope of the current discussion. Nevertheless, the idea of evaluating an emotion or behavior in the context of one's goals is an integral component of domain-general SR and underscores the overlap between SR and ER (Nigg, 2017). Gross's (2015) extended process model adds another useful element in considering the overlap between ER and SR, such that the process of ER is divided into three stages that overlap with several aspects of SR. The stages are specified as follows:

1. *Identification*: concerned with when to regulate an emotion;
2. *Selection*: concerned with what strategy to use to regulate an emotion;
3. *Implementation*: concerned with implementing a particular tactic suited to the present situation (Gross, 2015, pp. 14-15)

Identification Stage. In the identification stage, the emotional experience is perceived, evaluated as positive or negative affect, and gauged in intensity to determine whether ER abilities should be activated (Gross, 2015). For example, an individual might recognize that a feeling of sadness is distracting them from their work and thus needs to be addressed. The identification stage corresponds to the self-observation stage of Bandura's (1991) model of SR in that it requires emotional awareness, understanding of antecedents and consequences, and motivation to attend to emotional behaviors. Like self-observation in SR, identification of emotions is impacted by an individual's cognitive schemas, goal sets, and social priorities, as these factors influence which emotions are given more conscious awareness or direct attention (Bandura, 1991). This functions to provide the information necessary for the remainder of the SR/ER process.

Selection Stage. In the selection stage, possible ER strategies are perceived and brought to awareness, evaluated based on their match to the current emotional experience, and decided upon (Gross, 2015). For example, an individual might prefer to use the strategy of distraction when sad and decide to use this strategy in the current situation. The selection stage corresponds to the judgement stage of Bandura's (1991) model of SR in that it requires knowledge of possible adjustments and a decision-making process regarding which adjustments would lead to desired outcomes. Selecting an effective strategy depends on how the individual evaluates the importance of the activity in relation to their goals and whether they feel able to address the issue themselves (i.e., considerations of self-efficacy and locus of control; Bandura, 1991).

Implementation Stage. Finally, the implementation stage involves placing the chosen ER strategy in the current context, evaluating whether any other specialized adjustments need to be made, and enacting the strategy (Gross, 2015). For example, the individual might consider the

use of distraction to alleviate sadness, recognize that they still need to get work done, and determine that a brief distraction strategy (e.g., a 10-minute walk), would be best suited to the current context. The implementation stage corresponds to the self-reaction stage of Bandura's (1991) model of SR in that it involves the enactment of behavioral adjustment in order to meet individual goals. This stage draws on the individual's motivation to adjust behavior and ability to do so. The ideas of implementation (Gross, 2015) and self-reaction (Bandura, 1991) map on to Barkley's (1997a) idea of motor control/syntax/fluency (e.g., goal-directed behavior).

Given the overlap between the processes of SR and ER, it is no surprise that just as Gross's (1998, 2015) model corresponds to elements of Bandura's (1991) model of SR, it also corresponds to Barkley's (1997a) model. Importantly, consideration of ER in the context of Barkley's (1997a) model allows for a connection to be drawn between ER and EF. This connection will be discussed next.

ER in the Context of Barkley's (1997a) Model of SR. Barkley's (1997a) model of SR directly specifies that ER processes fit into the model under the *affect/motivation/arousal* component. Three important aspects of this model will be highlighted: the relationship between response inhibition and ER, the relationship between ER and EF, and the relationship between ER and the outcome component of motor control/fluency/syntax.

As previously mentioned, the idea of emotional response inhibition maps on to the domain-general response inhibition EF component of Barkley's (1997a) model. Similar to SR, Barkley (2015) conceptualizes emotional response inhibition as being the first step in the process of ER. Inhibiting the initial response tendency provides a delay period that allows for effortful ER strategies (e.g., Table 3) to be employed. If the individual has already expressed the prepotent emotion, then they will not be able to exert control and act intentionally or flexibly

across situations (Barkley, 2015). Having a delay between the stimulus and the emotional response can help the individual to consider the greater social context and respond in a socially adaptive way (Barkley & Fischer, 2010). ER abilities therefore depend on the EF of response inhibition. Indeed, empirical evidence has supported this connection (e.g., Hinshaw, 2003; Kühn et al., 2014; Tang & Schmeichel, 2014).

Despite the conflicting terminology use, part of the ‘affect’ regulation component of Barkley’s (1997a) model can be conceptualized as being synonymous with effortful ER. After the prepotent response is inhibited, effortful ER strategies can be employed in service of goal attainment, whether that be regarding emotional or non-emotional goals (Barkley, 2015; Tamir, 2016). Once the initial emotional response is inhibited, ER is able to work in conjunction with the other EFs in Barkley’s model (i.e., working memory, internalization of speech, and reconstitution) to adaptively adjust behavior (Barkley, 1997a). Empirical findings support relationships between ER and working memory (e.g., Schmeichel et al., 2008), verbal fluency (Gyurak et al., 2012), task-switching (Whitmer & Banich, 2007), and problem-solving (Blanchard-Fields, 2007). Overall, these studies have demonstrated that individual differences in EF are directly connected to differential success in regulating emotions (Hofmann et al., 2012; Schmeichel & Tang, 2015).

As stated, the implementation stage of Gross’s (2015) model in which an ER strategy is enacted overlaps with the motor control/syntax/fluency component of Barkley’s (1997a) model in the form of organized, goal-directed behavior. From this perspective, ER and SR utilize the same underlying mechanisms and have the same functional outcomes; the key differentiation is that with ER processes, the target of regulation is the emotional experience (Gross, 2014).

Development

The ability to regulate emotions emerges early on in development and follows a parallel trajectory to SR development (Rothbart et al., 2011). In light of the inherent overlap between these constructs, the same developmental features discussed in relation to SR also apply to ER. Further, like SR, ER should be considered as a process that develops alongside other, related processes (Sroufe, 2007). However, ER is unique in that it is intricately connected to the development of emotion itself (Thompson, 2011). As new emotions and corresponding dynamics emerge over the lifespan, regulation abilities must adapt (Davidson, 1998). Although the connection between ER and emotional development is understandably strong, ER also shares reciprocal relationships with neurological, cognitive, and social domains of development. These relationships will be described next in the context of emerging adulthood. Then, gender differences in ER will be highlighted.

ER in Emerging Adulthood

Perhaps the most relevant aspect of neurological development to the process of ER is the maturation of connections between the frontal lobe and the limbic system (Taber-Thomas & Pérez-Edgar, 2015). During emerging adulthood, white matter continues to increase, and the processes of myelination and synaptogenesis are ongoing, all of which help to increase the efficiency of the fronto-limbic pathway. This allows the frontal and prefrontal cortices, which are critical for higher-order EFs, to gain more control over the limbic system, which is a key component of emotion processing (Ahmed et al., 2015; Taber-Thomas & Pérez-Edgar, 2015). Maturation of these brain regions corresponds to increasing emotional functioning and goal-directed behavior (Taber-Thomas & Pérez-Edgar, 2015).

Cognitive elements are also closely related to ER development in emerging adulthood. Similar to the influence of postformal thought on the evaluative component of SR, decisions of ‘right’ versus ‘wrong’ play a role in the valuation and strategy selection components of ER (Gross, 2015). Postformal thought can influence cognitive appraisal and reappraisal strategies, such that both logic and subjectivity are required to adaptively interpret emotional events (Despotović, 2014). For instance, if an individual is late for an exam and gets a speeding ticket, an effective reappraisal might include flexibility in the interpretation of ‘right’ (i.e., not speeding) and ‘wrong’ (i.e., speeding) by keeping in mind the motivation behind the situation (i.e., to get to the exam on time). This reappraisal might serve to better regulate the resulting negative emotions. Cognitive reappraisal abilities have been found to increase linearly into emerging adulthood (McRae et al., 2012).

An interesting overlap between ER and cognitive development is the notion of risk-taking. Risk-taking, particularly in the context of sensation seeking, or the desire to increase stimulation, has been identified as an ER strategy. For example, extreme sports (Woodman et al., 2008), prolonged exposure high-risk sports (Woodman et al., 2010), and even substance use can all be considered strategies to modify the emotional experience (Gross, 2015). It is possible that the decline in risk-taking observed in late adolescence and emerging adulthood may correspond with an increase in adaptive ER and a broader range of ER strategies to choose from. This possibility is supported by evidence suggesting that ER strategies shift across the lifespan (e.g., Charles & Carstensen, 2014).

As mentioned, ER and emotional development go hand in hand. ER abilities are particularly important during late adolescence and emerging adulthood when emotional insecurity is high (Zimmermann & Iwanski, 2014). For individuals in this developmental period,

the emotional experience might fluctuate quickly and follow varying courses (Crone & Dahl, 2012). Perhaps expectedly, higher levels of emotional reactivity, or individual variation in the course of an emotion, have been shown to require higher levels of ER (Hare et al., 2008). In addition, emotions tend to be more complex and more negative during late adolescence and emerging adulthood than other developmental periods (Galambos et al., 2006; Hay & Diehl, 2011). Thus, the ongoing development of emotion necessitates a corresponding development of ER abilities (Thompson, 2011).

Late adolescence and emerging adulthood represent the peak of reward sensitivity, showing a decline into the early twenties (Urošević et al., 2012). Reward sensitivity is particularly relevant to the valuation system involved in ER, such that sensitivity toward riskier rewards can outweigh the value of prosocial rewards (Gross, 2015). As the fronto-limbic system continues to mature, emerging adults become better at integrating emotional and social information regarding rewards, helping them to evaluate rewards based on the greater social context rather than being biased toward riskier rewards. Socially, theory of mind and empathy skills are also maturing through this period, allowing for better integration of the social context into individual emotional experiences and subsequent ER processes (Smits et al., 2011; Stietz et al., 2019). Overall, these transitions reflect an underlying maturation of emotional processes that is reflected in the maturation of ER abilities (Zimmerman & Iwanski, 2014). Parallel to the rationale behind examining SR abilities during emerging adulthood, the present sample also represented a dynamic period for the examination of ER.

Gender Differences in ER

Unlike the inconsistent gender differences observed in SR, gender differences in ER are well-documented (Nolen-Hoeksema, 2012). Although it is a commonly held belief that females

are more emotional than males, empirical evidence regarding this difference is not clear (Barrett & Bliss-Moreau, 2009). What is clear is that women report using a wider variety of ER strategies and using them more often than males (Nolen-Hoeksema, 2012). Interestingly, Nolen-Hoeksema (2012) connects these patterns to the observed gender differences in developmental studies of effortful control. Females appear to have slightly higher effortful control and delay of gratification abilities than males (Raffaelli et al., 2005; Silverman, 2003).

While this adaptive advantage of SR and ER abilities should perhaps lead to reduced prevalence of related disorders for females, this is not the case (Nolen-Hoeksema, 2012). It is possible this is due to different implications of the ER strategies most frequently used by females versus males (e.g., McRae et al., 2008). Specifically, several studies have demonstrated that females are more likely to engage in rumination and seeking social support, whereas males are more likely to engage in suppression or avoidance to regulate emotions (Johnson & Whisman, 2013; Flynn et al., 2010; Tamres et al., 2002). Gender differences in strategy use persist even after emotional intensity is controlled (Zimmermann & Iwanski, 2014).

Unlike SR, there is clear evidence of gender differences in ER. Those differences, however, appear to be more related to magnitude or frequency rather than the underlying structure of ER. That is, although females appear to use a wider variety of strategies and use them more frequently than males, the actual strategies implemented are common to both males and females (Nolen-Hoeksema, 2012). Overall, evidence does not seem to suggest that the underlying structure of ER might differ between males and females.

Psychopathology

Considering that emotions are an integral part of human functioning, it makes sense that deficits in ER abilities can impact several domains of functioning. Davidson (1998) notes that

most, if not all, forms of psychopathology involve an emotional component. ER deficits have been associated with impairment in academic (e.g., Seibert et al., 2017), occupational (e.g., Totterdell et al., 2012), and social (e.g., Lopes et al., 2005) functioning. ER is considered a transdiagnostic construct (Sloan et al., 2017) and has been consistently connected to both internalizing and externalizing forms of psychopathology (Aldao et al., 2016). These can include mood disorders (e.g., Joormann & Siemer, 2014), anxiety disorders (e.g., Campbell-Sills et al., 2014), and substance use disorders (e.g., Kober, 2014). The present study focused on a widespread form of psychopathology with a well-established connection to ER deficits, depression.

ER & Depression

It has been suggested that individuals with depression do not necessarily experience higher levels of negative emotions than other people, but that they are less able to regulate those emotions (Joorman & Stanton, 2016). Sheppes, Suri, and Gross (2015) identified specific points of the ER process that, when dysregulated, could lead to depressive symptoms. First, during the identification stage, when an emotional experience has been identified that reaches the threshold of requiring ER abilities, the individual must actively engage ER abilities (Gross, 2015). If an individual fails to follow through on this step, it could be related to learned helplessness or low self-efficacy (Bandura et al., 2003; Sheppes et al., 2015). When ER abilities are not activated in this step, the original emotion persists; if the emotion was negative, this could lead to a prolonged period of negative affect for the individual.

Next, in the selection stage, a depressed individual may consider only maladaptive ER strategies, such as rumination, suppression, or other forms of response modulation that could lead to over-eating, over-sleeping, self-harm, or suicidal ideation (Sheppes et al., 2015).

Evidence from a recent meta-analysis indicated that individuals with depression use more maladaptive strategies and less adaptive strategies than their non-depressed counterparts (Visted et al., 2018). In particular, the ER strategy of rumination has been consistently connected to depression (Zhou et al., 2020). Although intended by individuals who use this strategy as a way to regulate emotions, rumination has been found to exacerbate depressive symptoms (Nolen-Hoeksema et al., 2008). ER deficits at this stage can be particularly impairing if the individual believes the ER strategy they are implementing is beneficial when, in fact, it is detrimental.

Finally, in the implementation stage, an individual may fail to effectively implement an ER strategy (Sheppes et al., 2015). Failure at this step could be related to a decreased ability to implement effective ER strategies, such as difficulty with cognitive reappraisal (Joorman & Stanton, 2016). It could also be related to learned helplessness or low self-efficacy, similar to the identification stage (Bandura et al., 2003). Sheppes and colleagues noted that deficits at any stage of the ER process can serve to initiate or maintain depressive episodes (2015).

ER, Gender, & Depression

The relationships among ER, gender, and depression have received significant empirical attention in the last several years. Studies have indicated that adaptive strategies (e.g., reappraisal, acceptance) do not have the same level of influence on reducing depressive symptoms that maladaptive strategies (e.g., rumination, suppression, avoidance) have on exacerbating depressive symptoms (Aldao et al., 2010). While females tend to use more ER strategies overall than males, theorists have suggested that the use of adaptive strategies may be helpful only in some contexts, whereas the use of maladaptive strategies is detrimental in all contexts (Nolen-Hoeksema & Aldao, 2011). For example, reappraisal or acceptance may not be helpful if the situation is in fact harmful or dangerous.

In particular, the connection between the maladaptive strategy of rumination and depressive symptoms appears to be strong, as evidenced by large effect sizes across samples (Aldao et al., 2010; Zhou et al., 2020). This has highlighted the connection between the use of rumination as an ER strategy and the higher prevalence rates of depression for females (Johnson & Whisman, 2013). Nolen-Hoeksema (2012) suggested that, based on evidence that females have heightened emotional awareness and have likely been socialized differently regarding emotional expression than males, it is possible that sometimes the heightened awareness and reflective focus becomes maladaptive and leads to rumination. Indeed, ER strategies have been found to mediate the relationship between emotional awareness and depressive symptoms (Eastabrook et al., 2014). Overall, past research suggests the impact of ER on depressive symptoms may be stronger for females than for males.

Measurement

Though substantial work has been done to differentiate the process of ER from related processes, issues with the path from theory to measurement of ER remain. This likely reflects the complexity of ER as a construct, including its pervasiveness across modalities, variety of possible strategies, and range of functional outcomes (Gross, 2014). A lack of clarity in the operationalization and measurement of ER has prompted calls for the examination of its construct validity (Bridges et al., 2004; Weems & Pina, 2010). Similar to the challenges noted with SR measurement, this lack of clarity seems to stem from the wide variability in both the methods and content of ER measurement (Adrian et al., 2011).

Common approaches to ER measurement include behavioral assessment of EFs and self-report measures (Fernandez et al., 2016). Methods such as affective/emotion/mood induction techniques (e.g., CO₂ challenge, Trier Social Stress Test, watching video/film clips) and

biological or physiological indicators (e.g., skin conductance, heart rate variability, facial electromyography [EMG], or electroencephalogram [EEG]) have also been used to assess ER (Adrian et al., 2011; Britton et al., 2012; Fernandez et al., 2016; Latham et al., 2017). While these approaches are instrumental in assessing aspects of ER not captured in EF tasks or self-reports, they are much more specific to the study of emotion than to domain-general SR or SPS. Thus, the following review will focus on the use of behavioral EF tasks and self-report measures of ER. Then, measures to be utilized in the present study will be specified.

Behavioral EF Tasks

Given that the same underlying mechanisms associated with SR are also thought to contribute to ER (e.g., response inhibition, working memory, set-shifting), some of the behavioral EF tasks used in SR research have been adapted for investigations of ER. Typically, tasks are adapted to include emotional content, such as pictures of emotional facial expressions, emotion-related words, or other elements intended to induce emotion during the task (e.g., Aker, 2019). Examples of emotionally adapted EF tasks utilized in ER research include, but are not limited to the following:

1. Inhibition
 - a. Emotional Go/No-Go Task (Murphy et al., 1999)
 - b. Emotional Stop Signal Task (Pawliczek et al., 2013)
 - c. Emotional Stroop Task (McKenna, 1986)
2. Working Memory
 - a. Affective *n*-back Task (Schweizer et al., 2011)
3. Set-Shifting
 - a. Emotional Picture Sorting Task (Aker & Landrø, 2014)
 - b. Attentional Control Capacity for Emotion (Johnson, 2009)

These tasks have been used in varied investigations of ER (e.g., Aker et al., 2014; Hare et al., 2008; Kappes & Bermeitinger, 2016). As with the use of EF tasks in the investigation of SR, concerns have been raised regarding the reliability (e.g., Eide et al., 2002) and predictive utility

(e.g., Wright et al., 2014) of some of these tasks. Regarding validity, it is unclear whether these tasks indeed assess ER, if the intended measurement of the original EF is preserved, or if they actually assess facets of domain-general SR in the context of emotional stimuli (e.g., Algom et al., 2004; De Ruiter & Brosschot, 1994; Schulz et al., 2007). In addition, concerns related to the use of behavioral EF tasks to assess SR also apply to the assessment of ER.

Self-Report Measures of ER

In light of the complexity of ER as a construct, the focus of self-report measures varies based on differences in the underlying theory used in developing the measure. Some measures focus on overall ER ability, some focus on specific modalities of ER (e.g., cognitive, behavioral), and some focus on strategy implementation (Bridges et al., 2004). These approaches to ER assessment via self-report are summarized next.

Perhaps the most widely used measure in clinical investigations of ER is the Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004). The DERS contains six subscales, including: (1) nonacceptance of emotional responses, (2) difficulty engaging in goal-directed behavior, (3) impulse control difficulties, (4) lack of emotional awareness, (5) limited access to emotion regulation strategies, and (6) lack of emotional clarity. These subscales highlight the aim of the DERS to capture a broad picture of ER abilities (Gratz & Roemer, 2004). The DERS has been used in a variety of clinical contexts to assess overall ER (e.g., Lafrance et al., 2014; Shorey et al., 2011; Tull et al., 2007). Further, this measure has demonstrated good psychometric properties and has been validated across genders, racial identities, and within undergraduate populations (Gratz & Roemer, 2004; Ritschel et al., 2015). The DERS was developed to measure only negative emotions (Gratz & Roemer, 2004). Given that positive emotions are also regulated, a second measure was developed in order to remedy this imbalance, titled the DERS-Positive

(Weiss et al., 2015). Despite the benefit of capturing positive emotions, the DERS-Positive is not frequently utilized in clinical investigations, likely due to a reduced connection between positive emotions and psychopathology.

Recently, a measure was developed that aims to assess the overall ability to regulate emotions as theorized by Gross's (2015) extended process model. The Perth Emotion Regulation Competency Inventory (PERCI) was designed to assess the regulation of both positive and negative emotions simultaneously (Preece et al., 2018). The PERCI includes eight subscales, four of which map on to negative emotions while the other four map on to positive emotions as follows: (1) negative-controlling experience, (2) negative-inhibiting behavior, (3) negative activating behavior, (4) negative-tolerating emotions, (5) positive-controlling experience, (6) positive-inhibiting behavior, (7) positive-activating behavior, and (8) positive-tolerating emotions (Preece et al., 2018). The original validation study demonstrated good psychometric properties and included undergraduate students (Preece et al., 2018). Though this measure fills an important gap in the literature through its foundation in Gross's updated (2015) model, it has yet to gain widespread use in the field.

Another measure designed to assess overall ER ability is the Regulatory Emotional Self-Efficacy Scale (r-RESE; Zou et al., 2019). The r-RESE is comprised of four subscales, including: (1) the up-regulation of positive emotions, (2) the down-regulation of positive emotions, (3) the down-regulation of despondency or distress, and (4) the down-regulation of anger. Like the PERCI, this measure was designed to assess the regulation of positive and negative emotions; however, the r-RESE is not able to be combined into a total score that reflects both domains (Zou et al., 2019). Further, the specificity of the items and resulting subscales do not appear to capture

the full construct of ER as described in Gross's (1998, 2015) models. The r-RESE demonstrated good psychometric properties but has not yet gained widespread use in the field.

In contrast to measures designed to assess the overall ability to regulate emotions, some measures focus on specific modalities of ER. Two complimentary examples that use this approach are the Cognitive Emotion Regulation Questionnaire (CERQ; Garnefski et al., 2002) and the Behavioral Emotion Regulation Questionnaire (BERQ; Kraaij & Garnefski, 2019). The CERQ was designed to assess nine ER strategies that utilize cognition, including: (1) self-blame, (2) other-blame, (3) rumination or focus on thought, (4) catastrophizing, (5) putting into perspective, (6) positive refocusing, (7) positive reappraisal, (8) acceptance, and (9) refocus on planning (Garnefski et al., 2002). The BERQ was designed to assess two facets of behavioral ER, including style of responding and common strategies used in response to stress (Kraaij & Garnefski, 2019). The five subscales of the BERQ include: (1) seeking distraction, (2) withdrawal, (3) actively approaching, (4) seeking social support, and (5) ignoring (Kraaij & Garnefski, 2019). Though these scales provide the ability to focus on individual modalities of ER, they do not represent the complete construct of ER, which encompasses skills across multiple modalities.

Yet another approach to the assessment of ER via self-report is through measurement of specific ER strategies. Some measures aim to assess a range of ER strategies, such as the Regulation of Emotion Systems Survey (RESS; De France & Hollenstein, 2017). The RESS assesses the strategies of distraction, rumination, reappraisal, suppression, engagement, and arousal control. Other measures assess a subset of the most frequently used ER strategies, for example the Emotion Regulation Questionnaire (ERQ; Gross & John, 2003), which focuses on the strategies of reappraisal and suppression. Finally, some measures focus on individual ER

strategies, such the Ruminative Responses Scale (a subscale of the Response Style Questionnaire), which is commonly used to assess rumination (e.g., Nolen-Hoeksema et al., 1993).

Though measures that assess specific ER strategies do not capture the whole construct of ER, one measure's ubiquitous use in the field warrants consideration. The ERQ developed by Gross and John (2003) is considered a widely-used measure of ER despite its focus on ER strategies (Preece et al., 2018). A likely reason for this is that it accurately reflects Gross's (1998) process model of ER before it was extended in 2015. This measure has been used in varied clinical investigations of ER (e.g., Joormann & Gotlib, 2010; Meyer et al., 2014). The ERQ has demonstrated good psychometric properties and has been validated in undergraduate populations (Melka et al., 2011).

Present Study Measures of ER

In correspondence with the rationale provided for the use of self-report measures to assess SR, the present study utilized self-report measures to assess ER. The ER measures included were the DERS (Gratz & Roemer, 2004), the PERCI (Preece et al., 2018), and the ERQ (Gross & John, 2003). The DERS and the PERCI were selected based on their aim to capture the overall construct of ER. The PERCI and the ERQ were chosen based on their theoretical foundation in Gross's (2015) and (1998) models of ER, respectively. Finally, the DERS and the ERQ were selected as they are arguably the two most commonly used measures in clinical investigations of ER. All three measures have demonstrated good psychometric properties and have been utilized in undergraduate populations. They will each be described in more detail in Chapter VI.

CHAPTER IV

SOCIAL PROBLEM-SOLVING

Problems inevitably arise in the course of everyday life. The social environment can generate a variety of problems, ranging from smaller issues such as dealing with an irritable co-worker to larger issues such as losing a job. The failure to solve a problem can lead to an array of negative consequences or the inability to attain a goal (Nezu, 2004). Given this potential for adverse outcomes, the ability to identify effective solutions to problems is considered a crucial aspect of adaptive functioning. The process by which individuals understand, appraise, and adapt to problems in daily living is referred to as *social problem-solving* (SPS; D’Zurilla & Nezu, 1990). The present chapter provides an overview of the process of SPS and highlights its overlap with SR and ER. First, the definition, mechanisms, and functions of SPS are described. Next, a theoretical model of SPS is presented and connected to Bandura’s (1991) and Barkley’s (1997a) models of SR as well as Gross’s (2015) extended process model of ER. In the final section, key aspects of development, psychopathology, and measurement specific to the process of SPS are reviewed. Gender differences are highlighted throughout.

Definition & Theory

Defining SPS

The concept of problem-solving has been studied in a multitude of forms across the field of psychology. In a general sense, problem-solving is conceptualized as a process of identifying and implementing the steps necessary to move from an initial state to a goal state (Sweller, 1988). This is often measured using tasks outlining specific problems that have a limited number of optimal solutions, such as mathematical calculations, mazes, or puzzles (Heppner & Peterson, 1982). However, problems that individuals encounter in daily life do not always fit into clear

categories or have optimal solutions. Thus, practitioners in the field identified a need to distinguish problems in daily living from prototypical problems assessed in laboratory experiments (D’Zurilla & Goldfried, 1971).

Common terms used to identify this type of problem-solving include *interpersonal* problem-solving (e.g., Shure & Spivack, 1980), *personal* problem-solving (e.g., Heppner & Peterson, 1982), or *social* problem-solving (e.g., D’Zurilla & Goldfried, 1971). This type of problem-solving has been studied across educational (e.g., Arslan, 2016), personality (e.g., D’Zurilla et al., 2011), developmental (Mayeux & Cillessen, 2003), counseling (Heppner et al., 2004), and clinical (D’Zurilla & Nezu, 2010) perspectives, among others. Social problem-solving (SPS) is arguably the most commonly used term within the clinical literature (e.g., Hasegawa et al., 2018; Romano et al., 2019); therefore, it was used in describing the present study.

Before defining SPS more specifically, each portion of the phrase warrants clarification. First, the inclusion of the term *social* does not restrict the construct to interpersonal issues, but rather is intended to place the individual and the process within a social context (Nezu, 2004). The term *social* was included to underscore the idea that problem-solving in daily life involves social skills and learning, both from the environment and from other people (D’Zurilla & Nezu, 1990). For instance, a caregiver who has double-booked a work meeting and their child’s piano recital for the same time needs to employ more than prototypical problem-solving skills to resolve the issue. Possible solutions, such as having to reschedule the meeting or provide an explanation to the child, hold different social consequences. In daily living, SPS could be engaged for intrapersonal, interpersonal, or broad social problems that may or may not have an explicit social aspect (D’Zurilla & Nezu, 2010).

Next, the term *problem* is intended to reflect a situational issue or obstacle in an individual's life that is preventing them from functioning adaptively and for which no solution is readily apparent (Nezu, 2004). This could be a current or anticipated situation that requires action on the part of the individual in order to resolve a conflict or achieve a goal (D'Zurilla & Nezu, 2010). Problems could stem from the environment, such as being evicted (i.e., barrier to a goal), interpersonal relationships, such as getting divorced (i.e., conflict between goals), or intrapersonal factors, such as difficulty losing weight (i.e., failure to attain a personal goal; Nezu, 2004). In this sense, problems can be conceptualized as a discrepancy between a current state and a goal state (Nezu, 1987). Finally, the process of *solving* the problem reflects an individual's ability to identify possible responses to the problem and select the response most likely to be effective; the effective response would be considered the *solution* (D'Zurilla & Nezu, 2010).

The notion of SPS in the clinical literature has largely been centered on a model first proposed by D'Zurilla and Goldfried (1971) and later expanded (D'Zurilla & Nezu, 2010). Based on the prominence of this model in the field, D'Zurilla and Nezu's (1990) definition of SPS was adopted for the present study. They define SPS as a process through which individuals identify adaptive solutions to everyday problems. More specifically, the model presents SPS as follows:

“Social problem solving is thus conceived as a conscious, rational, effortful, and purposeful activity aimed at improving a problematic situation, reducing or modifying the negative emotions generated by the situation, or both of these outcomes. Hence, it is best viewed as the metaprocess of understanding, appraising, and adapting to stressful life events, rather than simply a singular coping strategy or activity” (D'Zurilla & Nezu, 2010, p. 199).

Several aspects of this definition illustrate the overlap among SR, ER, and SPS. First, SPS is characterized as an effortful, intentional process. This maps on to the idea of top-down SR and ER and aligns with the placement of the reconstitution element of Barkley's (1997a) model of SR; this will be discussed in more detail later in this chapter. Second, the definition highlights the components of 'understanding,' 'appraising,' and 'adapting,' which can be likened to the elements of monitoring, evaluating, and adjusting discussed in the context of SR and ER (Barkley, 1997a; D'Zurilla & Nezu, 2010). Finally, the function of SPS is identified as modifying the outcome of a situation, which could include the modulation of emotions (Nezu, 2004). One feature of SPS that this definition does not capture, but is specified directly in Heppner and colleagues' definition, is the notion that SPS includes behavioral, cognitive, and emotional components (Heppner et al., 2004). Each of these aspects will be described in more detail in the following sections.

Bottom-up vs. Top-down SPS. In contrast to SR and ER, SPS primarily involves what would be considered top-down processes (Nezu, 2004). Bottom-up regulatory processes involve innate, reflexive, and habituated behaviors that represent immediate or reactive responses to stimuli (Evans & Stanovich, 2013). SPS, on the other hand, is employed when there is no immediate or preferred response to a stimulus, such that a solution to the problem is not readily apparent (Nezu, 2004). In other words, SPS is employed when the reactive action or solution will not be effective or may produce negative consequences (D'Zurilla & Goldfried, 1971). That being said, elements of SPS do include bottom-up processes. In particular, the identification of problems can be reactive, following either an environmental stimulus (e.g., unexpected road construction on the way to an important presentation) or an internal stimulus (e.g., an unexpected emotion during a conversation with a colleague; D'Zurilla & Nezu, 2010). Additionally,

gathering information about the problem, generating possible solutions, and evaluating consequences can involve detecting social cues or interpreting other information from the environment via bottom-up processes (Nezu, 2004). While bottom-up processes involved in SPS are not able to fully solve the problem (in comparison to bottom-up processes in SR and ER, which are able to regulate behavior, cognitions, and emotions), SPS is still comprised of both types of processes.

Modalities of SPS. SPS is conceptualized as a goal-directed process that involves behavioral, cognitive, and emotional components (Heppner et al., 2004). This is because problems in daily living often involve elements that cut across domains of functioning. When a problem arises, it typically affects an individual's actions, thoughts, and feelings, rather than one modality in isolation. For solutions to be effective, they must mirror the elements of the problem (D'Zurilla & Nezu, 2010). That is, similar to how problems generate actions, thoughts, and feelings about a situation, effective solutions serve to remedy or modify those actions, thoughts, and feelings (Nezu, 2004). For instance, an individual having an argument with their partner (i.e., the problem) might involve leaving to take a walk (behavioral), thoughts of concern for the relationship (cognitive), and feelings of frustration or sadness (emotional). Likewise, the solution might involve returning to initiate a conversation (behavioral), thinking through ways to frame a resolution (cognitive), and expressing feelings of remorse (emotional). In this way, SPS is similar to SR and ER in its pervasiveness across modalities of functioning.

Functions of SPS. The ultimate goal of SPS is to find an adaptive, effective solution to a problem. This can be contrasted with the actual implementation of a solution, which depends on different skills than the process of solving the problem (D'Zurilla & Nezu, 2010). Whereas the abilities associated with SPS are considered generalized, the abilities needed to implement a

solution in any given situation are specific to the conditions and environment of that problem. SPS encompasses the process of identifying a problem, generating solutions, selecting the most effective solution, and monitoring the effectiveness of the chosen solution (Nezu, 2004). The original phrasing of D’Zurilla and Nezu’s (2010) conceptualization of an ‘effective’ solution illustrates the overlap among SR, ER, and SPS; the definition is specified as follows:

“An ‘effective’ solution is one that achieves the problem-solving goal (e.g., changing the situation for the better, reducing negative emotions, increasing positive emotions), while it also maximizes other positive consequences and minimizes negative consequences. These consequences include long-term, as well as short-term, personal and social outcomes.” (D’Zurilla & Nezu, 2010, p. 199)

This definition emphasizes several important points of overlap among SR, ER, and SPS. First, it highlights the connection between solving a problem and achieving a goal, such that SPS is employed to remove a barrier or obstacle on the path to goal attainment, broadly speaking (Nezu, 2004). For instance, if an individual wants to apply for a job but does not have appropriate experience, adjusting behavior to obtain the experience could be viewed as solving a problem on the path to goal attainment. Second, it acknowledges that both problems and goals could involve a desire to adjust the experience of emotion (D’Zurilla & Nezu, 2010). For instance, if an individual has a fight with a family member and becomes upset, resolving the issue might include the goals of mending the relationship, decreasing negative emotions, and increasing positive emotions. Finally, it speaks to the function of maximizing the balance of consequences across the short- and long-term, an integral element discussed in the context of SR (e.g., Barkley, 1997a). Consequences of different solutions can impact the outcome of SPS, the emotional experience associated with the problem, the individual’s self-efficacy or self-perception, or other

features of the greater social context (D’Zurilla & Nezu, 2010). The ways through which SPS operates to accomplish these functions is described next in the context of D’Zurilla and Goldfried’s (1971) model.

Models of SPS

As mentioned, D’Zurilla and Goldfried’s (1971) model is a particularly prominent model of SPS. The foundational model of SPS was first posited by D’Zurilla and Goldfried in 1971 and later refined through operationalization and factor analytic studies (D’Zurilla & Nezu, 1982, 1990; D’Zurilla et al., 2002; Maydeu-Olivares & D’Zurilla, 1995, 1996). The progression of this model will be described below and connected to Bandura’s (1991) model of SR and Gross’s (2015) extended process model of ER. Then, SPS will be placed in the context of Barkley’s (1997a) model of SR and connected to EF.

D’Zurilla & Goldfried’s (1971) Model of SPS. D’Zurilla and Goldfried’s (1971) model of SPS originated within a behavioral modification context with the goal of using problem-solving as a basis for therapeutic intervention. The model conceptualized the goals of behavior modification and problem-solving to overlap, such that they both involved adjusting behavior in order to produce desired consequences. In this sense, SPS was viewed as a form of ‘self-control training’ that would allow individuals to better adapt to dynamic and often stressful environments (D’Zurilla & Goldfried, 1971). Approaching treatment from this perspective was considered by many to be one of the first ‘cognitive behavior therapies’ (D’Zurilla & Nezu, 2010). Behavior related to psychopathology was viewed as ‘ineffective’ and was thought to create undesired consequences for the individual, which made subsequent attempts at adaptive behavior more challenging. The posited theory of SPS was essentially a collection of propositions outlining how an individual would engage in ‘effective’ behavior and find solutions

to obstacles (D’Zurilla & Goldfried, 1971). This included a problem orientation and four stages of problem-solving as follows:

- (1) Problem definition and formulation
- (2) Generation of alternatives
- (3) Decision-making
- (4) Solution implementation and verification (D’Zurilla & Goldfried, 1971).

These stages were theorized to represent skill clusters (i.e., a certain set of skills would be involved with problem definition and formulation, different skills would be associated with generating alternatives, and so on) which would lead the individual to an effective solution (D’Zurilla & Nezu, 2010). Each of these will be summarized next and connected to Bandura’s (1991) model of SR and Gross’s (2015) models of ER.

Stage 1: Problem Definition and Formulation. The first stage of problem-solving involves identifying and defining the features of a problem (Nezu, 2004). As with SR and ER, the problematic stimulus that activates SPS can be driven by the environment, such as running low on finances, or driven by intrapersonal factors, such as feeling guilty about missing a friend’s birthday. One of the key identifiable features of a problem is the individual’s affective reaction to a situation; in other words, emotions can serve as cues that a problem needs to be addressed (D’Zurilla & Goldfried, 1971). A second element of this stage after the problem has been identified is to gather details and define aspects of the problematic situation to help inform the subsequent stages of problem-solving (Nezu, 2004). For example, if an individual receives a warning from their employer that they have been missing too many days of work, they may feel negative emotions including nervousness or sadness. After identifying that this problem needs to be addressed, the individual might read the warning carefully and determine they need to meet with their supervisor to develop an attendance plan.

This stage closely parallels the self-observation stage of Bandura's (1991) model of SR and the identification stage of Gross's (2015) model of ER in that it involves awareness of situational features, understanding of antecedents and consequences, and motivation to attend to problem behaviors. Identifying and defining the problem can be impacted by the individual's biases, interpersonal tendencies, and greater social context (Bandura, 1991; D'Zurilla & Nezu, 2010). For example, whether a warning from an employer is considered a significant problem might depend on the individual's financial standing, valuation of the position, and personal career goals. Like the first stages of SR and ER, this stage of SPS provides the information necessary for the remaining stages of the process.

Stage 2: Generation of Alternatives. After the problem has been identified and defined, the second step is to think of many possible solutions that could be implemented (Nezu, 2004). The authors of the model likened this stage to the process of 'brainstorming' and noted that the important feature is quantity, not quality, because the quality will be evaluated in the next stage (D'Zurilla & Goldfried, 1971). The goal of this stage is for the individual to generate enough solutions so that one of them is likely to be effective and produce the desired consequences. In considering the above example of receiving a warning, the individual might generate possible solutions including obtaining a letter from their primary care physician to give to their supervisor, requesting weekly work-from-home days, or seeking alternative employment.

Stage 3: Decision-making. Once enough possible solutions to the problem have been generated, the next step is to evaluate each solution and determine the most effective option (Nezu, 2004). This stage includes a cost-benefit analysis of each solution in terms of both its likelihood of solving the problem as well as an evaluation of the probable consequences if it is implemented (D'Zurilla & Goldfried, 1971). In the above example, the individual might

determine that seeking alternative employment is not a viable option and that providing a letter from their doctor may not help to justify future sick leave; they might determine that requesting work-from-home days will not only allow them to rest but also continue with employment.

The generation of alternatives and decision-making stages of SPS correspond to the judgement stage of Bandura's (1991) model of SR and the selection stage of Gross's (2015) model of ER. These stages all involve a valuation process, as well as an analysis of possible adjustments to behavior, cognitions, or emotions to determine which actions will lead to the desired consequences. This requires utilizing prior knowledge of possible responses and their associated consequences, as well as incorporating information gained in the identification stage (Nezu, 2004). In addition, this stage of SPS involves first selecting a general strategy and then adapting it to the specific situation, similar to the process outlined in the selection stage of Gross's (2015) model of ER. Selecting an effective solution depends on how the individual evaluates possible responses in the context of their goals, as well as their self-efficacy in solving the problem (Bandura, 1991; D'Zurilla & Goldfried, 1971).

Stage 4: Solution Implementation and Verification. The final stage of SPS involves monitoring and evaluating the solution after it has been implemented (Nezu, 2004). This is an important step, particularly in situations in which the solution does not produce the desired outcomes. If that is the case, the individual needs to return to the problem-solving process and implement a different solution (D'Zurilla & Nezu, 2010). The verification stage not only helps to identify that a new solution is needed, but also can provide information necessary regarding what stage of the process needs to be returned to. That is, another solution already generated could be effective or perhaps more information about the problematic situation needs to be gathered. In the example above, the individual's supervisor might state that work-from-home days are not

possible for the individual's position, but they could solve the problem by finding a substitute. Then, the individual could revisit the process to determine if they are able to implement the solution of finding a substitute and if that would produce the desired consequences.

The solution implementation and verification stage of SPS corresponds to the self-reaction stage of Bandura's (1991) model of SR and the implementation stage of Gross's (2015) model of ER in that all stages involve the adjustment of behavior, cognition, or emotion in order to meet individual goals. This additionally involves an evaluation of the effectiveness of the chosen adjustment as well as its associated consequences. Importantly, this stage also includes the ability and motivation to implement a solution (although, the actual skills involved in implementing a solution are not considered part of SPS as they are situation specific; Nezu, 2004). The idea of implementation maps on to Barkley's (1997a) idea of motor control/syntax/fluency (e.g., goal-directed behavior) and will be revisited later in this chapter.

D'Zurilla and Goldfried's (1971) model created the foundation for the construct understood today as SPS. The model was operationalized by D'Zurilla and Nezu in 1990 with the construction of the Social Problem-Solving Inventory (SPSI). The item content of the SPSI was developed to reflect the process of SPS as a general orientation and set of four specific skill clusters (D'Zurilla & Goldfried, 1971). A series of factor analytic investigations revealed that the underlying factor structure of the SPSI differed from the hypothesized structure of the original model (Maydue-Olivares & D'Zurilla, 1995, 1996). The results revealed two problem orientation factors and three factors referred to as problem-solving styles, rather than skill sets.

This signified a conceptual shift in the overall model, such that the general orientation component was separated into adaptive and maladaptive dimensions and the specific skill sets were separated into one cluster of adaptive responding and two separate clusters of maladaptive

responding (Maydeu-Olivares & D’Zurilla, 1995, 1996). The two orientation dimensions were termed *positive problem orientation* and *negative problem orientation*, while the three problem-solving styles were termed *rational problem-solving style*, *impulsive/carelessness problem-solving style*, and *avoidance problem-solving style* (D’Zurilla & Nezu, 2010). The five components are thought to comprise SPS. Each of these will be summarized next.

Problem Orientation. An individual’s problem orientation represents their typical attitude, set, or schema that is activated in response to problems. Problem orientation includes cognitive (e.g., attributions, appraisals, or expectancies regarding problems) and affective (e.g., emotional states aroused by the problem) components (D’Zurilla & Nezu, 2010). Problem orientation was separated into two dimensions identified as a positive and negative. An important aspect of these factors is that they do not reflect opposites falling along a single dimension, but instead represent independent (but overlapping) dimensions (Maydeu-Olivares & D’Zurilla, 1995). A *positive problem orientation* (PPO) reflects an adaptive set in which an individual tends to:

- Appraise a problem as a challenge
- Believe that problems are solvable
- Believe in one’s own personal ability to solve problems successfully
- Believe that successful problem-solving takes time, effort, and persistence
- Commit oneself to solving problems with dispatch rather than avoiding them (Maydeu-Olivares & D’Zurilla, 1996, p. 128).

In contrast, a *negative problem orientation* (NPO) reflects a maladaptive set in which an individual tends to:

- Appraise a problem as a significant threat to well-being
- Believe that problems are unsolvable
- Doubt one’s own personal ability to solve problems successfully
- Become frustrated and upset when confronted with problems in living (Maydeu-Olivares & D’Zurilla, 1996, p. 128).

Similar to SR and ER, self-efficacy is an influential element and is incorporated into an individual's problem orientation in terms of the belief in one's ability to solve a problem (D'Zurilla & Goldfried, 1971). Further, problem orientation is connected to emotional processing in that PPO is associated with positive affect and approach motivation, whereas NPO is connected to negative affect and avoidance motivation (Nezu, 2004). These differential connections can serve to either facilitate or inhibit the subsequent stages of SPS.

Problem-Solving Styles. The three remaining components of SPS represent typical response tendencies involved in identifying and implementing an effective solution (D'Zurilla & Nezu, 2010). In contrast to the problem orientation component thought to include cognitive and affective components, styles are thought to include primarily cognitive (e.g., monitoring, identifying, and evaluating aspects of the problem) and behavioral (e.g., typical problem-solving response tendencies) components (Nezu, 2004). The specific skill sets hypothesized in the original model were maintained in the updated conceptualization, such that adaptive versions of the skills were distinguished from maladaptive versions of the skills and clustered into 'styles' (Maydeu-Olivares & D'Zurilla, 1995, 1996). More specifically, the response styles reflect how and individual typically gathers information, generates solutions, decides on the most effective solution, and monitors the consequences of the chosen solution (D'Zurilla & Nezu, 2010).

Rational problem-solving style (RPS) is conceptualized as an adaptive problem-solving style and involves a methodical approach to the stages of problem-solving (Nezu, 2004). The authors characterized this style as 'rational,' 'deliberate,' and 'systematic' (D'Zurilla & Nezu, 2010). Regarding the stages of problem-solving, RPS includes an effortful process of identifying problems when they arise, a logical approach to gathering information about the problem, generation of a comprehensive set of possible solutions, a thorough evaluation process to

determine the most effective solution, and subsequent monitoring of consequences of the implemented solution (Nezu, 2004).

Impulsivity/carelessness style (ICS) is conceptualized as a maladaptive problem-solving style that involves a rushed approach to the stages of problem-solving, such that effective solutions are not given much thought (Nezu, 2004). The authors characterized this style as ‘hurried,’ ‘narrow,’ and ‘incomplete’ (D’Zurilla & Nezu, 2010). The first stage of problem-solving is perhaps the most impacted by this style, such that very little information is gathered regarding the problem prior to generating possible solutions. The solutions that are generated are often limited and not evaluated in a systematic way. The solution is then implemented quickly without much consideration of possible consequences (Nezu, 2004). In considering SPS as a top-down, effortful process, ICS is arguably the least effortful and most reactive form of problem-solving, which aligns with its conceptualization as a maladaptive style. ICS can be damaging in that the individual believes they are working toward solving the problem by implementing a variety of solutions, yet these solutions are likely to be ineffective (D’Zurilla & Nezu, 2010).

Avoidance style (AS) is also conceptualized as a maladaptive problem-solving style which involves neglecting problems and pushing them off on to other people (Nezu, 2004). The authors described this style as being characterized by ‘procrastination,’ ‘passivity,’ and ‘dependency’ (Maydeu-Olivares & D’Zurilla, 1996, p. 128). AS involves avoiding engaging in the stages of problem-solving altogether and instead hoping that either the problem will dissipate or that someone else will step in to solve the problem. This style can be particularly detrimental when considering the potential for an accumulation of problems and associated negative consequences. AS can also create prolonged negative affect for the individual if they recognize a problem but then do not address it for a long period of time (D’Zurilla & Nezu, 2010).

In summary, PPO and RPS are considered adaptive (or constructive) problem-solving dimensions, whereas NPO, ICS, and AS are considered maladaptive (or dysfunctional) problem-solving dimensions (Nezu, 2004). While the two components of orientation and style are often investigated and discussed separately, the combination of these elements is thought to represent an individual's overall ability to identify effective solutions to problems in living (D'Zurilla & Nezu, 2010). Just as with SR and ER, the underlying mechanisms involved in the overall ability to solve everyday problems can be tied to EF; this connection will be discussed next in the context of Barkley's (1997a) model of SR.

SPS in the Context of Barkley's (1997a) Model of SR. SPS aligns with the reconstitution element of Barkley's (1997a) model of SR. Three important aspects of this model will be highlighted: the relationship between response inhibition and SPS, the relationship between SPS and EF, and the relationship between SPS and the outcome component of motor control/fluency/syntax.

As discussed in the context of SR and ER, effortful processes require the immediate or prepotent response to a situation to first be inhibited. For SPS, without this inhibition, the most effective solution to the problem cannot be identified because the individual has already acted (Nezu, 2004). The original model of SPS describes the reliance of SPS on response inhibition, noting that inhibitory processes help the individual to not react inappropriately, implement an ineffective solution, or avoid the problem entirely. The authors describe this as the need to 'stop and think' (D'Zurilla & Goldfried, 1971, p. 113). This notion directly corresponds to discussions in the context of SR and ER that underscore the importance of a delay period between the stimulus and the response in order for the individual to engage in intentional processes. For SPS, this is particularly important in terms of taking time to evaluate possible consequences and

consider the greater social context prior to implementing a solution. Empirical evidence speaks to a connection between SPS and response inhibition (e.g., Ciairano et al., 2007; Walker & Henderson, 2012).

As noted, SPS aligns with Barkley's (1997a) element of reconstitution, or the ability to analyze and synthesize behavioral responses. More specifically, reconstitution (conceptualized as an EF) is likely an underlying mechanism of SPS. Problem-solving often requires behavioral sequences that were unsuccessful to be broken down so that each component can be evaluated and reconstructed in a way that is more likely to be successful. This corresponds to what D'Zurilla and Goldfried (1971) referred to as 'combination and improvement' of solutions, which involves brainstorming different variations of solutions in order to increase effectiveness. Once the immediate action is inhibited, reconstitution (and other effortful SPS mechanisms) would then work in conjunction with the other EFs in Barkley's (1997a) model to adjust behavior and solve problems. Empirical evidence suggests connections between SPS and working memory (e.g., Brown et al., 2012; Huang et al., 2014), internal speech (e.g., Diaz et al., 2014; Goudena, 1987), ER (e.g., de Castro et al., 2003), and general EF (Muscara et al., 2008; Riggs et al., 2006; Thoma et al., 2015).

The solution implementation stage of D'Zurilla and Goldfried's (1971) model aligns with the motor control/syntax/fluency component of Barkley's (1997a) model in the form of an effective solution. Similar to SR and ER, this component reflects the outcome of SPS in that behavior is adjusted so as to achieve desired consequences and avoid undesired consequences related to the problem (D'Zurilla & Nezu, 2010). The actual implementation of a solution is not considered to be part of SPS due to the specificity of skills needed for particular situations; this is parallel to SR and ER in that the actual behavioral adjustment (i.e., goal-directed behavior) is not

considered part of the process, but rather the outcome of the process (Barkley, 1997a). For instance, if an individual is working to regulate the behavior of procrastination to work toward the goal of increasing productivity on homework, the actual engagement in homework requires a unique set of skills specific to that situation. Similarly, with SPS, if the individual encounters a problem of missing a lecture, the skills involved in obtaining lecture notes from a classmate are specific to that situation. In all cases, the skills involved in the processes of SR, ER, and SPS are considered generalized while the outcomes of these processes are reflected in goal-directed behavior that is tailored to the situation.

Considering the connections amongst these models, SR, ER, and SPS appear to overlap in several ways, including shared underlying mechanisms, pervasiveness across modalities, and similarities in functional outcome; this overlap will be revisited in Chapter V.

Development

Similar to the trajectories of SR and ER, SPS emerges early in development and continuously improves through adulthood (Mayeux & Cillessen, 2003). In fact, SPS abilities are thought to increase through young adulthood and into middle adulthood, then decline in older adulthood (D’Zurilla et al., 1998). As a process that develops alongside other processes, many of the same influences discussed in the context of SR and ER development also impact the SPS development. Aspects of neurological, cognitive, emotional, and social domains of development during emerging adulthood that are connected to SPS will be described in the following sections. Then, gender differences in SPS will be highlighted.

SPS in Emerging Adulthood

Brain areas associated with social cognition continue developing into the mid-twenties via both structural and functional changes (Kilford et al., 2016). In particular, continued

maturation of frontal cortices, as well as increased efficiency in fronto-limbic connections, have been found to impact social, goal-directed behavior (Taber-Thomas & Pérez-Edgar, 2015). During emerging adulthood, these neurological changes are associated with increased integration of social and reward information, improved theory of mind and empathy skills, and enhanced problem-solving (Blakemore & Choudhury, 2006). In addition, environmental influences, such as social and cultural factors, are thought to impact the processes of synaptic pruning and changes in functional connectivity (Taylor et al., 2015). In terms of SPS, this reflects a process of building social competence and learning from the environment, which help to improve skills specific to solving social problems (D’Zurilla & Nezu, 2010).

In terms of cognitive development, the notion of postformal thought is particularly relevant to the development of SPS. This is because evaluating effective solutions to complex social problems requires both logic and subjectivity, as problems may have multiple ‘correct’ solutions, but the consequences of each will differ based on social and cultural norms (D’Zurilla & Nezu, 2010). Throughout emerging adulthood, individuals are learning to integrate intrapersonal, interpersonal, and socio-cultural information, which is a key aspect of navigating the ambiguous problems that might arise as life becomes more complex (Despotović, 2014). This process of integration can also be impacted by theory of mind, empathy, and reward sensitivity. As these processes continue to shift in emerging adulthood, the valuation, cost-benefit analysis, and generation of solutions elements of SPS are likely to shift in a similar manner.

Aspects of social development are closely connected to the development of SPS through emerging adulthood. As noted, theory of mind and empathy skills, which are important components of social cognition, are continuing to improve throughout this period (Dumontheil et al., 2010; Smits et al., 2011). Emerging adulthood is characterized by an increasing complexity

in social environments and a transition from an individualized perspective toward a societal perspective (Lapsley & Woodbury, 2016). Because problems that require SPS occur within the individual's social context, improvement in perspective-taking abilities and overall social cognition can help to facilitate improvements in SPS abilities (Shure, 1982). In addition, several features of emerging adulthood, including high rates of moving, role transitions, and ambiguous expectations, likely increase the number of problems individuals experience daily, thereby requiring stronger SPS skills (Arnett, 2015).

Gender Differences in SPS

Findings regarding gender differences in SPS have been mixed. Early investigations of gender and SPS relied on performance-based measures that did not address generalized problem-solving ability and did not identify any differences between males and females (D'Zurilla et al., 1998). Following the operationalization of D'Zurilla and Goldfried's (1971) model and validation of the SPSI-Revised, gender differences could be examined along theorized dimensions of problem-solving ability, including problem orientation and problem-solving style (Nezu, 2004). One of the first investigations of gender using the SPSI-R indicated differences on the dimensions of NPO and PPO, such that females were found to have higher NPO and lower PPO than males (D'Zurilla et al., 1998). Since then, this finding has been replicated in additional samples (Bell & D'Zurilla, 2009; Belzer et al., 2002; D'Zurilla et al., 1998; Robichaud et al., 2003; Roy et al., 2019). Regarding problem-solving styles, some studies have found that males are higher in ICS than females (Belzer et al., 2002; D'Zurilla et al., 1998), while another study revealed no difference in ICS and instead found that females were lower in RPS than males (Bell & D'Zurilla, 2009). Conversely, another study found females were higher in RPS than males (Roy et al., 2019).

In contrast to these results, several investigations using the SPSI-R have not found gender differences on any SPS dimensions (e.g., Anderson et al., 2009; Haugh, 2006; McCabe et al., 1999; Reinecke et al., 2001). Additionally, investigations using other measures of SPS have not found evidence for differences between males and females (Dixon et al., 1993; Robichaud & Dugas, 2005a). Overall, these studies provide mixed evidence for gender differences, with perhaps the clearest pattern being higher NPO for females as compared to males. Relevant to the present study, this difference appears to be more so related to strength (i.e., gender differences in levels of NPO), rather than a difference in the underlying structure of overall SPS.

Psychopathology

With the potential for negative consequences to accumulate following failure to solve a problem, deficits in SPS can have an impact on psychological health and well-being. Deficits in SPS have been connected to impairment in academic (e.g., D’Zurilla & Sheedy, 1992), occupational (e.g., Elliot et al., 1996), and social functioning (e.g., Muscara et al., 2008; Sibley et al., 2010). SPS is considered a transdiagnostic construct and has been associated with both internalizing and externalizing forms of psychopathology (Bell & D’Zurilla, 2009; Jaffee & D’Zurilla, 2003, Siu & Shek, 2010). These can include mood disorders (Anderson et al., 2009, 2011), anxiety disorders (Belzer et al., 2002), and substance use (Jaffee & D’Zurilla, 2009). The present study focused on depression, a widespread form of psychopathology with a well-established connection to SPS deficits.

SPS & Depression

Based on D’Zurilla and Goldfried’s (1971) model of SPS, Nezu (1987) proposed a problem-solving model of depression. The model is based on the premise that stressful events in life often lead to problems. If those problems are not solved effectively, negative consequences

could result. These negative consequences could influence functioning in several ways. First, negative consequences resulting from the unsolved problem could worsen the problem itself (Nezu, 1987). For example, if an individual receives a wrongful parking citation, avoiding the problem instead of paying or appealing the ticket could lead to additional citations being issued. Second, novel consequences could be generated (Nezu, 1987). Not addressing the citations could lead to the individual arguing with their partner over financial concerns. Third, negative consequences could serve to decrease personal or social reinforcement (Nezu, 1987). For instance, the individual may not be able to engage in social activities with their partner due to conflict or financial concerns. Finally, negative consequences could serve to dampen motivation to engage in SPS in the future (Nezu, 1987). If the individual had attempted to appeal the original ticket and was unsuccessful, they may be less likely to implement another solution due to lowered self-efficacy or an increased likelihood of perceiving the problem as a threat.

In addition to outlining this general structure, Nezu's (1987) model describes connections between each component of SPS and depressive symptoms. The component most consistently associated with depression has been NPO (e.g., D'Zurilla et al., 1998; Kant et al., 1997; Wilson et al., 2011). Several aspects of NPO align with symptoms of depression, including a bias toward negative appraisals, low self-efficacy, and irrational beliefs regarding problems (Nezu, 1987). Importantly, the model specifies that it is not the presence versus absence of NPO that likely predicts depressive symptoms, but rather it is the impact of NPO on the subsequent stages of problem-solving (Nezu, 1987). That is, high NPO serves to inhibit the remaining stages of SPS. Failure to solve the problem could then reinforce the individual's negative orientation, creating a cyclical relationship that can initiate or maintain depressive symptoms (Nezu, 1987).

Regarding the four stages of problem-solving, Nezu (1987) posits that skill deficits in any stage can disrupt SPS and create a negative cycle. Deficits could involve information gathering and realistic goal setting, generating too few solutions, or an inability to identify solutions that will be effective. Some evidence suggests that individuals with depression generate fewer and less effective solutions than their non-depressed counterparts (Marx et al., 1992; Nezu & Ronan, 1985). Overall, NPO, deficits in the four stages of problem-solving, and the accumulating negative impact of unsolved problems, could make an individual vulnerable to initial or recurrent depressive episodes. Indeed, negative consequences and ongoing problems have been shown to elicit and exacerbate depressive symptoms (Anderson et al., 2009, 2011; Fergus et al., 2015; Haugh, 2006).

SPS, Gender, & Depression

Perhaps due to the mixed evidence for gender differences in the context of SPS abilities, relatively few studies have investigated gender differences in the context of the relationship between SPS and depressive symptoms. The clearest pattern of gender differences has emerged regarding the dimension of NPO, which has also been the dimension most consistently associated with depressive symptoms. One study found that females were more likely to report higher NPO and higher depressive symptoms than males, but the results did not indicate an interaction between these factors (D’Zurilla et al., 1998). In contrast, other studies investigating depressive symptoms have not found evidence for gender differences, even on the dimension of NPO (e.g., Anderson et al., 2009; Haugh, 2006; McCabe et al., 1999; Reinecke et al., 2001). While it is possible that higher levels of NPO might impact the relationship between SPS and depressive symptoms, past research is not suggestive of a clear association among gender, NPO, and depression, let alone overall SPS.

Measurement

In comparison to the assessment of SR and ER, the assessment of SPS has been confined to a smaller number of approaches and operationalizations. Typically, measures of SPS are considered either *process* measures or *outcome* measures. *Process* measures assess general SPS ability including behavioral, cognitive, and emotional features, that contribute to the process of finding an effective solution (D’Zurilla, Nezu, & Maydeu-Olivares, 2004). In contrast, *outcome* measures assess the effectiveness or quality of solutions in specific situations. In other words, process measures are thought to assess an individual’s strengths or deficits in SPS, whereas outcome measures assess their performance in problem-solving (D’Zurilla et al., 2004). Some tasks of EF are intended to measure problem-solving ability, such as the Tower of London Task (Shallice, 1982) or the Porteus Maze Task (Porteus, 1942). However, these are considered measures of general problem-solving, not problem-solving that occurs in a social context (Heppner & Peterson, 1982). The following discussion will focus on process and outcome measures of SPS. Then, the measures utilized in the present study will be specified.

Process Measures of SPS

Arguably the most widely used measure of SPS is the SPSI-R (D’Zurilla et al., 2002). As mentioned, the item pool of the original measure (the SPSI) was designed to reflect the general orientation and set of four specific skill clusters detailed in D’Zurilla and Goldfried’s (1971) model. Then, a series of factor analytic investigations revealed that the underlying factor structure of the SPSI differed from the hypothesized structure (Maydue-Olivares & D’Zurilla, 1995, 1996). The revised measure, the SPSI-R, assesses overall SPS ability through items addressing two problem orientation dimensions and three problem-solving styles. These five subscales include: (1) PPO, (2) NPO, (3) RPS, (4) ICS, and (5) AS. The original four skill

clusters are represented in the problem-solving styles measured in the SPSI-R, such that adaptive skills align with the RPS subscale, and maladaptive skills align with the ICS and AS subscales (Nezu, 2004). These subscales can be combined into a total score that reflects an individual's overall ability to identify solutions to problems in daily life (D'Zurilla & Nezu, 2010). This measure has been used in several investigations of SPS (e.g., Anderson et al., 2009; Bell & D'Zurilla, 2009; Haugh, 2006; Romano et al., 2019). Further, the SPSI-R has demonstrated good psychometric properties and has been utilized in samples of undergraduate students (Bell & D'Zurilla, 2009; Chang & D'Zurilla, 1996; D'Zurilla & Chang, 1995; D'Zurilla et al., 2002; D'Zurilla & Sheedy, 1992).

Perhaps the second most commonly used measure of SPS is the Problem-Solving Inventory (PSI; Heppner & Peterson, 1982). The PSI was originally developed based on the stages of problem-solving, including problem orientation, definition, generation of solutions, decision-making, and evaluation. Similar to the development of the SPSI-R, an item pool was generated based on D'Zurilla and Goldfried's (1971) model of SPS; however, following factor analytic investigation, a different underlying structure emerged (Heppner & Peterson, 1982). Specific problem-solving skills assessing SPS appraisal loaded on to three factors, which are now the subscales of the PSI.

The three subscales of the PSI are labeled as: (1) problem-solving confidence (PSC), (2) approach-avoidant style (AAS), and (3) personal control (PC; Heppner & Peterson, 1982). The subscales reflect an individual's belief in their ability to solve problems, problem-solving response tendencies, and perception of control over behaviors related to the problem, respectively (Heppner et al., 2004). The PSI has been used in several investigations of SPS

(Heppner et al., 2004). The PSI has demonstrated good psychometric properties and has been utilized in samples of undergraduate students (Dixon et al., 1993; Julal, 2016).

Another process measure that is specific to one dimension of SPS is the Negative Problem Orientation Questionnaire (NPOQ; Robichaud & Dugas, 2005a). This measure was designed based on the NPO component of SPS and was developed in order to isolate NPO given its consistent connection to psychopathology in studies using the SPSI-R. More specifically, the developers of this measure identified a need for the behavioral, cognitive, and emotional components of NPO to be adequately assessed, as the SPSI-R captures only the cognitive and emotional aspects (Nezu, 2004; Robichaud & Dugas, 2005a). The NPOQ has been used in investigations of NPO as a dimension of SPS (Barahmand, 2008; Fergus et al., 2015; Humphrey, 2016). Further, the NPOQ has demonstrated good psychometric properties and has been utilized in samples of undergraduate students (Kertz et al., 2015; Robichaud & Dugas, 2005a, 2005b).

Outcome Measures of SPS

Prior to the operationalization of D’Zurilla and Goldfried’s (1971) model, the leading tool used to assess SPS was the Means-End Problem-Solving Procedure (MEPS; Platt & Spivak, 1975). The MEPS assesses an individual’s ability to generate an effective solution to problems in daily life. This includes identifying necessary problem-solving steps, anticipating problems, and understanding of problem situations (D’Zurilla & Maydeu-Olivares, 1995). This procedure includes 10 hypothetical situations that describe real-life problems; it can be completed via interview or self-report format. The situations are presented as having a beginning and an ending, and participants are instructed to generate an effective solution that would connect the beginning of the story (initial state) to the end of the story (goal state). Scores are based on the number of solutions, number of obstacles identified, and amount of time taken (D’Zurilla & Maydeu-

Olivares, 1995). In this way, the MEPS is considered an outcome measure, as the indicator of problem-solving ability is the actual quality of solutions, rather than the process of SPS itself.

Concerns with the MEPS have been raised. The MEPS is often adapted based on the study, making psychometric analysis more challenging (House & Scott, 1996). The presentation of hypothetical situations (some of which have questionable content, such as getting revenge) is thought to make it difficult for the individual to imagine how they would personally respond (D’Zurilla & Maydeu-Olivares, 1995). Some studies have tried to combat this by adapting the MEPS to instruct participants to recall their own problem situations, yet this procedure relies heavily on memory, particularly the expectation that participants recall the specific solutions they had previously generated in response to the problem (Anderson et al., 2009). Despite concerns with the reliability and external validity of this measure, the MEPS has been used in varied clinical investigations of SPS (e.g., Davey, 1994; Goddard et al., 1996; Marx et al., 1992).

A second outcome measure of SPS is the Problem-Solving Self-Monitoring task (PSSM; D’Zurilla & Nezu, 1999). This task was designed to better assess the effectiveness of solutions generated in daily life. In the PSSM task, participants are provided instructions and definitions of what to monitor (e.g., problem, solution, problem-solving) and are asked to record problems as they arise across a period of time (D’Zurilla et al., 2004). Then, the real-life solutions are rated based on effectiveness, and a total score is used as an indicator of SPS ability. Rating dimensions of the recorded problems and solutions include wellbeing, threat, challenge, control, confidence, effort, emotion, situation change, emotion change, and satisfaction. Although this task helps to address concerns with the external validity of other SPS measures, it has not gained widespread use in clinical investigations (e.g., Anderson et al., 2009, 2011).

Summary of SPS Measurement

Concerns have been raised as to whether process measures (e.g., capturing appraisal, orientation, style) and outcome measures (e.g., evaluating solution generation and implementation) are assessing the same components of SPS (Anderson et al., 2009, 2011). In addition, the question of whether either process or outcome measures are connected to objective problem-solving performance is unclear (Shewchuk et al., 2000). In considering process versus outcome measures in the context of the present study, it was determined that process measures better overlap with the selected measures of SR and ER. This is because self-report measures of SR and ER ability also assess the overall ability of individuals to engage in these processes, rather than the outcome of these processes. In other words, the actual regulation of behavior, cognition, emotions in specific situations would be parallel to the implementation of effective solutions as assessed by outcome measures.

Present Study Measures of SPS

The present study utilized self-report measures to assess SPS. The SPS measures included were the SPSI-R (D’Zurilla et al., 2002), the PSI (Heppner & Peterson, 1982), and the NPOQ (Robichaud & Dugas, 2005a). The SPSI-R and the PSI were selected based on their aim to capture the overall construct of SPS. All three measures were chosen due to their theoretical foundation in D’Zurilla and Goldfried’s (1971) model of SPS. In addition, all three measures are commonly used in clinical investigations of SPS. These measures have demonstrated good psychometric properties and have been utilized in undergraduate populations. They will each be described in more detail in Chapter VI.

CHAPTER V

THE PRESENT STUDY

The purpose of this chapter is to synthesize the literature and frame the theoretical and empirical bases of the present study. The present study had three interrelated goals: to assess the construct validity of SR, ER, and SPS, examine the convergent and discriminant validity of measures of these constructs, and characterize the relationship between these constructs and depressive symptoms. A major strength of the present study was in the complexity of the analyses. To investigate the construct, convergent, and discriminant validity of measures of the constructs of interest, a CFA was conducted, and four rival models were tested against each other. Then, in order to assess the constructs' relationship with depressive symptoms, latent variable SEM was conducted using the best-fitting CFA model. The CFA and latent variable models also included a multigroup analysis to examine possible gender differences. In the following sections, empirical support and rationale for study aims and design will be outlined. In addition, hypotheses and proposed models will be presented.

Study Aims

Construct Validity of SR, ER, and SPS

SR, ER, and SPS each represent complex, high-order constructs that are difficult to operationalize and measure. Given the range of components comprising each construct, developing a fully representative measure is an understandably significant challenge. As such, several of the measures included in the present study have been subject to factor analytic investigations in isolation to help characterize their underlying structure (e.g., D'Zurilla & Maydeu-Olivares, 1995; Melka et al., 2011; Moilanen, 2007). This often occurs at the item level; that is, all items in the measure are examined to determine how items load on to different factors

within the measure (Byrne, 2016). Another use of factor analysis is to examine constructs at the measure level, such that multiple measures are loaded on to one factor to determine how much variance in the measures is generated by the underlying construct (Keith, 2019). This approach speaks to construct validity across multiple measures that are intended to capture that construct. Despite concerns having been raised regarding the construct validity of SR, ER, and SPS (e.g., Duckworth & Kern, 2011; Weems & Pina, 2010), commonly used measures of these constructs have yet to be investigated from a measure-level CFA perspective.

Pertinent to the present discussion is how closely the selected measures of SR, ER, and SPS are related to each other within each construct (e.g., how related are the three measures of SR). Correlational evidence between the measures of interest is limited. When measures are developed, they are often intended to meet a need and thus are the first of their kind. As such, original validation studies may not include other measures of the exact construct (e.g., Carey et al., 2004; Gross & John, 2003). To add, when subsequent studies intend to investigate a construct, they often include only one measure of that construct; for example, investigations of SPS might include only the SPSI-R (e.g., Chang, 2017; Durand-Bush et al., 2015). The relationships between measures of the same construct are important to examine because how closely the measures are related provides evidence for construct validity. That is, measures intended to capture the same construct should be strongly correlated, which would demonstrate convergent validity (Campbell & Fiske, 1959; Cronbach & Meehl, 1955). The available evidence for the selected measures of each construct will be summarized next.

Self-Regulation. The three selected SR measures included the SSRQ (Brown et al., 1999; Carey et al., 2004), the ASRI (Moilanen, 2007), and the BSCS (Tangney et al., 2004). On all three measures, higher scores represent higher levels of SR ability. The SSRQ is positively

correlated with the BSCS ($r = .77, p < .05$; Gonzalez et al., 2019). The ASRI does not appear to have been included in investigations with either the SSRQ or the BSCS. In a pilot study conducted by the thesis author intended to inform the present study, the ASRI was found to be positively correlated with the original, 63-item SRQ ($r = .75, p < .05$; Buffie & Nangle, 2018). The SSRQ and SRQ are highly correlated ($r = .96, p < .05$; Carey et al., 2004), which suggests a relationship between the SSRQ and ASRI is likely. Overall, these relationships provide evidence for the convergent validity of these selected measures of SR.

These three measures represent a subset of the varied approaches to SR measurement. Though the correlations among these three measures provide evidence for validity, calls for clarification of the overall scope of SR measurement have been numerous (e.g., Duckworth & Kern, 2011; Eisenberg et al., 2011; Zhou et al., 2012). Part of the lack of clarity may be because most measures aim to capture a portion of SR (i.e., EF or effortful control) rather than the overall construct (Eisenberg et al., 2011). The SSRQ and ASRI appear to be the only measures that attempt to capture the broad construct of SR in a self-report format. In contrast, the BSCS was designed to primarily capture top-down SR (Tangney et al., 2004), yet the high correlation between the BSCS and SSRQ suggest they may be capturing similar aspects of the construct. As noted, the extent to which self-report measures differ from behavioral tasks in the assessment of SR has been a long-standing debate (e.g., Allom et al., 2016; Friedman & Banich, 2019); however, the extent to which self-report measures of varied components of SR are capturing the intended construct remains unclear (Duckworth & Kern, 2011).

Emotion Regulation. The three selected ER measures included the DERS (Gratz & Roemer, 2004), the PERCI (Preece et al., 2018), and the ERQ (Gross & John, 2003). On the DERS and the PERCI, higher scores represent higher levels of ER difficulty; higher scores on

the ERQ subscales indicate higher levels of use for that particular strategy. The DERS has demonstrated relationships with the ERQ reappraisal ($r = -.24, p < .05$) and suppression ($r = .27, p < .05$) subscales (Salsman & Linehan, 2012). Similarly, the PERCI has demonstrated relationships with the ERQ reappraisal ($r = -.25, p < .05$) and suppression ($r = .23, p < .05$) subscales (Preece et al., 2018). The DERS and PERCI do not appear to have been included together in investigations of ER. The low correlations among these measures do not provide strong evidence for convergent validity.

While the DERS and the ERQ are described as the two most well-validated measures of ER (e.g., Ireland et al., 2017; Preece et al., 2018), the lower correlations between them suggest that they may be capturing different aspects of ER. Although both measures have specific emphases (i.e., the DERS focuses on the regulation of negative emotions and the ERQ focuses on the use of two specific strategies), both measures are frequently utilized in overall investigations of ER (e.g., Joormann & Gotlib, 2010; Lafrance et al., 2014; Meyer et al., 2014). Calls for clarification in the measurement of ER have identified this issue and have posited that, due to the complexity of this construct, ER is likely best accounted for by multiple measures (Weems & Pina, 2010). How well current measures of ER are able to capture the overall construct has yet to be examined.

Social Problem-Solving. The three selected measures of SPS included the SPSI-R (D’Zurilla et al., 2002), the PSI (Heppner & Peterson, 1982), and the NPOQ (Robichaud & Dugas, 2005a). Higher scores on the SPSI-R overall score indicate higher SPS ability, whereas higher scores on the PSI indicate lower SPS ability. Higher scores on each subscale of the SPSI-R and PSI represent higher levels of that component of SPS. Similarly, higher scores on the NPOQ indicate higher levels of NPO. The maladaptive subscales of the SPSI-R (i.e., NPO, ICS,

and AS) have demonstrated positive relationships with the subscales of the PSI (r 's ranged from .37 to .74, $p < .05$). In contrast, the adaptive subscales of the SPSI-R (i.e., PPO and RPS) have demonstrated negative relationships with the subscales of the PSI (r 's ranged from -.38 to -.62, $p < .05$; Maydeu-Olivares & D'Zurilla, 1997). Other investigations of these two measures have found similar ranges in correlations (e.g., Dreer et al., 2004; Shewchuk et al., 2000).

The total score of the PSI and the total score of a shortened version of the SPSI-R, the SPSI-R:S, were found to be highly correlated ($r = -.82$, $p < .05$; Hawkins et al., 2009). Of note, the SPSI-R and SPSI-R:S capture the same components of SPS (D'Zurilla et al., 2002; Li et al., 2016). The NPOQ has also been examined alongside the SPSI-R:S and found to be correlated with the NPO subscale ($r = .83$, $p < .05$) and the PPO subscale ($r = -.39$, $p < .05$; Robichaud & Dugas, 2005a). The NPOQ is correlated with the two maladaptive problem-solving dimensions of the SPSI-R, namely ICS ($r = .41$, $p < .05$) and AS ($r = .54$, $p < .05$; Pawluk et al., 2017). The NPOQ and PSI do not appear to have been included together in investigations of SPS. Overall, these relationships provide some evidence for convergent validity; however, some elements that comprise SPS appear to be more related than others (e.g., the range of correlations between the SPSI-R and PSI subscales).

The SPSI-R and the PSI are two of the most commonly used measures of SPS (e.g., Anderson et al., 2009; Shewchuk et al., 2000). However, investigations attempting to characterize the underlying construct captured in these measures and the extent to which they overlap have often yielded conflicting results (D'Zurilla & Maydeu-Olivares, 1995, 1996; Heppner et al., 2004; Maydeu-Olivares, & D'Zurilla, 1997). Overall, the SPSI-R seems to have emerged as the front-runner in describing the construct understood today as SPS, whereas the PSI has been characterized more so as a measure of 'problem-solving appraisal,' or an

individual's assessment and understanding of their own SPS abilities (D'Zurilla & Nezu, 2010; Heppner et al., 2004). Despite these differing conceptualizations and the varied relations between subscales, both measures purport to measure the construct of SPS.

In addition, the component of NPO has been identified as accounting for a significant amount of the variance in relationships between psychological well-being and SPS, and thus is often used as the primary indicator in investigations of SPS (e.g., Bell & D'Zurilla, 2009; Chang, 2017; Kant et al., 1997). In contrast, RPS, the component of SPS that is intended to capture the adaptive versions of SPS skills, is rarely a key factor in connections to psychopathology (e.g., Haugh, 2006; Reinecke et al., 2001). Several investigators have recognized issues with these measures of SPS in that they seem to capture varied components of the construct (Anderson et al., 2009, 2011; D'Zurilla & Maydeu-Olivares, 1995; Heppner et al., 2004; Robichaud & Dugas, 2005a). How well all three measures capture the construct of SPS when considered in the context of each other has not yet been investigated.

Gender Differences in the Constructs of SR, ER, and SPS. As reviewed, past theoretical and empirical work on the constructs of interest does not appear to indicate that the constructs' structures would differ based on gender. Regarding SR, factor analytic investigations of SR measures mirror empirical findings in that no notable gender differences have been identified (Carey et al., 2004; Moilanen et al., 2007). Though gender differences in ER and some facets of SPS exist, investigations of underlying measure structures do not indicate a clear pattern of differences (D'Zurilla et al., 2002; Gratz & Roemer, 2004; Gross & John, 2003; Heppner & Peterson, 1982; Preece et al., 2018; Robichaud & Dugas, 2005a). While evidence for structural gender differences among these constructs is lacking, possible differences were examined in the measurement stage in order to better inform the latent variable model.

Convergent & Discriminant Validity of SR, ER, and SPS

Although theorists within each construct area mostly agree on their construct's composition, there seems to be very little “cross-construct” communication or consensus as to the common and distinct features of each construct. As described, the majority of work in differentiating these constructs has been at the theoretical level (e.g., D’Zurilla & Nezu, 2010; Gross, 2014; Nigg, 2017; see [Table 1](#) and [Table 2](#)). In particular, Chapter IV integrates theoretical models of the three constructs and highlights points of overlap. To some extent, empirical work has been done to differentiate pairs of the constructs (e.g., SR versus ER), yet no study was identified that investigated the common versus distinct aspects of all three constructs in the context of one another. The present study aimed to address this gap in the literature through evaluating four possible ways measures of these constructs might relate to each other, which will be described later in this chapter. To help provide a framework for the proposed models, the convergent and discriminant evidence available for pairs of the constructs will be summarized next. Of note, all measures used to assess the constructs of interest are self-report measures, which introduces an element of shared method variance (Campbell & Fiske, 1959). Thus, the present investigation of convergent and discriminant validity was considered within the framework of a shared method.

SR & ER. As described in Chapters II and III, ER can be conceptualized as a form of SR in which the target of regulation is emotion (Gross, 2014; Nigg, 2017). While these constructs share a significant amount of overlap, both in underlying mechanisms and functional outcomes, they do appear to be distinct in that the dysregulation of emotions can impair domain-general SR (Diamond & Aspinwall, 2003; Tice & Bratslavsky, 2000). This has been shown to occur through two pathways: first, negative affect, mood, or emotions can serve to disrupt or inhibit adaptive

SR (Bridgett et al., 2013; Moberly & Watkins, 2010); second, putting energy and effort toward regulating emotions can subtract resources from domain-general SR (Muraven & Baumeister, 2000). ER has been demonstrated to impact SR through mis-regulation (i.e., focus on emotional over non-emotional goals) or under-regulation (i.e., not enough resources are left over after addressing negative affect; Baumeister et al., 1998; Tice et al., 2001). While SR and ER likely share common features, these findings indicate that they can interact with each other, which also suggests the presence of distinct features.

Some investigations have reported correlations between the measures of SR and ER selected for the present study. The SSRQ was found to be positively related to the ERQ reappraisal subscale ($r = .20, p < .05$) and negatively related to the suppression subscale ($r = -.14, p < .05$; Lazuras et al., 2019). The BSCS and the DERS have demonstrated a negative relationship ($r = -.46, p < .05$; Aka et al., 2020). The ASRI does not appear to have been examined with any of the selected ER measures; similarly, the PERCI does not appear to have been investigated with any of the selected SR measures. In the pilot study conducted prior to the present proposal, negative relationships were found between the SRQ and the DERS ($r = -.61$), as well as the ASRI and the DERS ($r = -.62, p < .05$; Buffie & Nangle, 2018).

Overall, the theories of these constructs suggest that while some convergence is expected between SR and ER, they should also function as distinct constructs. There seems to be minimal evidence for discriminant validity of these constructs. More specifically, the relationship between two measures of ER should be stronger than the relationship between a measure of ER and a measure of SR; yet, this pattern does not always hold up (e.g., the relationship between the SRQ and DERS was $r = .61, p < .05$, while the relationship between the DERS and the ERQ

reappraisal subscale was $r = -.24, p < .05$). This suggests a substantial amount of convergence between measures of SR and measures of ER.

SR & SPS. As described in Chapter IV, SR and SPS appear to share a significant amount of theoretical overlap, both in underlying mechanisms and functional outcomes. However, no empirical studies were identified that investigated SR and SPS in the context of each other. The majority of studies that examined these constructs either focused on emotion as the target of regulation (more relevant to the relationship between ER and SPS) or general problem-solving, rather than SPS. Some investigations have recognized the overlap between SPS and self-control (e.g., Antonowicz & Ross, 2005; Rohde et al., 1990), while others have utilized measures of EF and delay of gratification to explore the relationship (e.g., Ganesalingam et al., 2007). However, these studies do not provide analyses of the relationships between these constructs (they instead focused on a third variable outcome) and therefore do not provide much indication of the overlap versus uniqueness between SR and SPS.

In the pilot study conducted prior to the present proposal, positive relationships were found between the SRQ and SPSI-R ($r = .75, p < .05$), as well as the ASRI and the SPSI-R ($r = .68, p < .05$; Buffie & Nangle, 2018). This supports a fair degree of possible overlap between the constructs yet based on their theoretical distinctions and lack of empirical connection, they should also function as distinct constructs. The same concern regarding discriminant validity noted between SR and ER is relevant here, such that the strong relationship between measures of SR and SPS indicate low divergence. In particular, some subscales of the SPSI-R and PSI were correlated at magnitudes as low as $r = .37$, while the SRQ and SPSI-R were correlated at a magnitude of $r = .75$. This suggests a substantial amount of convergence between measures of SR and measures of SPS.

ER & SPS. As described in Chapter IV, ER and SPS appear to share a significant amount of theoretical overlap, both in underlying mechanisms and functional outcomes. Empirical investigations of ER and SPS have tended to focus on two connections between these constructs: the impact of emotion on SPS and the interaction between the ER strategy of rumination and SPS. In particular, positive affect has been connected to PPO, whereas negative affect has been connected to NPO (Chang & D’Zurilla, 1996). Importantly, these aspects can function to enable or disrupt subsequent SPS (Nezu, 2004). Indeed, evidence suggests that positive affect facilitates SPS (Nelson & Sim, 2014), and negative affect inhibits SPS (Chang, 2017). In addition, high levels of rumination have been linked to maladaptive SPS (Lyubomirsky et al., 1999). This has been primarily investigated in the context of depressive symptoms and will be discussed in more detail in the next section. Other studies have found that depending on the problem, ER strategies can be employed in service of SPS (Hoppmann et al., 2008). While ER and SPS likely share common features, these findings indicate that they can interact with each other, which also suggests the presence of distinct features.

Some investigations have reported correlations between the measures of ER and SPS selected for the present study. The SPSI-R was found to be negatively correlated with the DERS ($r = -.50, p < .05$), positively correlated with the ERQ reappraisal subscale ($r = .37, p < .05$), and not significantly related to the ERQ suppression subscale (Turner et al., 2012). In another study, the adaptive subscales of the SPSI-R demonstrated negative relationships with all of the DERS subscales (r 's ranged from $-.16$ to $-.22, p < .05$) except for DERS Awareness, which did not correlate with either PPO or RPS (Kuzucu, 2016). The maladaptive subscales of the SPSI-R demonstrated positive relationships with the subscales of the DERS (r 's ranged from $.17$ to $.40, p < .05$; Kuzucu, 2016). Similarly, the NPOQ demonstrated positive relationships with all of the

DERS subscales (r 's ranged from .37 to .61, $p < .05$), except for the DERS Awareness subscale (Kertz et al., 2015). In the pilot study conducted prior to the present proposal, a negative relationship was found between the DERS and the SPSI-R ($r = -.64$, $p < .05$; Buffie & Nangle, 2018).

Overall, the theories of these constructs suggest that while some convergence is expected between ER and SPS, they should also function as distinct constructs. The same concern regarding discriminant validity noted between the other construct combinations is relevant here, such that the strong relationship between measures of ER and SPS indicate low divergence. In particular, some subscales of the SPSI-R and PSI were correlated at magnitudes as low as $r = .37$, $p < .05$, while the DERS and SPSI-R were correlated at a magnitude of $r = -.64$, $p < .05$. This suggests a substantial amount of convergence between measures of ER and SPS.

Common vs. Distinct Pathways to Depressive Symptoms

As discussed in Chapters II-IV, each of the constructs has been identified as a significant contributor to depressive symptoms (Anderson et al., 2009; Joormann & Stanton, 2016; Strauman, 2017), yet the combined influence of these constructs on depression has not been assessed. Given that no studies were identified that investigated SR and SPS in the context of each other, the combined influence of these constructs on depressive symptoms is the least clear. The majority of research examining the combined influence of either SR and ER or ER and SPS on depressive symptoms has focused on one aspect of ER, rumination (e.g., Hasegawa et al., 2018; Noreen et al., 2015; Pyszczynski & Greenberg, 1987). The common theme in these conceptualizations is that something stressful occurs in an individual's life, for instance an unsolved problem or an unattained goal. The individual then experiences a high level of negative affect and attempts to regulate through the strategy of rumination. As discussed in Chapter III,

rumination is a particularly detrimental ER strategy because, while the individual believes it to be helpful, it does not help to down-regulate negative emotions (Nolen-Hoeksema et al., 2008; Zhou et al., 2020). Failure to solve the problem, attain the goal, and regulate emotions can function to initiate or maintain depressive symptoms over time (Hasegawa et al., 2018; Pyszczynski & Greenberg, 1987).

These patterns suggest that SR, ER, and SPS may interact to exacerbate depressive symptoms. However, what remains unknown is whether SR, ER, and SPS share common features. More specifically, are the measures currently being used to assess SR, ER, and SPS capturing each construct as a unique, distinct entity, or is a substantial amount of shared variance present across measures of these constructs? If the three constructs share common features, might deficits in the common features themselves better explain observed depressive symptoms? Conversely, if each construct holds a unique connection to depressive symptoms, can the unique aspects be better characterized (and targeted more directly) by isolating and removing the common components among the constructs? Until these questions are examined more closely, interpretations of the relationships among SR, ER, SPS, and depression may be flawed. That is, understanding the relationships among the measures used to assess these constructs will help to better inform the subsequent observed relationships. The present study aimed to address this gap in the literature.

Gender Differences in Predicting Depressive Symptoms. A question of interest in the present study was whether the relationship between the constructs of interest and depressive symptoms is impacted by gender. As noted in Chapter II, past research is not suggestive of a significant impact of gender on the relationship between domain-general SR and depressive symptoms. In contrast, notable gender differences in ER have been identified (Nolen-Hoeksema,

2012). Relevant to the present study, evidence suggests the relationship between ER and depressive symptoms is significantly impacted by gender (e.g., Aldao et al., 2010). While evidence for differences in components of SPS exists, such as higher levels of NPO observed in females as compared to males (e.g., D’Zurilla et al., 1998), the present study focused on overall SPS ability, which does not appear to differ based on gender.

Study Rationale

Participants

As noted in Chapter I, there are several important reasons to investigate the research questions of interest in a population of emerging adults. During emerging adulthood, development across neurological, cognitive, emotional, and social domains occurs, which substantially influences the maturation of SR, ER, and SPS. The solidification of these processes during this inherently instable period creates an opportunity for things to go awry. Indeed, evidence has suggested that the age of onset for many forms of psychopathology occurs in the teens and twenties (Kessler et al., 2007). In particular, major depressive disorder is a significant concern, with high prevalence rates found in both emerging adult and undergraduate populations (Auerbach et al., 2018; Hasin et al., 2018). These factors support the examination of SR, ER, SPS, and depressive symptoms during this developmental period.

Design

Undergraduate students aged 18-29 completed three self-report measures each of the constructs interest (3 SR, 3 ER, and 3 SPS), as well as a measure of depressive symptoms. The analyses progressed in two stages: the measurement model stage and the structural model stage. In the measurement model stage, a CFA was conducted. Four rival CFA models, including (1) a first-order model, (2) a higher-order model, (3) a bifactor model, and (4) a one-factor model,

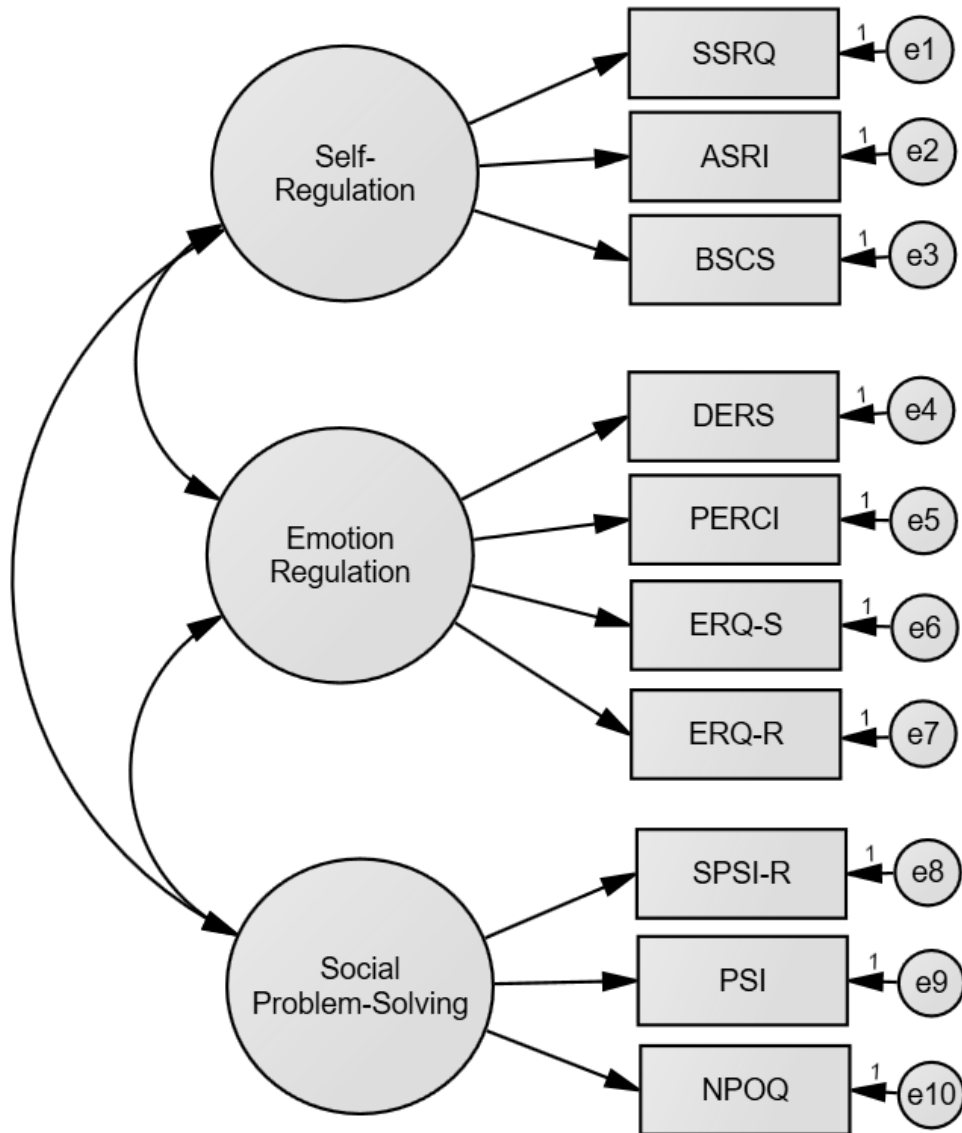
were tested against each other. In the structural model stage, the best fitting CFA model was used in latent variable SEM. The CFA and latent variable models included a multigroup analysis to examine possible gender differences. These steps will be discussed in the following sections.

Confirmatory Factor Analysis. The first goal of the present study was to assess the construct validity of SR, ER, and SPS by conducting a CFA based on three measures of each construct. Factor analysis can be used to assess how much variance in measures is generated by underlying constructs (Byrne, 2016). Three measures of each construct were selected to have enough data points for multiple operationalization (Crano et al., 2014). This refers to the notion that multiple assessments are better able to capture a wider portion of a construct's nomological net as compared to single assessments of the construct. For each construct, the three measures were partitioned into shared variance among measures (the latent construct) and the remaining variance of each measure (Crano et al., 2014). This created a 'pure' latent construct that is free of measurement error. The factor loadings between the latent construct and each measure indicated the extent to which variance in the measure is generated by the underlying construct (Byrne, 2016). This was accomplished using a first-order CFA model ([Figure 1](#)). This type of model is used to test the factorial validity of a latent construct and can be conceptualized as a basic CFA model as discussed in Chapter I (Byrne, 2016).

Rival CFA Models. The second goal of the present study was to examine convergent and discriminant validity of the constructs by testing a series of CFA models that reflect different possibilities for the underlying structure of the observed variables. The first model tested was the first-order CFA model described in the previous section ([Figure 1](#)).

Figure 1

Proposed First-Order CFA Model



This model proposed that each measure loads on to its theorized construct, and that the three theorized constructs are related to one another. In particular, this model suggests that each latent construct functions as a distinct entity and does not share features with the other constructs.

The second model was a higher-order CFA model ([Figure 2](#)), which is a type of hierarchical CFA model. Hierarchical models can be used to help explain observed correlations between first-order factors or their measured variables (Brunner et al., 2012). This model included the relationships as depicted in the first model, but also added the influence of a higher-order factor thought to impact each of the first-order factors. Similar to the manner in which the first-order factors represent the shared variance in each group of measures, the higher-order factor represented the shared variance among the three first-order factors. The three first-order factors were partitioned into the common variance (the latent higher-order construct) and the remaining variance in each construct (the unique factor variance; Keith, 2019). Higher-order models can be conceptualized as a factor analysis of the first-order constructs (Keith, 2019). This model suggests that the degree to which the three constructs are related is due to them all being manifestations of a larger, over-arching construct.

The third model tested was another type of hierarchical CFA model, referred to as a bifactor model ([Figure 3](#)). This model differs from the higher-order model in that, instead of the common factor influencing the measures through the first-order constructs, the variance is shared among all nine measures (Keith, 2019).

Figure 2

Proposed Higher-Order CFA Model

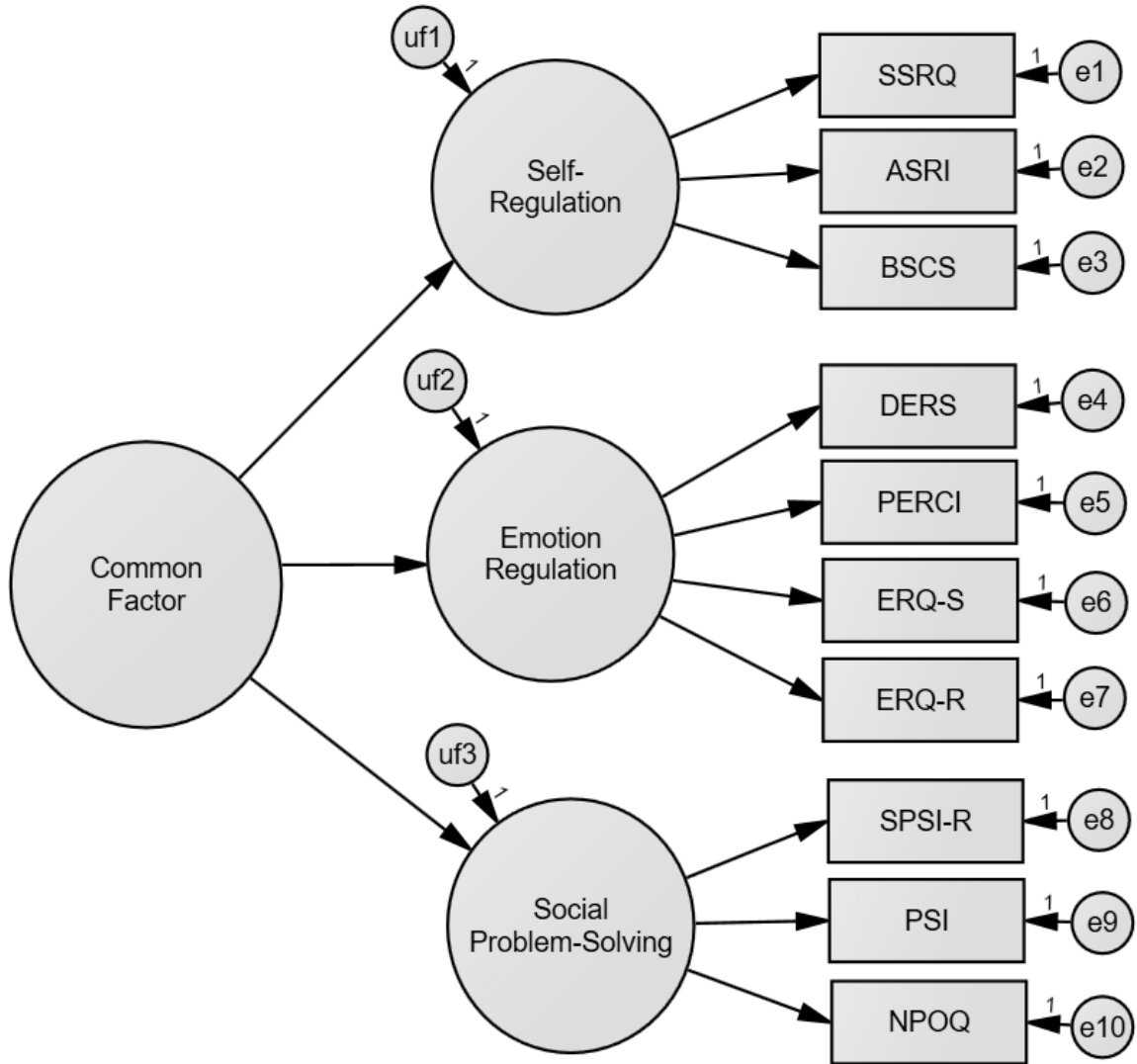
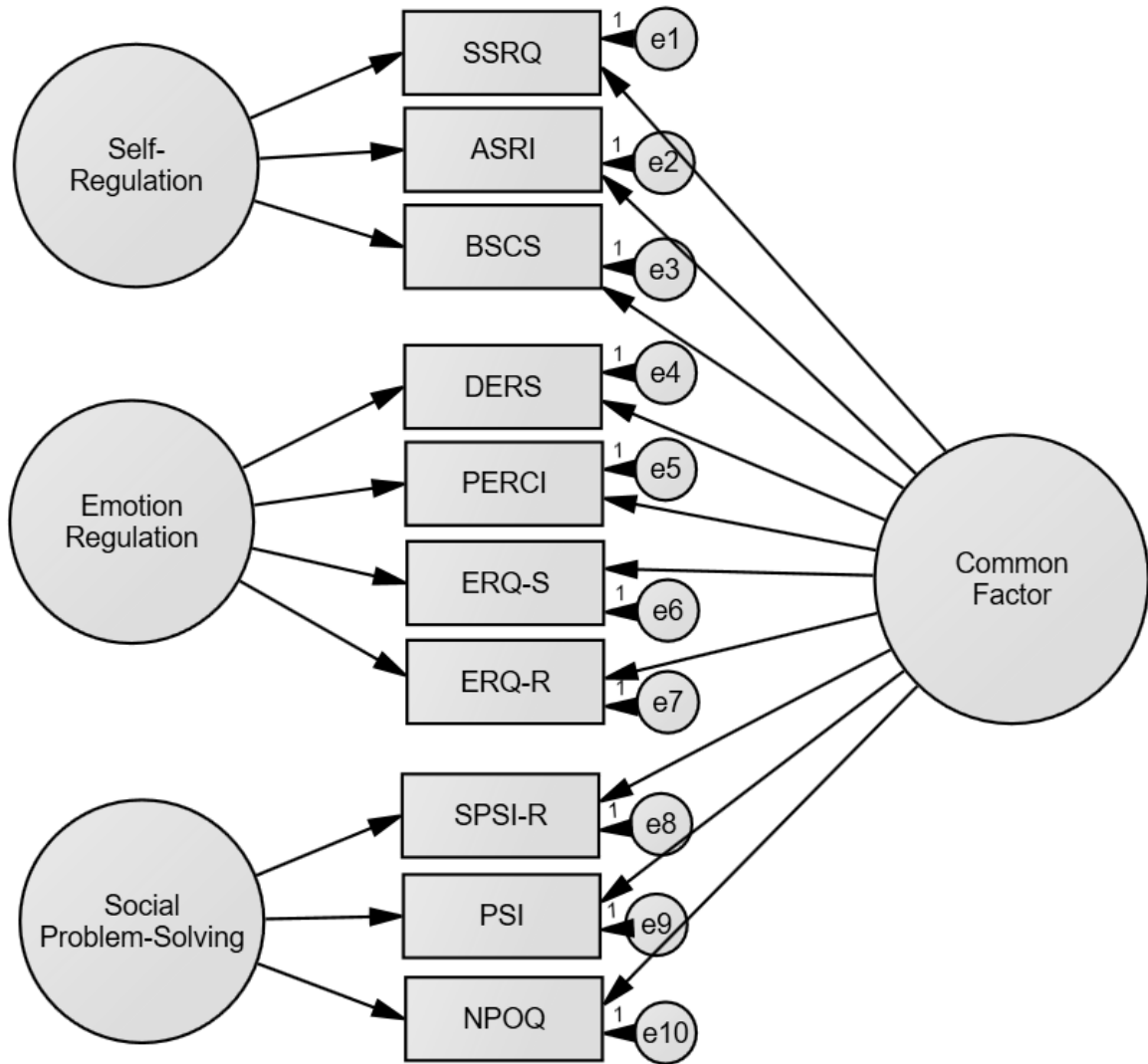


Figure 3

Proposed Bifactor CFA Model



In other words, the common factor in the bifactor model represents shared features of all nine measures that is separate from the shared features of the three sets of measures representing each first-order construct. This model suggests that each latent construct functions as a distinct entity, and that the nine measures share common features separate from the three constructs of interest.

The fourth and final model tested was a one-factor model ([Figure 4](#)). In this model, the three constructs of interest were not represented as distinct entities and were instead collapsed into one (Brunner et al., 2012). This model suggested that the three constructs are overlapping to the point that they function better as one, common construct. This would suggest maximum convergence of the constructs and indicate that the nine selected measures are in fact all generated by one underlying construct. The four models discussed to this point represent the measurement model stage of the analyses. How the models were tested against each other will be described in more detail in the Analysis Plan section of Chapter IV. The best-fitting model was used in the structural model stage, which will be discussed next.

Latent Variable SEM. The third goal of the present study was to use the best-fitting CFA model to assess how the common and/or distinct features of SR, ER, and SPS relate to depressive symptoms (possible options represented in [Figure 5](#), [Figure 6](#), [Figure 7](#), and [Figure 8](#)). This portion represents the structural stage of the analyses. In the measurement stage, the measured variables were factor-analyzed, such that the resulting latent constructs were considered ‘free’ of error (Crano et al., 2014). The relationships that were tested in the subsequent structural model represent more than correlations or regression coefficients in that error has been removed. This allowed for an examination of how well either the common features, distinct features, or both relate to depressive symptoms, depending on the best-fitting CFA model.

Figure 4

Proposed One-Factor CFA Model

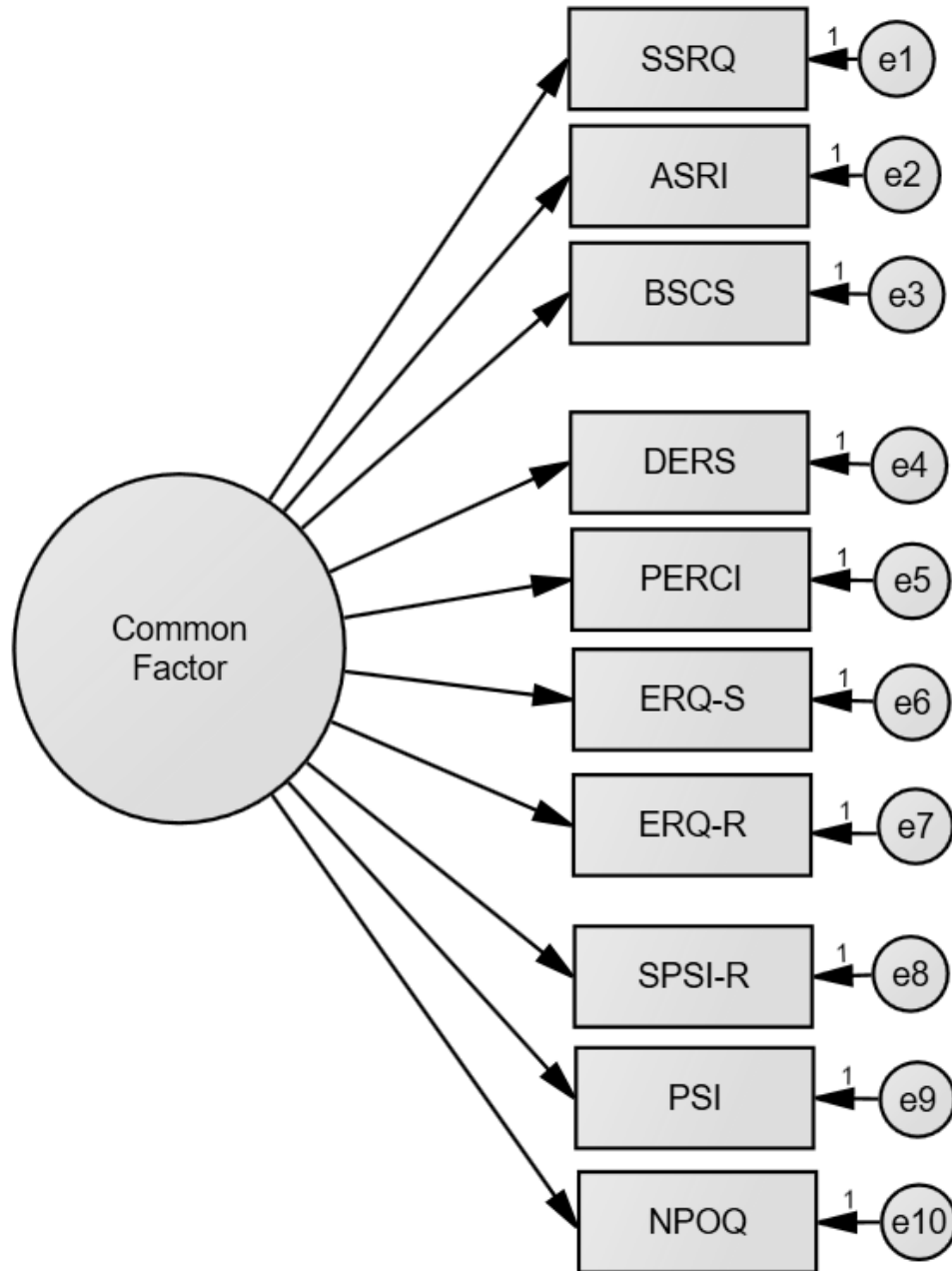


Figure 5

Proposed First-Order CFA Model; Latent Variable SEM Predicting Depressive Symptoms

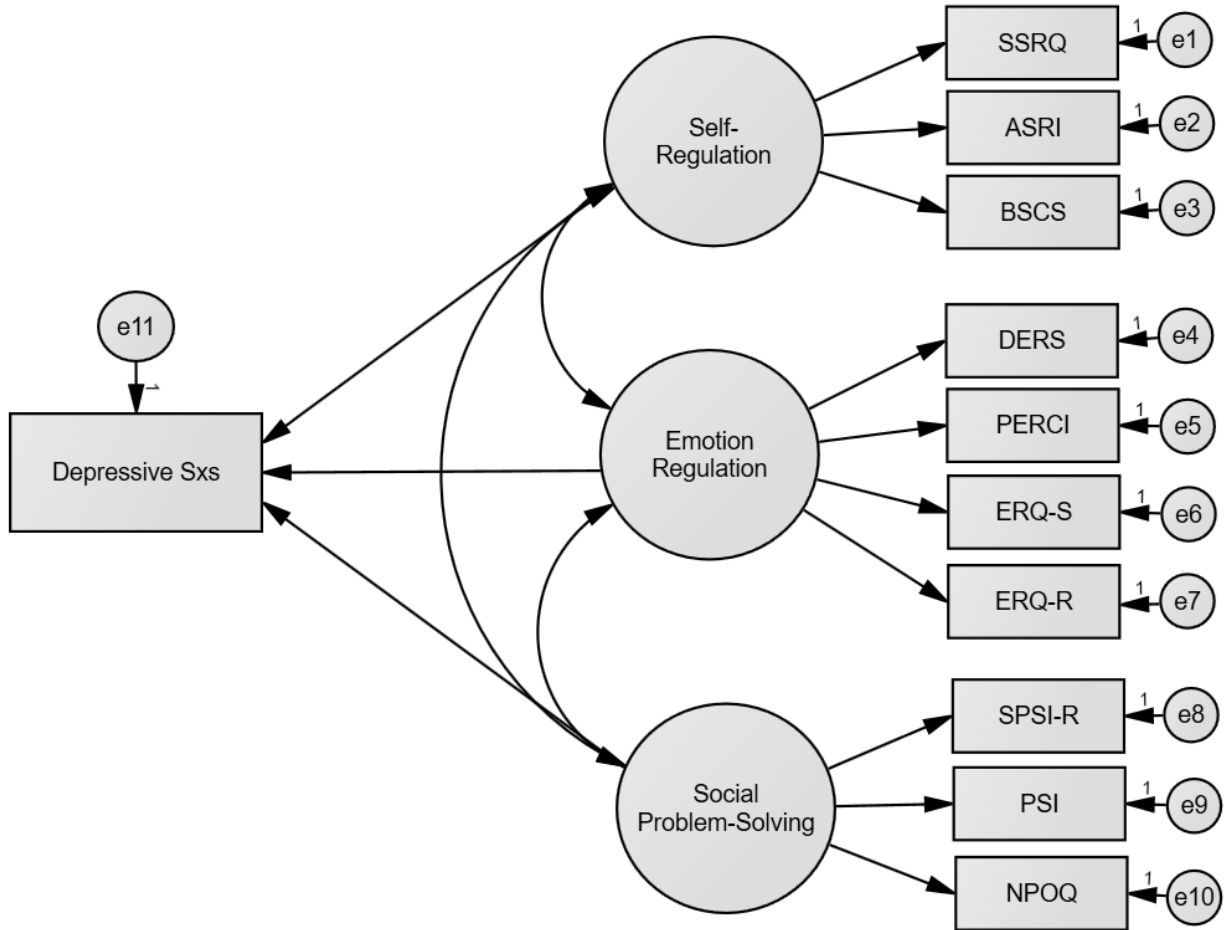


Figure 6

Proposed Higher-Order CFA Model; Latent Variable SEM Predicting Depressive Symptoms

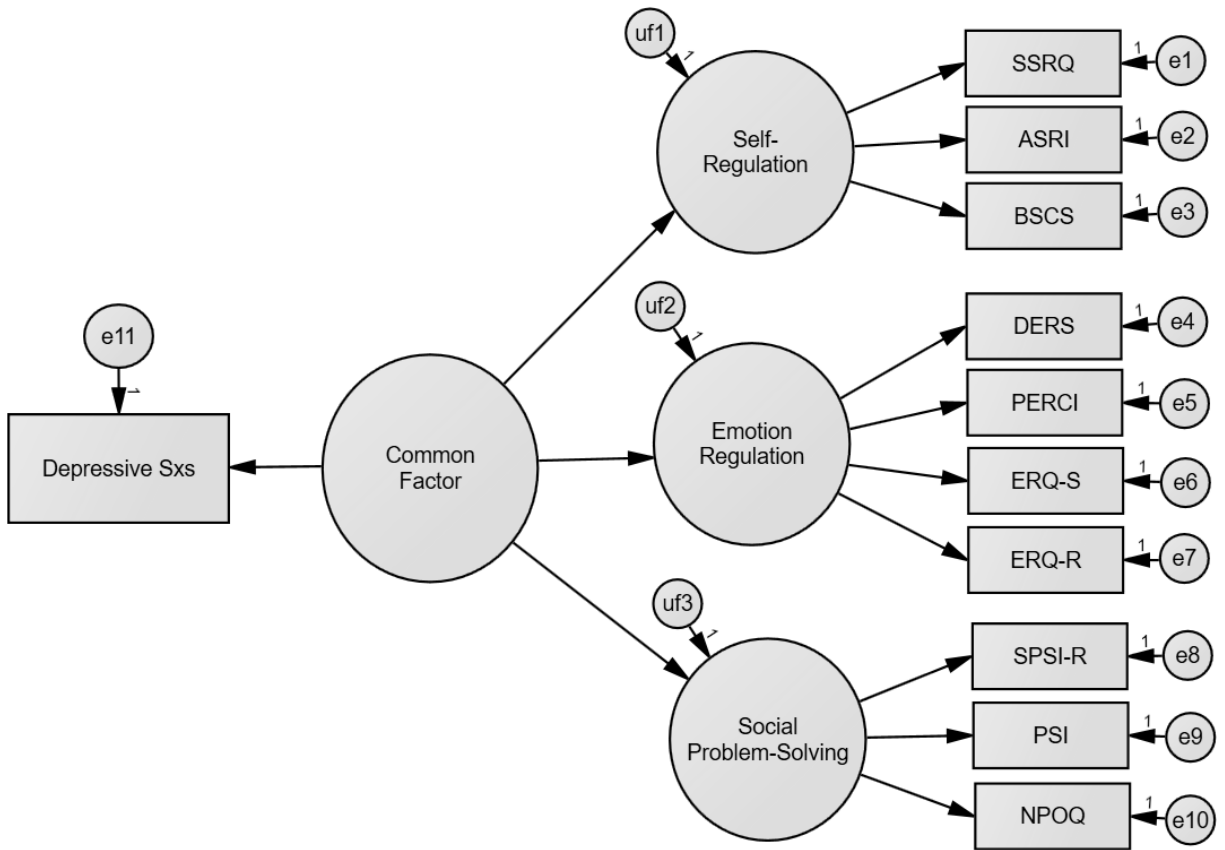


Figure 7

Proposed Bifactor CFA Model; Latent Variable SEM Predicting Depressive Symptoms

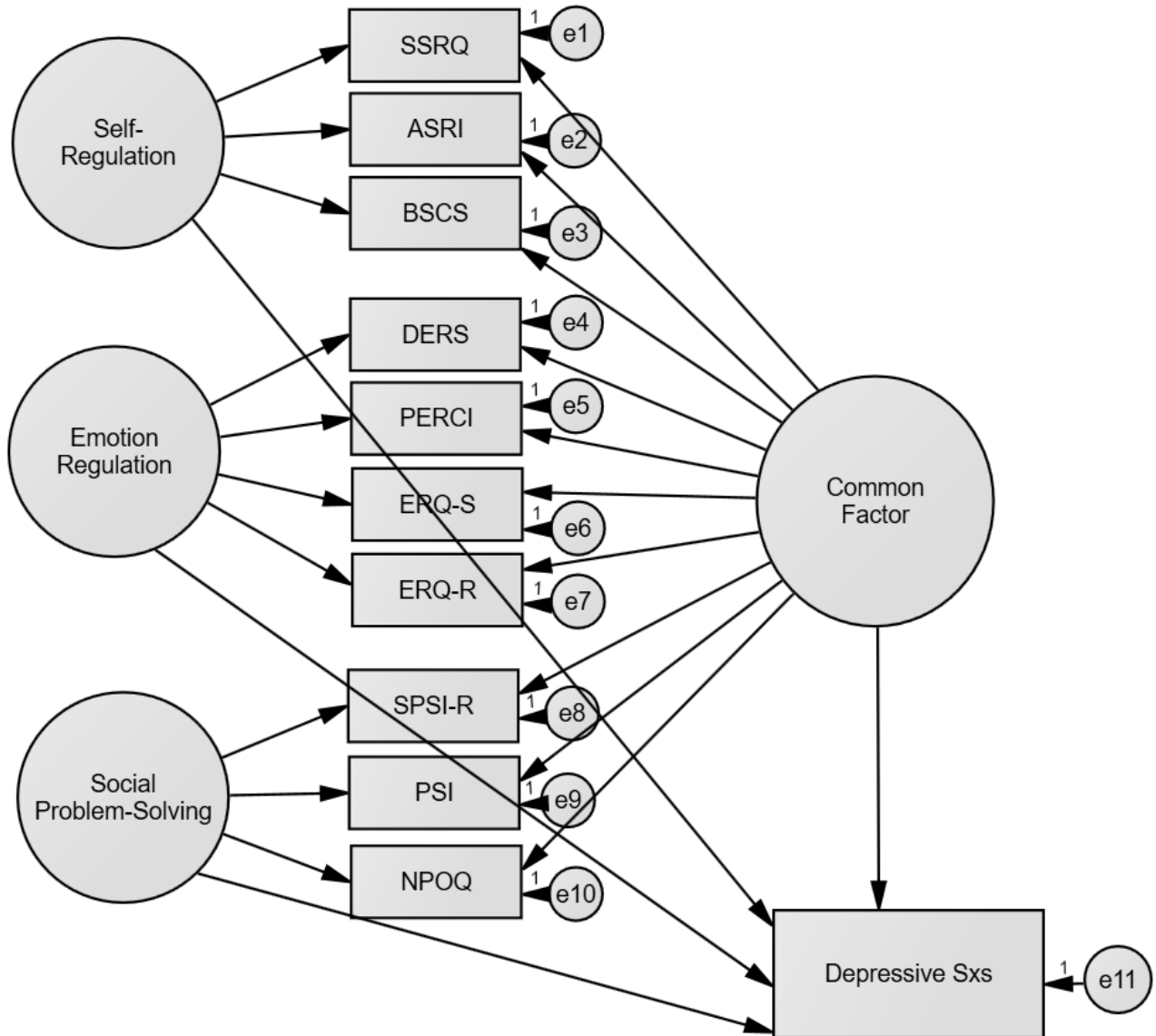
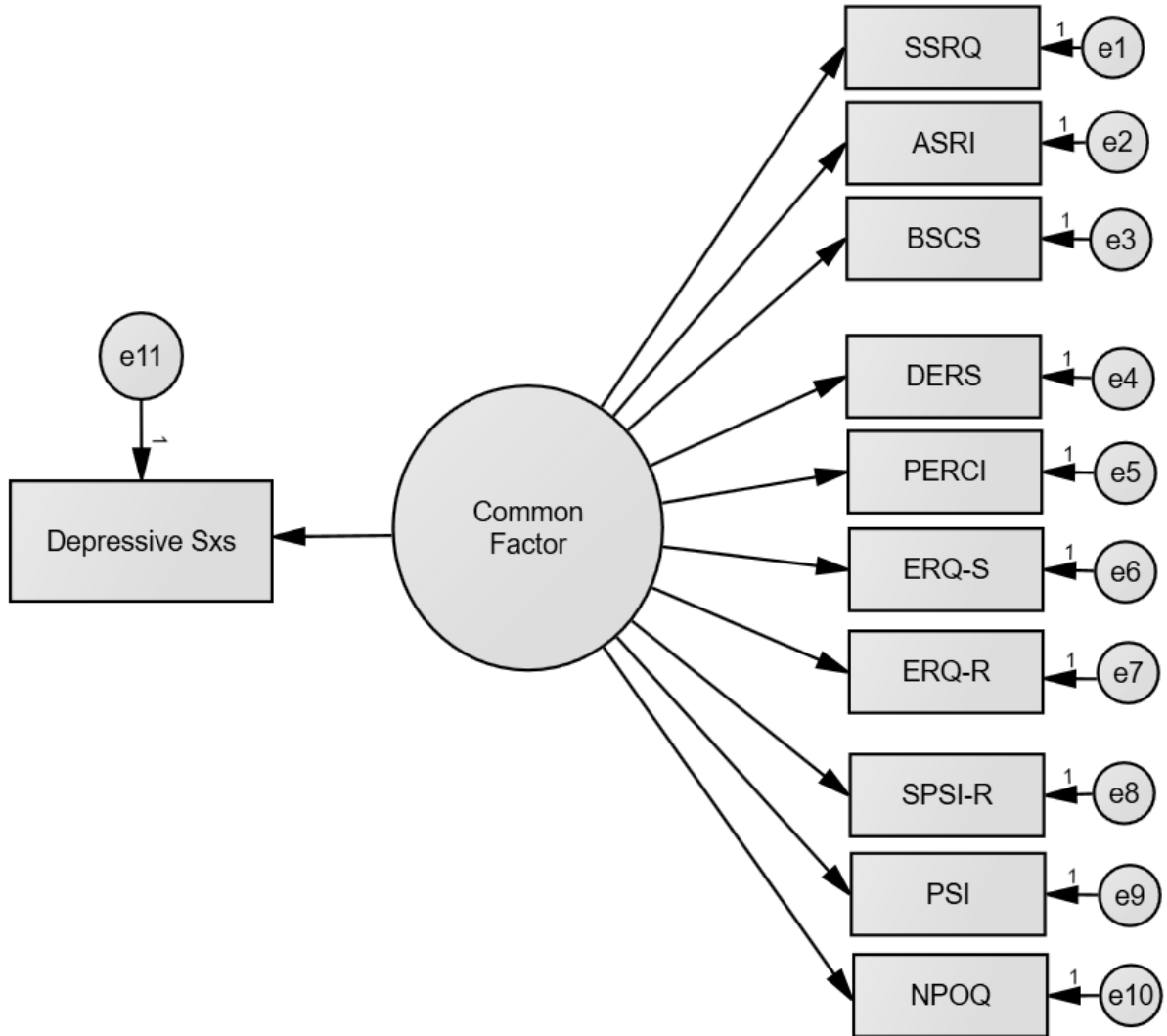


Figure 8

Proposed One-Factor CFA Model; Latent Variable SEM Predicting Depressive Symptoms



Multigroup Analysis (Gender). Based on the evidence reviewed in Chapters I-IV, there was reason to predict some of the relationships of interest may differ based on gender. Examining these differences in CFA/SEM involved consideration of *invariance*, or whether the models are invariant across groups (Byrne, 2016). This was tested through multigroup analysis, which involves systematically allowing paths to either vary or be constrained to equivalent values and then comparing the differences in model fit (Keith, 2019). This analysis can answer the two interrelated questions of (1) are the constructs equivalent across groups as measured and (2) are certain structural paths among variables equivalent across groups? The first question addresses whether the constructs SR, ER, and SPS are being measured the same across groups (invariance), while the second question addresses whether gender interacts with the constructs to impact the outcome (Byrne, 2016; Keith, 2019). Invariance testing does not require the model to be tested as two distinct groups (i.e., model tested once for females and once for males) and thus does not require a substantially larger sample size than single-group SEM (Prindle & McArdle, 2012).

Summary

Overall, there are several advantages to using a CFA/SEM approach. First, these approaches were able to account for both predictive error (i.e., variance remaining after a predictor explains an outcome) and measurement error (Crano et al., 2014). Second, fit indices allowed for the overall fit of the hypothesized model in comparison to the underlying data to be assessed. Third, it was possible to statistically test rival or competing models to provide additional support for the best-fitting model (Keith, 2019). Finally, multigroup analyses allowed for the comparison between two categorical groups without significantly impacting sample size.

Hypotheses

Bivariate Correlations

Because several of the measures selected for the present study have yet to be included in investigations together, bivariate correlations between all predictor measures and the outcome measure of depression were examined first. Of note, bivariate relationships were tested across all measures of each construct to assess for pattern differences. However, hypotheses will be presented as general rather than specific relationships.

First, given the overlap in theoretical foundations discussed between SR and ER (Gross, 2014; Nigg, 2017), as well as empirical evidence of their interaction (e.g., Tice & Bratslavsky, 2000), it was hypothesized that adaptive SR would be positively related to adaptive ER (Hypothesis 1). Second, despite a lack of empirical evidence linking SR to SPS, overlap in underlying mechanisms and functional outcomes suggests these constructs are likely related (Barkley, 1997a; D’Zurilla & Nezu, 2010). As such, it was predicted that adaptive SR would be positively related to adaptive SPS (Hypothesis 2). Third, in addition to the theoretical overlap discussed, the constructs of ER and SPS have been investigated empirically and found to interact with each other, particularly in the context of depressive symptoms (e.g., Hasegawa et al., 2018; Hoppmann et al., 2008). It was hypothesized that adaptive ER would be positively related to adaptive SPS (Hypothesis 3). Finally, previous investigations have identified deficits in SR, ER, and SPS as being significant contributors to depressive symptoms (e.g., Anderson et al., 2009; Joormann & Stanton, 2016; Strauman, 2017). It was therefore predicted that adaptive SR, ER, and SPS would be related to lower depressive symptoms (Hypothesis 4-6).

Mean-Level Differences (Gender)

As discussed in Chapters I-IV, some differences may exist in the relationships of interest based on gender. To investigate this possibility, mean-level differences between males and females on the constructs of interest were examined first, prior to multigroup examinations of the CFA/SEM models. Similar to the approach for correlational analyses, these differences were tested across all measures of each construct to assess for pattern differences; however, the hypotheses will be presented as general rather than specific relationships. Based on prior research indicating gender differences in ER (e.g., Nolen-Hoeksema, 2012), it was predicted that females would report higher difficulties in ER than males (Hypothesis 7). Regarding SPS, some evidence indicates a possible gender difference between females and males on levels of NPO (e.g., Bell & D’Zurilla, 2009). Thus, it was predicted that females would report higher levels of NPO than males (Hypothesis 8). Finally, consistent evidence across multiple samples has indicated a gender difference in depressive symptoms (e.g., Salk et al., 2017). It was therefore predicted that females would report higher levels of depressive symptoms than males (Hypothesis 9).

First-Order CFA Model

The next set of hypotheses will refer to the first-order model CFA ([Figure 1](#)). As discussed in Chapters II-IV, all selected measures were chosen based on their (1) aim to capture the overall construct, (2) connection to theory, and (3) frequency of use in the field. They were each predicted to load on to their theorized constructs as follows.

The three measures selected to assess SR have been found to be related to each other and to other constructs as would be expected based on SR theory (e.g., Brown et al., 1999; Carey et al., 2004; Moilanen, 2007; Tangney et al., 2004). As such, it was hypothesized that the three

measures selected to assess SR would load on to a latent factor thought to represent the underlying construct of SR (Hypothesis 10). Regarding ER, the three measures included what are considered the most well-validated measures of ER, which have been found to be related to each other (Gratz & Roemer, 2004; Gross & John, 2003; Ireland et al., 2017; Preece et al., 2018). It was predicted that the three measures selected to assess ER (with the ERQ split into an ERQ-S suppression score and ERQ-R reappraisal score) would load on to a latent factor thought to represent the underlying construct of ER (Hypothesis 11). Finally, although the three measures of SPS have been subject to investigations to determine whether they assess similar components, they all purport to capture elements of the underlying construct of SPS (e.g., D’Zurilla et al., 2002; Heppner & Peterson, 1982; Robichaud & Dugas, 2005a). In addition, they have been found to be related to each other in previous empirical studies (e.g., Maydeu-Olivares & D’Zurilla, 1997; Pawluk et al., 2017). It was hypothesized that the three measures selected to assess SPS would load on to a latent factor thought to represent the underlying construct of SPS (Hypothesis 12).

In this model ([Figure 1](#)), it was also predicted that all three latent factors would be correlated with each other (Hypotheses 13-15). This was based on the same evidence highlighted in predicting correlational relationships between these three constructs discussed above (e.g., Hasegawa et al., 2018; Tice & Bratslavsky, 2000), as well as the areas of theoretical overlap presented in Chapters II-IV.

Rival CFA Models

The four proposed models were tested against one another to determine which model fits the underlying data best. While this process was somewhat exploratory in nature, evidence presented in Chapters II-IV suggested that the higher-order model ([Figure 2](#)) may result in the

best fit (Hypothesis 16). There were several reasons underlying this hypothesis. First, the first-order model ([Figure 1](#)) proposed that the constructs of interest are related but does not include shared features after measurement error has been removed. This would indicate that the constructs function entirely as distinct entities and that the measures do not share any variance; in other words, it is not that the constructs are unrelated, but rather that the degree to which they are related is not a reflection of shared variance with an overarching construct. Theoretical evidence discussed in Chapters II-IV suggests that the constructs likely share several features, including underlying mechanisms and functional outcomes (e.g., Barkley, 1997a; D’Zurilla & Nezu, 2010; Gross, 2014). On the other end of the spectrum, the one-factor model ([Figure 4](#)) suggests that the constructs converge to the extent that they should not be considered distinct constructs and instead function better as one common factor. Though a certain amount of convergence among constructs is expected, substantial theoretical work has been done that suggests these three constructs are worth differentiating (e.g., Barkley, 1997a; D’Zurilla & Nezu, 2010; Gross, 2014). Further, empirical work suggests that the constructs can interact with each other, which indicates that some distinct features are likely also present (e.g., Hasegawa et al., 2018; Tice & Bratslavsky, 2000).

The theoretical difference between the higher-order model ([Figure 2](#)) and the bifactor model ([Figure 3](#)) is less apparent. Specifically, the higher-order model suggests that a common factor (i.e., shared variance among the three latent constructs) is present and indirectly impacts the observed measures through the first-order factors. In contrast, the bifactor model suggests that a common factor that is separate from the first-order factors explains a portion of the shared variance amongst all nine measures of the constructs. The common factor represented in the higher-order model ([Figure 2](#)) could represent the shared features of SR, ER, and SPS

highlighted throughout Chapters II-IV, including underlying mechanisms (i.e., top-down and bottom-up processes; skills specific to cognitive, emotional, or behavioral modalities; EFs) or functional outcomes (i.e., features related to monitoring, evaluating, and adjusting behavior across modalities to achieve a goal or solve a problem; Barkley 1997a; Gross, 2014; D’Zurilla & Nezu, 2010). However, the common factor represented in the bifactor model ([Figure 3](#)) would represent shared features that impact all of the observed measures but that are separate from the three latent constructs of interest. Possible features of this separate common factor could include constructs like self-efficacy (e.g., Bandura, 1991), baseline affect (e.g., Chang, 2017), or stress (e.g., D’Zurilla & Nezu, 2010). Thus, while all four models represent some of the possible structures underlying these constructs, based on the noted theoretical overlap, it was hypothesized that the higher-order model ([Figure 2](#)) would fit best (Hypothesis 16).

Latent Variable SEM

Due to the approach of the present study in using a measurement model (CFA) to inform the structural model (latent variable SEM), it was challenging to hypothesize the final outcome of the analyses in terms of how the common and/or distinct features of SR, ER, and SPS might be related to depressive symptoms. Possible latent variable SEM models are presented in Figures 5 through 8. Generally speaking, it was predicted that either the common features (higher-order model or one-factor model; [Figure 6](#) and [Figure 8](#), respectively), distinct features (first-order model; [Figure 5](#)), or a combination of both (bifactor model; [Figure 7](#)) would predict depressive symptoms (Hypothesis 17). This was based on the same evidence highlighted for the predictions that the constructs would be independently related to depressive symptoms (e.g., Anderson et al., 2009; Joormann & Stanton, 2016; Strauman, 2017), as well as evidence suggesting that SR, ER, and SPS share common features (e.g., Barkley, 1997a; Gross, 2014; D’Zurilla & Nezu, 2010).

Multigroup Analysis (Gender)

Multigroup analysis can help to answer the following two questions: (1) are the constructs equivalent across groups as measured and (2) are certain structural paths among variables equivalent across groups? Regarding the first question, prior evidence does not indicate that the constructs of SR, ER, and SPS should differ significantly based on gender. Regarding the second question, there was not enough evidence to suggest that the relationship between SR and depressive symptoms would be impacted by gender. While differences in components of SPS (e.g., NPO) have been identified between males and females, the proposed models focused on overall SPS ability rather than NPO specifically. As such, the relationship between SPS and depressive symptoms was not predicted to be impacted by gender. The key gender difference investigated was within the context of ER.

Notable gender differences in ER have been identified. However, those differences appear to be more quantitative than qualitative. That is, although females appear to use a wider variety of strategies and use them more frequently than males, the actual strategies implemented are common to both males and females (Nolen-Hoeksema, 2012). Evidence suggests the relationship between ER and depressive symptoms is impacted by gender (e.g., Aldao et al., 2010). It was therefore predicted that the relationship between ER and depressive symptoms would be stronger for females than for males (Hypothesis 18). This hypothesis would have been tested only if either the first-order model ([Figure 1](#); [Figure 5](#)) or the bifactor model ([Figure 3](#); [Figure 7](#)) were found to be the best fitting model.

CHAPTER VI

METHOD

Participants

Participants were undergraduate students ($N = 592$), aged 18 to 29 years old, from a rural New England university. Regarding power, previous investigations using CFA/SEM have suggested the guideline of 10 participants per parameter to be estimated (e.g., Melka et al., 2011; Schreiber et al., 2006); the sample size was well within this range for all models. Participants were recruited for the study through the Psychology Department Sona subject pool, a web-based research scheduling program. Two research (Sona) credits were awarded for participating in the study (see Appendix A for Sona recruitment posting).

Measures

Measures of SR

Short Form Self-Regulation Questionnaire (SSRQ). The Short Form Self-Regulation Questionnaire (SSRQ) is a 31-item, self-report measure designed to assess the ability to regulate behavior to be in line with goals (Brown et al., 1999; Carey et al., 2004; Appendix D). Items are answered on a Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Example items include, “I easily get distracted from my plans,” and “I am able to accomplish goals I set for myself.” Items are summed to compute a total score; higher scores reflect higher SR abilities. The SSRQ has demonstrated good psychometric properties (Carey et al., 2004; Neal & Carey, 2005). The internal consistency was found to be high in multiple samples (Cronbach’s $\alpha = .92$; Carey et al., 2004; Durand-Bush et al., 2015). Regarding validity, the SSRQ has demonstrated relationships with other measures as expected based on SR theory (e.g., Chowdhury & Pychyl,

2018; Lazuras et al., 2019). The SSRQ has been used in several investigations with undergraduate samples (e.g., Brown et al., 2015; Durand-Bush et al., 2015; Hong, 2013).

Adolescent Self-Regulatory Inventory (ASRI). The Adolescent Self-Regulatory Inventory (ASRI) is a 36-item, self-report measure designed to assess the ability to regulate behavior, cognitions, and emotions (Moilanen, 2007; Appendix E). Items are answered on a Likert scale ranging from 1 (*not true at all for me*) to 5 (*really true for me*). Example items include, “If I really want something, I have to have it right away,” and “When I have a big project, I can keep working on it.” Items are summed to compute a total score; higher scores reflect higher SR abilities. The scale can also be divided into short-term (24 items) and long-term (28 items) subscales; these subscales are highly correlated ($r = .79$; Moilanen, 2007, 2015). The ASRI has demonstrated adequate psychometric properties, including high internal consistency (Cronbach’s $\alpha = .94$) and good test-retest reliability ($r = .80$; Moilanen, 2007, 2015; Moilanen & Manuel, 2017). Regarding validity, the ASRI has demonstrated relationships with other measures as expected based on SR theory (Moilanen, 2007, 2015). The ASRI has been used in investigations with undergraduate samples (e.g., Moilanen & Manuel, 2017; Ramli et al., 2018).

Brief Self-Control Scale (BSCS). The Brief Self-Control Scale (BSCS) is a 13-item, self-report measure designed to assess top-down SR or self-control (Tangney et al., 2004; Appendix F). Items are answered on a Likert scale ranging from 1 (*not at all*) to 5 (*very much*). Example items include, “I am able to work effectively toward long-term goals,” and “I often act without thinking through all the alternatives.” Items are summed to compute a total score; higher scores reflect higher self-control abilities. The scale can also be divided into five subscales as follows: self-discipline (5 items), deliberate/nonimpulsive action (3 items), healthy habits (2 items), work ethic (2 items), and reliability (1 item); however, the subscales are not frequently

used (e.g., Linder et al., 2015). The BSCS has demonstrated good psychometric properties (Manapat et al., 2019; Tangney et al., 2004). Internal consistency is good (Cronbach's $\alpha = .89$) and the measure is related to other measures as would be expected based on SR theory, providing evidence for its validity (Tangney et al., 2004). The BSCS has been used in several investigations with undergraduate samples (e.g., Denovan & Macaskill, 2017; Wasylkiw et al., 2020).

Measures of ER

Difficulties in Emotion Regulation Scale (DERS). The Difficulties in Emotion Regulation Scale (DERS) is a 36-item, self-report measure designed to assess clinically relevant difficulties with regulating negative emotions (Gratz & Roemer, 2004; Appendix G). The items are answered on a Likert scale ranging from 1 (*almost never*) to 5 (*almost always*). Example items include, "I am clear about my feelings," and "When I'm upset, I acknowledge my emotions." Items are summed to compute a total score; higher scores reflect higher difficulties in ER. The DERS can also be examined as six subscales, including: (1) nonacceptance of emotional responses (6 items), (2) difficulty engaging in goal-directed behavior (5 items), (3) impulse control difficulties (6 items), (4) lack of emotional awareness (6 items), (5) limited access to emotion regulation strategies (8 items), and (6) lack of emotional clarity (5 items). The DERS has demonstrated good psychometric properties, including high internal consistency (Cronbach's $\alpha = .93$) and good test-retest reliability ($r = .88$; Gratz & Roemer, 2004). Regarding validity, the DERS has demonstrated relationships with other measures as expected based on ER theory (e.g., Gratz & Roemer, 2004; Ritschel et al., 2015). The DERS has been used in several investigations with undergraduate samples (e.g., Lafrance et al., 2014; Shorey et al., 2011; Tull et al., 2007).

Perth Emotion Regulation Competency Inventory (PERCI). The Perth Emotion Regulation Competency Inventory (PERCI) is a 32-item, self-report measure designed to assess the overall ability to regulate both negative and positive emotions (Preece et al., 2018; Appendix H). Items are answered on a Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Example items include, “When I’m feeling bad, I have no control over the strength and duration of that feeling,” and “I don’t know what to do to create pleasant feelings in myself.” Items are summed to compute a total score; higher scores reflect higher difficulties with ER. The PERCI can be examined as eight subscales (4 items each), including: (1) negative-controlling experience, (2) negative-inhibiting behavior, (3) negative activating behavior, (4) negative-tolerating emotions, (5) positive-controlling experience, (6) positive-inhibiting behavior, (7) positive-activating behavior, (8) positive-tolerating emotions. The PERCI demonstrated good psychometric properties in the original validation study, including a high internal consistency (Cronbach’s $\alpha = .94$) and demonstrated relationships with other measures as would be expected based on ER theory, providing evidence for its validity (Preece et al., 2018). The original validation study included samples of undergraduate students (Preece et al., 2018).

Emotion Regulation Questionnaire (ERQ). The Emotion Regulation Questionnaire (ERQ) is a 10-item, self-report measure designed to assess two strategies of ER, suppression and reappraisal (Gross & John, 2003; Appendix I). Items are answered on a Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Example items include, “When I want to feel less negative emotion, I change the way I’m thinking about the situation,” and “I control my emotions by not expressing them.” As noted, the ERQ is divided into two subscales, suppression (4 items) and reappraisal (6 items). Items within these subscales are summed to create two total scores; higher scores on the subscales reflect higher levels of that specific ER strategy. The ERQ

has demonstrated adequate psychometric properties (Gross & John, 2003; Melka et al., 2011). Averaged across four samples, the internal consistency of each subscale was found to be adequate (suppression Cronbach's $\alpha = .73$; reappraisal Cronbach's $\alpha = .79$) and test-retest reliability for both subscales was good ($r = .69$; Gross & John, 2003). Regarding validity, the ERQ has demonstrated relationships with other measures as would be expected based on ER theory (e.g., Preece et al., 2019). The ERQ has been used in several investigations with undergraduate samples (e.g., Thomas & Zolkoski, 2020; Wasylkiw et al., 2020).

Measures of SPS

Social Problem-Solving Inventory-Revised (SPSI-R). The Social Problem-Solving Inventory-Revised (SPSI-R) is a 52-item, self-report measure designed to assess the ability to identify solutions to problems in everyday living (D'Zurilla et al., 2002; Appendix J). Items are answered on a Likert scale ranging from 0 (*not true at all for me*) to 4 (*extremely true of me*). Example items include, "When I am trying to solve a problem, I keep in mind what my goal is at all times," and "Whenever I have a problem, I believe that it can be solved." Items can be summed to compute a total score; higher scores reflect higher SPS abilities. The SPSI-R is broken into five subscales, including: Positive Problem Orientation (20 items), Negative Problem Orientation (10 items), Rational Problem-Solving (20 items), Impulsive/Careless Style (10 items), and Avoidance Style (7 items). The SPSI-R has demonstrated good psychometric properties (D'Zurilla et al., 2002). Internal consistency has been found to be adequate across subscales (Cronbach's α ranged from .72 to .92) and test-retest reliability was good (r 's ranged from .74 to .97; D'Zurilla et al., 2002). Regarding validity, the SPSI-R has demonstrated relationships with other measures as would be expected (D'Zurilla & Nezu, 2010) and has been used in several investigations with undergraduate samples (e.g., Dreer et al., 2004; Haugh, 2006).

Problem-Solving Inventory (PSI). The Problem-Solving Inventory (PSI) is a 35-item, self-report measure designed to assess problem-solving appraisal (Heppner & Peterson, 1982; Appendix K). Items are answered on a Likert scale ranging from 1 (*strongly agree*) to 6 (*strongly disagree*). Example items include, “I trust my ability to solve new and difficult problems,” and “I generally go with the first good idea that comes to my mind.” Items can be summed to compute a total score; lower scores reflect better SPS abilities. The PSI can also be examined as three subscales, including: problem-solving confidence (11 items), approach-avoidant style (16 items), and personal control (5 items). The PSI has demonstrated good psychometric properties (Heppner & Peterson, 1982). Internal consistency was found to be adequate across subscales (Cronbach’s α ranged from .72 to .90) and test-retest reliability was good (r ’s ranged from .83 to .89; Heppner, 1988). Regarding validity, the PSI has demonstrated relationships with other measures as would be expected based on SPS theory (e.g., Heppner et al., 2004). The PSI has been used in several investigations with undergraduate samples (e.g., Dixon et al., 1993; Heppner et al., 2004; Julal, 2016).

Negative Problem Orientation Questionnaire (NPOQ). The Negative Problem Orientation Questionnaire (NPOQ) is a 12-item, self-report scale designed to assess an individual’s approach to solving problems in everyday life (Robichaud & Dugas, 2005a; Appendix L). Items are answered on a Likert scale ranging from 1 (*not at all true of me*) to 5 (*extremely true of me*). Example items include, “I see problems as a threat to my well-being,” and “Even if I have looked at a problem from all possible angles, I still wonder if the solution I decided on will be effective.” Items are summed to compute a total score; higher scores reflect higher levels of NPO. The NPOQ has demonstrated good psychometric properties, including high internal consistency (Cronbach’s $\alpha = .92$) and test-retest reliability ($r = .80$) (Robichaud &

Dugas, 2005a, 2005b). Regarding validity, the NPOQ demonstrated relationships with other measures as would be expected based on theory (Robichaud & Dugas, 2005a, 2005b). The NPOQ has been used in investigations with undergraduate samples (e.g., Bottesi et al., 2016; Kertz et al., 2015).

Descriptive & Outcome Measures

Participants responded to questions about basic demographic information (Appendix C). The demographic information was used to describe the sample and explore group differences.

Center for Epidemiological Studies Depression Scale (CES-D). The Center for Epidemiological Studies Depression Scale (CES-D) is a 20-item, self-report measure designed to assess the symptoms of depression according to DSM-IV (APA, 2013; Radloff, 1977; Appendix M). Items are answered on a Likert scale and range from 1 (*rarely or none of the time; less than 1 day*) to 5 (*most or all of the time; 5-7 days*). Example items include, “I was bothered by things that didn’t usually bother me,” and “I felt sad.” Items are summed to compute a total score; higher scores reflect higher levels of depressive symptoms. The CES-D has demonstrated good psychometric properties, including high internal consistency (Cronbach’s $\alpha = .90$) and relationships with other measures as would be expected (Carleton et al., 2013; Radloff, 1977; 1991; Siddaway et al., 2017). The CES-D has been used in several investigations with undergraduate populations (e.g., Patten et al., 2020; Pirbaglou et al., 2013).

Coronavirus Anxiety Scale (CAS). The Coronavirus Anxiety Scale (CAS) is a 5-item, self-report measure designed to screen for dysfunctional anxiety related to the COVID-19 pandemic (Lee, 2020; Appendix N). Items are rated on a Likert scale from 0 (*not at all*) to 4 (*nearly every day for the last two weeks*). Example items include, “I felt dizzy, lightheaded, or faint, when I read or listened to news about the coronavirus,” and “I had trouble falling or

staying asleep because I was thinking about the coronavirus.” Items are summed to compute a total score; higher scores reflect higher levels of COVID-related anxiety. The CAS demonstrated adequate psychometric properties, including high internal consistency (Cronbach’s $\alpha = .93$) and correlations with other measures as expected (Lee, 2020). The CAS has been examined in participants aged 18-29 (e.g., Lee et al., 2020).

Procedure

The present study was approved by the university’s Institutional Review Board for the Protection of Human Subjects. Participants were provided a link to the survey via the Sona system after signing up for a timeslot. The study was administered anonymously via Qualtrics, a secure survey-based website used to facilitate data collection. Prior to starting the study, informed consent was obtained (see Appendix B for Informed Consent). All participants were informed that they would be asked to answer questions about their self-regulation, emotion regulation, problem-solving abilities, and psychological functioning. Participants were also informed that their identity and responses would remain anonymous, that they could withdraw from the study at any time, and that they could choose to skip questions that they felt uncomfortable answering. The battery of questionnaires was completed via Qualtrics (Appendices D-N). All predictor variable questionnaires (SR, ER, and SPS) were presented in randomized order across participants, followed by the CES-D, CAS, and demographic questions. All questionnaires took approximately 90 minutes to complete. Upon study completion, participants were thanked for their participation and given a resource list for counseling services should any participants have felt distressed and wished to seek such services (see Appendix O for resource list). Finally, participants were awarded two research (Sona) credits, which could be applied toward introductory psychology courses.

Analysis Plan

Preliminary Analyses

Preliminary analyses were performed using SPSS 26/27 prior to conducting the hypothesis-driven analyses. Descriptive data were assessed for the demographic variables of age, gender, and race. Internal consistencies (Cronbach's α), total and/or subscale scores, means, and standard deviations were computed for all measures. Distributions were assessed for normality via histograms, and pairs of variables were assessed for linear relationships via scatterplots. Data were examined for skewness, kurtosis, and outliers. Relevant assumptions were evaluated prior to conducting each statistical analysis (e.g., Keith, 2019; Tabachnick & Fidell, 2007).

Correlational Analyses

Bivariate correlations among all variables of interest were conducted. The three sets of measures for the predictor variables (i.e., SR, ER, and SPS) were compared to examine pattern differences. Bivariate relationships between all predictor variables and the outcome variable (CES-D) were assessed. These analyses tested Hypotheses 1-6 regarding correlational relationships among the constructs of interest.

Mean-Level Differences (Gender)

Mean-level differences on the variables of interest between males and females were examined using independent *t* tests. Similar to the approach for bivariate correlations, the three sets of measures for the predictor variables (i.e., SR, ER, and SPS) were compared to investigate pattern differences. These analyses tested Hypotheses 8-9 regarding gender differences on the constructs of interest.

Measurement Models: CFA

The CFA measurement models depicted in Figures 2-5 were tested using SPSS AMOS 26/28. Prior to estimating the models, the identification status for each model (i.e., the balance of measured to estimated parameters) was checked (Byrne, 2016; Keith, 2019). Then, each model was estimated and evaluated for fit based on a variety of model fit indices. Some examples include, but are not limited to the following (guidelines outlined by Keith, 2019):

- χ^2 value; non-significance supports the model and lower values indicate better fit when comparing models
- RMSEA; $<.05$ = good fit, $<.08$ = adequate fit, $<.10$ = poor fit
- CFI; $>.95$ = good fit, $>.90$ = adequate fit
- AIC; smaller values indicate better fit (used for comparing non-nested models)
- BIC; smaller values indicate better fit, reward for parsimony (used for comparing non-nested models)

The overall fit of each model, in addition to their comparison to each other, was used to determine the best-fitting CFA model. The first-order factors depicted in [Figure 1](#) examined Hypotheses 10-15 regarding the construct validity of SR, ER, and SPS. The comparison of model fit across competing CFA models tested Hypothesis 16 regarding convergent versus discriminant validity of the constructs.

Structural Model: SEM

The best-fitting measurement model was used to test one of the four possible models depicted in Figures 5 through 8 connecting SR, ER, and SPS to depressive symptoms. Prior to estimating the model, the identification status was checked (Byrne, 2016; Keith, 2019). Then, the model was estimated and evaluated for fit based on a variety of model fit indices. The model was evaluated as a stand-alone model rather than compared to competing models (Keith, 2019). This analysis tested Hypothesis 17 regarding the relationships among common and/or distinct features of SR, ER, and SPS and their connection to depressive symptoms.

Multigroup Analysis (Gender)

Multigroup analyses were conducted for both the measurement model and the structural model portions to examine possible differences between males and females. This analysis involves systematically allowing paths to either vary or be constrained to equivalent values and then comparing the differences in model fit (Keith, 2019). Differences in model fit were assessed using a similar collection of fit indices as described above. This analysis tested Hypothesis 18 regarding possible gender differences in ER.

CHAPTER VII

RESULTS

This chapter begins with a brief overview of the analysis plan. First, preliminary analyses were conducted, which included assessment of missing data, sample demographics, and scale descriptives. Relevant assumptions were evaluated prior to conducting each statistical analysis (e.g., Keith, 2019; Tabachnick & Fidell, 2007). Next, bivariate correlations were computed, and mean-level gender differences were examined using independent *t* tests. In the measurement model stage, each of the four CFA models was estimated and evaluated. The overall fit of each model, in addition to their comparison to each other, was used to determine the best-fitting CFA model. In the structural model stage, the best-fitting measurement model was used to examine the connections among SR, ER, SPS, and depressive symptoms in a latent variable SEM model. Lastly, multigroup analyses were conducted for both the measurement and structural model portions to examine possible gender differences.

Preliminary Analyses

Preliminary analyses were performed using SPSS 26/27. Six hundred and thirty-four participants were recruited; however, 25 of these participants either declined consent or opted out prior to study completion, resulting in an *N* of 609. Total scores on all measures were computed using summed totals which require no missing data to be considered an accurate estimate. Approximately .02% of the overall data was missing, and according to Little's MCAR test, total scores across variables were missing completely at random, $\chi^2(122) = 120.51, p = .52$. Given the nature of the measures used and the assumptions of SEM (e.g., Keith, 2019), only participants that responded to all items on the measures of interest were included in analyses (i.e., listwise deletion). This yielded a final *N* of 592.

The sample was comprised of participants who identified as 51.9% female, 46.6% male, 1.0% non-binary, .3% female to male transgender, .2% not sure, and 0% male to female transgender. Of note, when examining gender differences (mean-level and multigroup analyses), data for non-binary, transgender, and unsure participants were excluded due to small sample size for those subgroups and a corresponding lack of power (Cohen, 1992; Glick et al., 2018). The race/ethnicity of the sample was as follows: 89.9% White, 3.5% Asian, 2.9% Multiple Racial Identities, 1.5% Black, 1.5% Latinx, and .3% American Indian/Native American or Alaska Native. Age of participants ranged from 18 to 29 ($M = 19.02$, $SD = 1.50$).

[Table 4](#) displays descriptive statistics for each observed variable. Internal consistencies across measures ranged from acceptable to excellent (Tavakol & Dennick, 2011). Analysis of the CAS revealed a significantly skewed and kurtotic distribution ($Range = 0-20$, $M = 1.34$, $SD = 2.79$, $Mode = 0$). Thus, the CAS was excluded from subsequent analyses.

[Table 5](#) displays mean comparisons to past samples for each observed variable, including published studies with undergraduate students and two pilot study samples collected by the thesis author (Buffie et al., 2020; Buffie & Nangle, 2018). Overall, the variable means of the data collected were in correspondence with past samples; no observed means were more than one standard deviation above or below past samples. The mean of the CES-D appeared to be slightly higher than samples collected prior to 2020 (current dataset $M = 19.77$, published data $M = 16.38$, spring 2018 pilot data $M = 15.95$; Buffie & Nangle, 2018). A recent meta-analytic study demonstrated higher prevalence rates of depressive symptoms in undergraduate student populations following the onset of the COVID-19 pandemic (Deng et al., 2021), which could account for the increase in depressive symptoms observed in the present dataset.

Table 4*Scale Descriptives*

	Possible Range	Observed Range	Mean	Standard Deviation	Skewness	Kurtosis	Cronbach's α
SSRQ	31-155	48-155	106.23	17.82	.02	-.06	.93
ASRI	36-180	66-159	114.49	14.70	.08	.18	.83
BSCS	13-65	16-63	38.51	9.14	.05	-.15	.86
DERS	36-180	36-165	90.81	25.39	.32	-.28	.95
PERCI	32-224	32-190	97.83	30.01	.09	-.35	.94
ERQ_C	6-42	7-42	27.62	6.41	-.21	.23	.85
ERQ_S	4-28	4-28	16.31	4.81	-.20	-.34	.74
SPSI	0-20	1.99-18.80	10.55	3.08	-.01	-.30	.87
PSI	32-192	66-185	126.07	20.11	.48	.32	.91
NPOQ	12-60	12-60	28.87	10.60	.46	-.29	.94
CESD	0-60	0-55	19.77	12.02	.52	-.45	.92
CAS	0-20	0-18	1.33	2.79	2.81	8.85	.89

Note. $N = 592$.

Statistical Assumptions

Applicable assumptions were evaluated prior to conducting each analysis (e.g., Keith, 2019; Tabachnick & Fidell, 2007). The independence of observations assumption was considered met based on the administration procedures utilized (see Chapter VI). Univariate outliers were assessed using the z -score method (± 3.29); outliers falling three standard deviations above or below the mean were winsorized. Multivariate outliers were assessed by examining a studentized deleted residual by leverage scatterplot ($SDRESID = \pm 2.00$; leverage $= [2k + 2]/n$) and $DFBeta$ values falling above or below the threshold of $2/\sqrt{n}$.

Table 5*Variable Mean Comparisons to Past Samples*

	Observed Mean & Standard Deviation	Published Data with College Students	S18 Pilot Data (N = 350)	S20 Pilot Data (N = 315)
SSRQ	M = 106.23 SD = 17.82	M = 112.74 ¹ SD = 14.36	-	-
ASRI	M = 114.49 SD = 14.70	M = 119.44 ² SD = 15.84	M = 118.03 SD = 14.67	-
BSCS	M = 38.51 SD = 9.14	M = 39.22 ³ SD = 8.58	-	-
DERS	M = 90.81 SD = 25.39	M = 89.95 ⁴ SD = 23.44	M = 85.29 SD = 25.39	M = 90.86 SD = 22.98
PERCI	M = 97.83 SD = 30.01	M = 93.40 ⁵ SD = 32.21	-	-
ERQ_C	M = 27.62 SD = 6.41	M = 27.60 ⁶ SD = 5.64	-	-
ERQ_S	M = 16.31 SD = 4.81	M = 13.56 ⁶ SD = 4.44	-	-
SPSI	M = 10.55 SD = 3.08	M = 12.55 ⁷ SD = 2.48	M = 11.24 SD = 2.78	M = 10.74 SD = 2.64
PSI	M = 97.93 SD = 20.11	M = 87.09 ⁸ SD = 21.91	-	-
NPOQ	M = 28.87 SD = 10.60	M = 25.03 ⁹ SD = 7.80	-	-
CESD	M = 19.77 SD = 12.02	M = 16.38 ¹⁰ SD = 9.88	M = 15.95 SD = 13.98	M = 19.00 SD = 14.46

Note. Means are displayed in **bolded** font. 1. Durand-Bush et al. (2015) *N* = 469; 2. Moilanen (2015) *N* = 168; 3. Tangney et al. (2004) *N* = 351; 4. Finkelstein-Fox et al. (2018) *N* = 158; 5. Preece et al. (2018) *N* = 231; 6. Gross & John (2003) *N* = 791; 7. Bell & D’Zurilla (2009) *N* = 259; 8. Tmkaya (2009) *N* = 353; 9. Robichaud & Dugas (2005a) *N* = 201; 10. Nadorff et al. (2011) *N* = 571. S18 = spring 2018 (Buffie & Nangle, 2018); S20 = spring 2020 (Buffie et al., 2020).

Six multivariate outliers were identified and removed from relevant analyses. Normality was assessed via histograms, skewness and kurtosis values (critical value of +/-1.96), and standardized residual q-q plots. Linearity was assessed via scatterplots between predictor and outcome variables and standardized residual p-p plots (SR, ER, and SPS regressed onto CES-D). Homogeneity of variance in the context of mean-level gender difference analyses was assessed

via Levene's test and the F_{\max} ratio test. Homoscedasticity was assessed via standardized residual by standardized predicted scatterplots. All assumptions related to regression were considered met. Assumptions related to path analyses were also considered met, including (a) assumed perfect reliability of measures, (b) all models were recursive, (c) no common causes were missing from consideration, and (d) a state of equilibrium was reached (e.g., hypothesized causal processes had sufficient time (Keith, 2019).

Correlational Analyses

All bivariate relationships were significant and in the expected directions (Table 6). As predicted, adaptive SR was positively related to adaptive ER (Hypothesis 1); adaptive SR was positively related to adaptive SPS (Hypothesis 2); adaptive ER was positively related to adaptive SPS (Hypothesis 3); and adaptive SR, ER, and SPS were related to lower depressive symptoms (Hypotheses 4-6). The within-construct correlations for SR ranged from $r(590) = .70, p < .01$ to $r(590) = .78, p < .01$; ER ranged from $r(590) = -.11, p < .01$ to $r(590) = .74, p < .01$; and SPS ranged from $r(590) = -.56, p < .01$ to $r(590) = .84, p < .01$. The between-construct correlations for SR and ER ranged from $r(590) = -.12, p < .01$ to $r(590) = -.68, p < .01$; ER and SPS ranged from $r(590) = .11, p < .01$ to $r(590) = .69, p < .01$; and SR and SPS ranged from $r(590) = -.44, p < .01$ to $r(590) = .82, p < .01$.

Cohen (1988) established rules of thumb regarding interpretation of correlational magnitude, such that correlation coefficients of around .10 are considered "small," around .30 are considered "medium," and above .50 are considered "large." Across variables, most correlations fell into the medium to large magnitude range (Cohen, 1988). The weakest magnitudes were observed between the ERQ suppression subscale (ERQ_S) and all other variables, which ranged from small to medium.

Table 6*Bivariate Correlations*

	SSRQ	ASRI	BSCS	DERS	PERCI	ERQC	ERQS	SPSI	PSI	NPOQ	CESD
SSRQ	-										
ASRI	.78	-									
BSCS	.71	.70	-								
DERS	-.68	-.57	-.49	-							
PERCI	-.63	-.61	-.58	.74	-						
ERQ_C	.49	.45	.32	-.48	-.40	-					
ERQ_S	-.20	-.13	-.12	.34	.25	-.11	-				
SPSI	.82	.72	.62	-.67	-.60	.52	-.17	-			
PSI	.77	.69	.56	-.60	-.57	.52	-.19	.84	-		
NPOQ	-.60	-.51	-.44	.69	.61	-.41	.11	-.67	-.56	-	
CESD	-.55	-.47	-.42	.76	.62	-.43	.22	-.52	-.45	.63	-

Note. $N = 592$; all correlations significant at $p < .01$.

Light shaded regions represent within-construct correlations for SR, ER, and SPS.

Medium-Light shaded regions represent between-construct correlations for SR and ER.

Medium-Dark shaded regions represent between-construct correlations for ER and SPS.

Dark shaded regions represent between construct-correlations for SR and SPS.

Mean-Level Differences (Gender)

Results of the independent t tests examining mean-level gender differences between males and females for all variables are displayed in [Table 7](#). As predicted, females reported significantly higher levels of NPO (Hypothesis 8) and higher levels of depressive symptoms (Hypothesis 9) than males. Results for gender differences in ER (Hypothesis 7) were mixed, such that females reported higher levels of emotional dysregulation (DERS) than males, whereas males reported higher use of suppression as an ER strategy (ERQ_S) than females. Males and females did not differ in their overall ability to regulate emotions (PERCI) or the use of cognitive reappraisal as an ER strategy (ERQ_C).

Contrary to prediction, females reported lower levels of SR than males (SSRQ). Gender differences additionally emerged for overall problem-solving ability, such that females reported lower levels of SPS than males (SPSI-R and PSI).

Table 7

Mean-Level Gender Differences

	Mean	SD	Independent <i>t</i>	Cohen's <i>d</i>
SSRQ	104.79	18.71	$t(581) = -2.41$	$d = -.20$
	108.33	16.40	$p = .016^*$	95% CI: -.36, -.04
ASRI	113.93	15.91	$t(581) = -1.13$	$d = -.09$
	115.32	13.16	$p = .257$	95% CI: -.26, .07
BSCS	38.66	9.26	$t(581) = .28$	$d = .02$
	38.45	8.98	$p = .783$	95% CI: -.14, .19
DERS	95.02	27.30	$t(581) = 4.85$	$d = .40$
	85.09	21.22	$p < .001^*$	95% CI: .24, .57
PERCI	99.54	31.43	$t(581) = 1.77$	$d = .15$
	95.13	28.21	$p = .077$	95% CI: -.02, .31
ERQ_C	27.53	6.55	$t(581) = -.76$	$d = -.06$
	27.93	6.09	$p = .447$	95% CI: -.23, .10
ERQ_S	15.45	5.04	$t(581) = -4.55$	$d = -.39$
	17.24	4.34	$p < .001^*$	95% CI: -.54, -.21
SPSI	10.12	3.31	$t(581) = -3.91$	$d = -.32$
	11.10	2.70	$p < .001^*$	95% CI: -.49, -.16
PSI	124.75	20.44	$t(581) = -2.03$	$d = -.17$
	128.12	19.57	$p = .043^*$	95% CI: -.33, -.01
NPOQ	30.44	11.22	$t(581) = 4.51$	$d = .37$
	26.60	9.10	$p < .001^*$	95% CI: .21, .54
CESD	22.20	12.30	$t(581) = 6.03$	$d = .50$
	16.45	10.55	$p < .001^*$	95% CI: .34, .67

Note. $N = 583$ ($n_{\text{female}} = 307$; $n_{\text{male}} = 276$); Females means are displayed in **bolded** font. * indicates significance at $p < .05$.

Measurement Models: CFA

The measurement and structural models were tested using SPSS AMOS 26/28. All participants with missing data as well as six identified multivariate outliers were removed prior to SEM analyses, yielding a total N of 586. For ease of interpretation, all variables were rescaled prior to SEM analyses by dividing the total score by the number of scale items. The original

computation method for the SPSI overall index reflects a weighted average based on the number of items in each subscale (D’Zurilla et al., 2002). Because unmeasured variables have no inherent scale, a scale must be set for each latent variable and error term using one of two methods: unit variance identification (UVI) or unit loading identification (ULI). UVI involves setting the latent factor variances to one, whereas ULI involves setting a factor loading to one for each latent factor (Keith, 2019). UVI is commonly used for CFA model estimation (e.g., Ellis & Fraser, 2019) and when evaluating competing models (e.g., Weiss et al., 2021). Thus, UVI was used for all latent variable estimation, with the exception of the higher-order model due to the requirement that unique factor variance has to be estimated in that particular type of model. All models were evaluated based on the *a priori* fit index thresholds displayed in [Table 8](#).

Table 8

Fit Index a priori Thresholds

Index	Threshold	Fit
χ^2	Lower	Better Fit
AIC	Lower	Better Fit
BIC	Lower	Better Fit
TLI	>.90	Adequate Fit
CFI	>.90	Adequate Fit
RMSEA	<.08	Adequate Fit
SRMR	<.08	Good Fit

Note. Sourced from Keith, 2019, p. 327.

First-Order CFA Model

As discussed in Chapter I, factor analysis is used to assess the extent to which observed variables are generated by latent constructs (Byrne, 2016). Factor loadings, which can be interpreted as regression coefficients with measurement error removed, reflect the strength of the

relationship between the observed variable and latent construct. CFA is used when theory helps inform a proposed model thought to reflect the underlying factor structure of the observed variables (Keith, 2019). Ultimately, the first-order model was utilized to examine the construct validity of SR, ER, and SPS as commonly measured in practice, addressing the first goal of the study.

Model Results. Prior to running the analysis, the model was determined to be overidentified (i.e., more measured parameters than parameters needing to be estimated). The results of the first-order CFA model estimation (standardized) are displayed in [Figure 9](#). No Heywood cases or standardized factor loadings greater than one were detected. All factor loadings were significant, in the expected directions, and considered medium to large in magnitude ([Table 9](#)). As predicted, the correlations among all three latent factors were significant, in the expected directions, and considered large in magnitude ([Table 9](#); Hypotheses 13-15). This finding supports the examination of a higher-order model (discussed in the next section) which was proposed to help explain correlations among the first-order latent factors.

A modified model is displayed in [Figure 10](#). Modifications were made in order of highest parameter change (modification index [MI] change > 20; represents the impact the modification would have on the χ^2 value for the model) until the fit index threshold goals were reached ([Table 10](#)). Notable cross-loadings were evaluated first, followed by error terms. Four modifications were required in order to reach the *a priori* fit index thresholds, including: 1) adding a path from the ER latent variable to the NPOQ, 2) correlating the BSCS and PERCI error terms, 3) correlating the ERQ_C error term with the ER latent variable, and 4) correlating the ERQ_S and NPOQ error terms. All modifications were significant and in the expected directions ([Table 11](#)).

Figure 9

First-Order CFA Model (Original)

$\chi^2(32, N = 586) = 308.13, p < .001$

TLI = .91

CFI = .94

RMSEA = .12 [.11, .13]

SRMR = .05

AIC = 354.13

BIC = 454.71

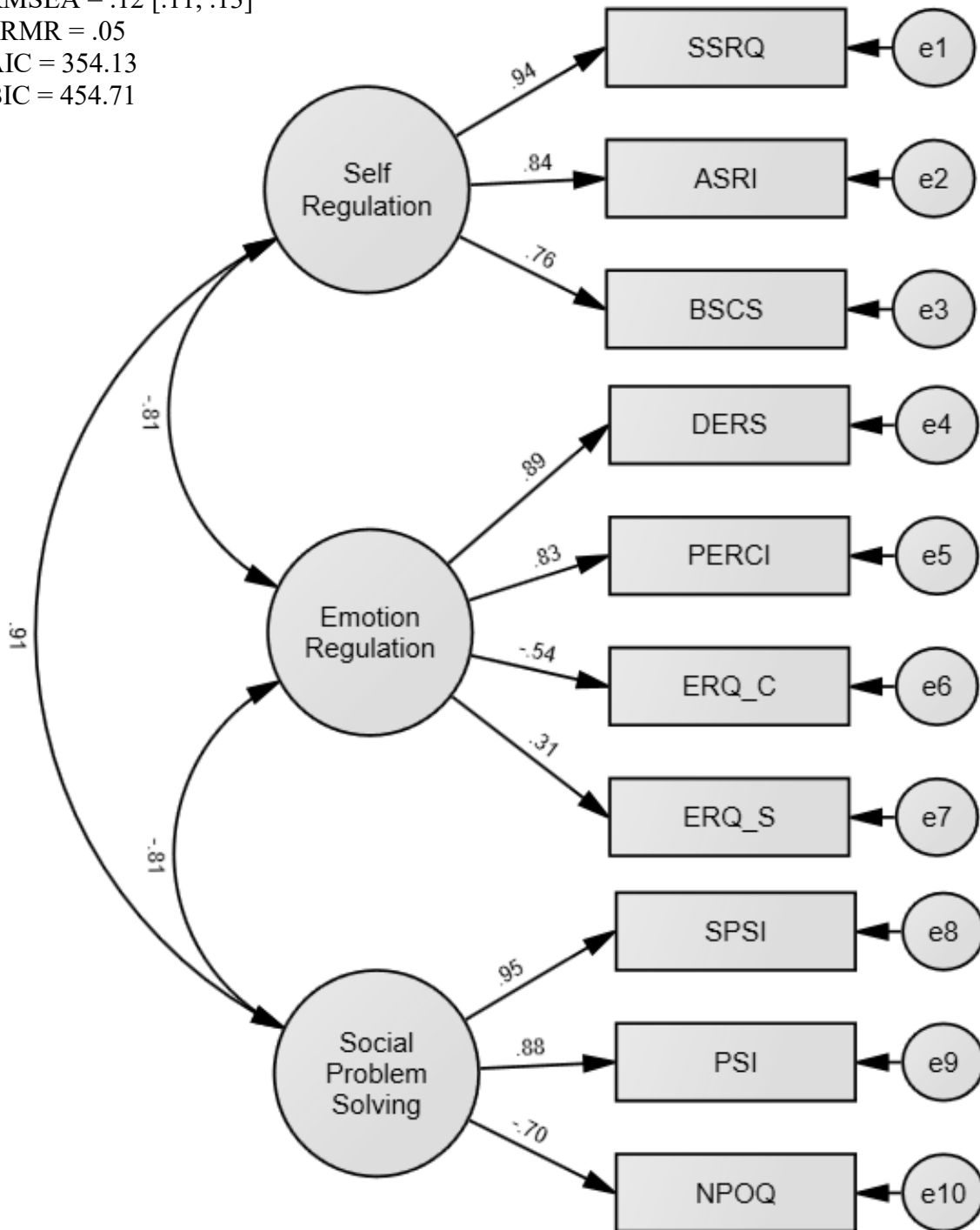


Table 9*First-Order CFA (Original) – Estimated Factor Loadings & Covariances*

Path	Unstandardized Estimate	Standardized Estimate	Standard Error	Critical Ratio
SR – SSRQ	.54	.94	.02	29.84*
SR – ASRI	.34	.84	.01	24.89*
SR – BSCS	.53	.76	.03	21.14*
ER – DERS	.62	.89	.02	26.25*
ER – PERCI	.78	.83	.03	23.43*
ER – ERQ_C	-.57	-.54	.04	-13.43*
ER – ERQ_S	.38	.31	.05	7.38*
SPS – SPSI	2.89	.95	.10	30.26*
SPS – PSI	.51	.88	.02	26.73*
SPS – NPOQ	-.61	-.70	.03	-18.99*
SR – ER	-.81	-.81	.02	-39.79*
ER – SPS	-.81	-.81	.02	-40.84*
SR – SPS	.91	.91	.01	76.38*

Note. * indicates significance at $p < .001$.

Figure 10

First-Order CFA Model (Modified)

$\chi^2(28, N = 586) = 119.13, p < .001$

TLI = .97

CFI = .98

RMSEA = .08 [.06, .09]

SRMR = .03

AIC = 173.11

BIC = 291.19

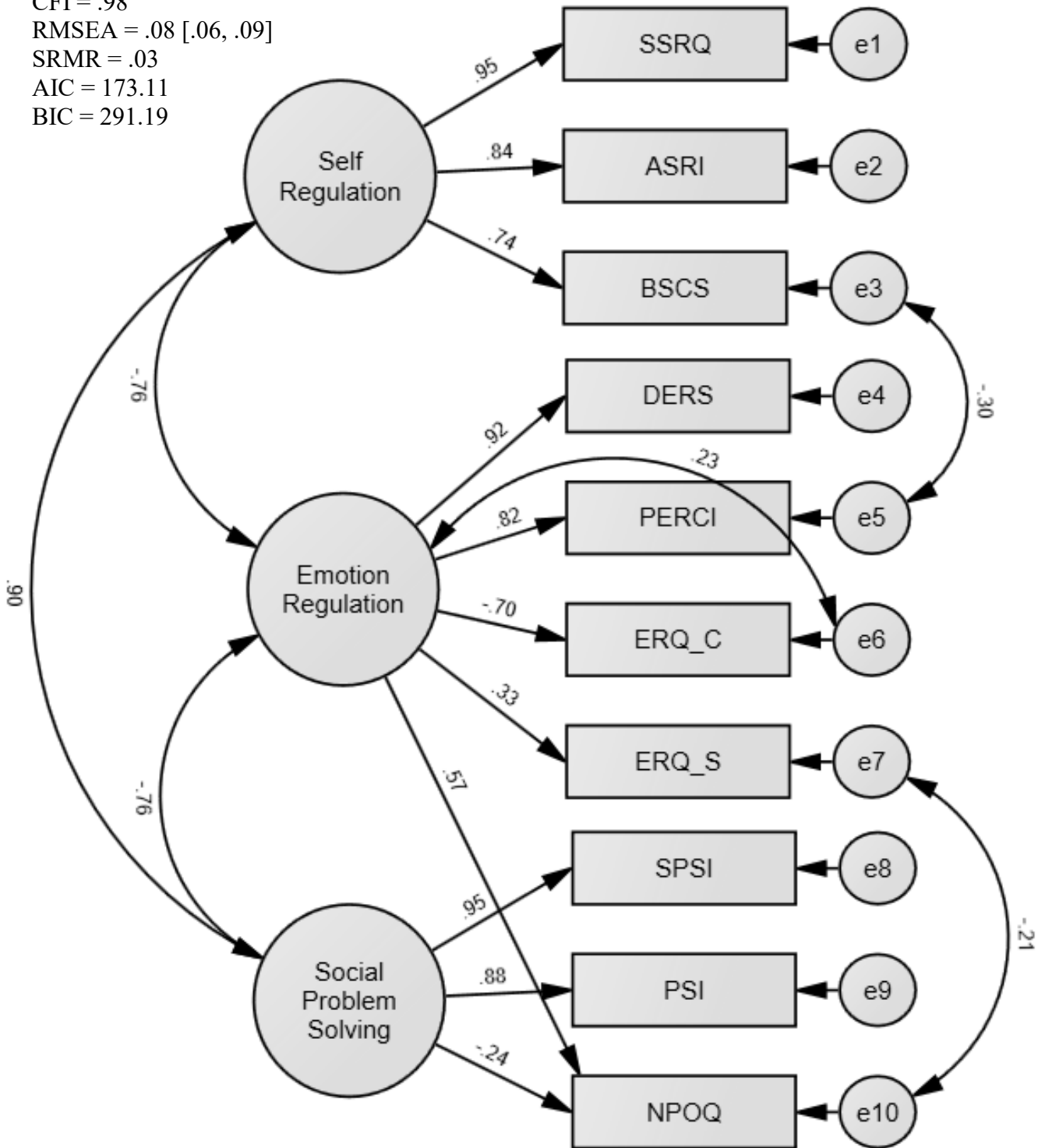


Table 10*First-Order CFA (Modified) – Change in Model Fit*

Modification	χ^2	<i>df</i>	TLI	CFI	RMSEA	SRMR	AIC	BIC
Original	308.13	32	.908	.935	.121	.0549	354.13	454.71
ER – NPOQ	218.41	31	.936	.956	.102	.0478	266.41	371.37
E3 – E5	178.73	30	.947	.965	.092	.0464	228.73	338.06
E6 – ER	142.16	29	.958	.973	.082	.0358	194.16	307.87
E7 – E10	119.11	28	.965	.978	.075	.0329	173.11	291.19

Note. Modifications made in order of highest parameter change until goal fit index thresholds reached; began with notable cross-loadings then error terms (MI change > 20; .10).

Table 11*First-Order CFA (Modified) – Estimated Factor Loadings & Covariances*

Path	Unstandardized Estimate	Standardized Estimate	Standard Error	Critical Ratio
ER – NPOQ	.49	.57	.05	10.20*
E3 – E5	-.08	-.30	.01	-6.09*
E6 – ER	.21	.23	.04	5.37*
E7 – E10	-.14	-.21	.03	-4.76*

Note. * indicates significance at $p < .001$.

The modifications and corresponding redistribution of variance primarily impacted the ER latent variable to ERQ_C factor loading (-.54 to -.70) and the SPS latent variable to NPOQ factor loading (-.71 to .24).

Evaluation of Model Fit. With the exception of the RMSEA, fit indices indicated an overall adequate fit of the original model. The χ^2 value was significant as expected with sample sizes over $N = 400$ (Keith, 2019). The TLI (.91) and CFI (.94) were considered adequate, and the SRMR (.05) was considered good. However, the RMSEA (.12) was considered poor. The four

modifications, while making the model less parsimonious (*df* decreased from 32 to 28), substantially improved the fit of the model. Again, the χ^2 value was significant as expected with sample sizes over $N = 400$. The TLI (.97), CFI (.98), and SRMR (.03) were considered good. The RMSEA (.08) was considered adequate. The AIC and BIC both significantly decreased, indicating a better fit of the modified model compared to the original model.

Construct Validity

As discussed in Chapters II-IV, all selected measures were chosen based on their (1) aim to capture the overall construct, (2) connection to theory, and (3) frequency of use in the field. The prediction that each measure would load on to its theorized construct was mostly supported.

Self-Regulation. As predicted, the three measures selected to assess SR loaded on to the latent factor thought to represent the underlying construct of SR (Hypothesis 10). All three factor loadings were considered large in magnitude and did not substantially change between the original and modified models. This suggests the measures appropriately captured the intended construct of SR.

Emotion Regulation. Hypothesis 11 was partially supported in that two out of the three measures selected to assess ER loaded on to the latent factor thought to represent the underlying construct of ER. The factor loadings for the DERS and the PERCI were considered large in magnitude and did not substantially change between the original and modified models, suggesting these measures appropriately captured the intended construct. The factor loading for the ERQ_S did not change between the original and modified models, but was considered medium in magnitude, suggesting this measure is less representative of the underlying ER construct than the other measures. One of the modifications involved correlating the ERQ_C error term with the ER latent variable, suggesting that there is unique variance within that

measure that is related to ER in a different manner than the remainder of the measure's variance. After accounting for this unique variance, the ERQ_C factor loading was strengthened (path increased from $-.54$ in the original model to $-.70$ in the modified model).

Social Problem-Solving. Hypothesis 12 was partially supported in that two out of the three measures selected to assess SPS loaded on to the latent factor thought to represent the underlying construct of SPS. The factor loadings for the SPSI and the PSI were considered large in magnitude and did not substantially change between the original and modified models, suggesting these measures appropriately captured the intended construct. One of the modifications involved adding a path from the ER latent variable to the NPOQ, suggesting a portion of the variance in the NPOQ is more so reflective of the underlying construct of ER (modified path = $.57$) than of SPS (modified path = $-.24$). The relationship between ER and the NPOQ is additionally supported by the suggested modification of correlating the ERQ_S and NPOQ error terms.

Overall, these findings support the construct validity of SR, ER, and SPS. However, two measures, the ERQ and the NPOQ, appeared to include notable portions of variance unaccounted for by the latent constructs of ER and SPS, respectively.

Higher-Order CFA Model

As discussed in Chapter I, CFA can also be utilized to examine convergent and discriminant validity by testing rival models (Keith, 2019). Models that reflect convergence of observed variables, divergence of observed variables, and possibilities in between were presented in Chapter V. A comparison of the first-order, higher-order, bifactor, and one-factor CFA models was utilized to examine the convergent and discriminant validity of SR, ER, and SPS as commonly measured in practice, addressing the second goal of the study.

The first-order model represented the highest level of divergence, such that all constructs within the model are considered distinct entities and do not share underlying variance after measurement error has been removed. It is not that the constructs were hypothesized to be unrelated, but rather that the degree to which they are related is not a reflection of shared variance with an overarching construct. In contrast, the higher-order model represented a level “in between” convergence and divergence, such that it reflects the constructs as being distinct entities with a common element of shared variance that underlies the three constructs.

Despite the theoretical difference between the first-order and higher-order models, the two models are mathematically equivalent. As noted in Chapter V, higher-order models are used to explain observed correlations between first-order factors (Brunner et al., 2012). The higher-order model can therefore be conceptualized as a factor analysis of the first-order factors. Because correlations and standardized regression equations are utilized to compute and evaluate both models, the mathematical outcomes of the models are identical. Thus, the primary difference between the first-order and higher-order models is the shift from correlations among latent constructs to error-free factor loading estimates for the first-order variables to a higher-order construct labeled the “Common Factor” (i.e., shared variance among the three latent constructs). Specifically, the higher-order model suggests that the common factor indirectly impacts the observed measures through the first-order factors. The common factor could represent the shared features of SR, ER, and SPS highlighted throughout Chapters II-IV, including underlying mechanisms (i.e., top-down and bottom-up processes; skills specific to cognitive, emotional, or behavioral modalities; EFs) or functional outcomes (i.e., features related to monitoring, evaluating, and adjusting behavior across modalities to achieve a goal or solve a problem; Barkley 1997a; Gross, 2014; D’Zurilla & Nezu, 2010).

Model Results. Prior to running the analysis, the model was determined to be overidentified (i.e., more measured parameters than parameters needing to be estimated). The results of the higher-order CFA model estimation (standardized) are displayed in [Figure 11](#). As previously discussed, ULI was utilized to set the scale of the unmeasured variables due to the requirement of unique factor variance for the first-order factor loadings to be estimated; one factor loading for each of the first-order latent variables was fixed to a value of one. No Heywood cases or standardized factor loadings greater than one were detected. All first-order factor loadings were significant, in the expected directions, and considered medium to large in magnitude ([Table 12](#)). In addition, all higher-order factor loadings were significant, in the expected directions, and considered large in magnitude ([Table 12](#)). These findings correspond to the correlations observed in the first-order model and suggest a significant amount of shared variance among SR, ER, and SPS after accounting for the unique variance of each factor.

The modified model is displayed in [Figure 12](#). Modifications were made in order of highest parameter change (MI change > 20) until the fit index threshold goals were reached ([Table 13](#)). Notable cross-loadings were evaluated first, followed by error terms. Four modifications were required in order to reach the *a priori* fit index thresholds, including: 1) adding a path from the ER latent variable to the NPOQ, 2) correlating the BSCS and PERCI error terms, 3) correlating the ERQ_C error term with the ER variable unique factor variance, and 4) correlating the ERQ_S and NPOQ error terms. All modifications were significant and in the expected directions ([Table 14](#)).

The primary difference between the first-order and higher-order model modifications is the shift from correlating the ERQ_C error term with the ER latent variable itself (first-order model) versus the ER latent variable unique factor variance (higher-order model). This suggests that variance separate from the ER latent variable is correlated with variance that is unique to the ERQ_C measure.

Evaluation of Model Fit. With the exception of the RMSEA, fit indices indicated an overall adequate fit of the original model. The χ^2 value was significant as expected with sample sizes over $N = 400$ (Keith, 2019). The TLI (.91) and CFI (.94) were considered adequate, and the SRMR (.05) was considered good. However, the RMSEA (.12) was considered poor. The four modifications, while making the model less parsimonious (df decreased from 32 to 28), substantially improved the fit of the model. Again, the χ^2 value was significant as expected with sample sizes over $N = 400$. The TLI (.97), CFI (.98), and SRMR (.03) were considered good. The RMSEA (.08) was considered adequate. The AIC and BIC both significantly decreased, indicating a better fit of the modified model compared to the original model.

As previously noted, the higher-order model suggests that a common factor underlies the three latent constructs of interest and indirectly impacts the observed measures through the first-order factors. Overall, the higher-order model fit the data moderately well, which supports a conceptualization of the constructs as being comprised of both common and shared features. However, the number of modifications necessary to achieve a good fit indicated exploration of additional models was warranted.

Figure 11

Higher-Order CFA Model (Original)

$\chi^2(32, N = 586) = 308.13, p < .001$

TLI = .91

CFI = .94

RMSEA = .12 [.11, .13]

SRMR = .05

AIC = 354.13

BIC = 454.71

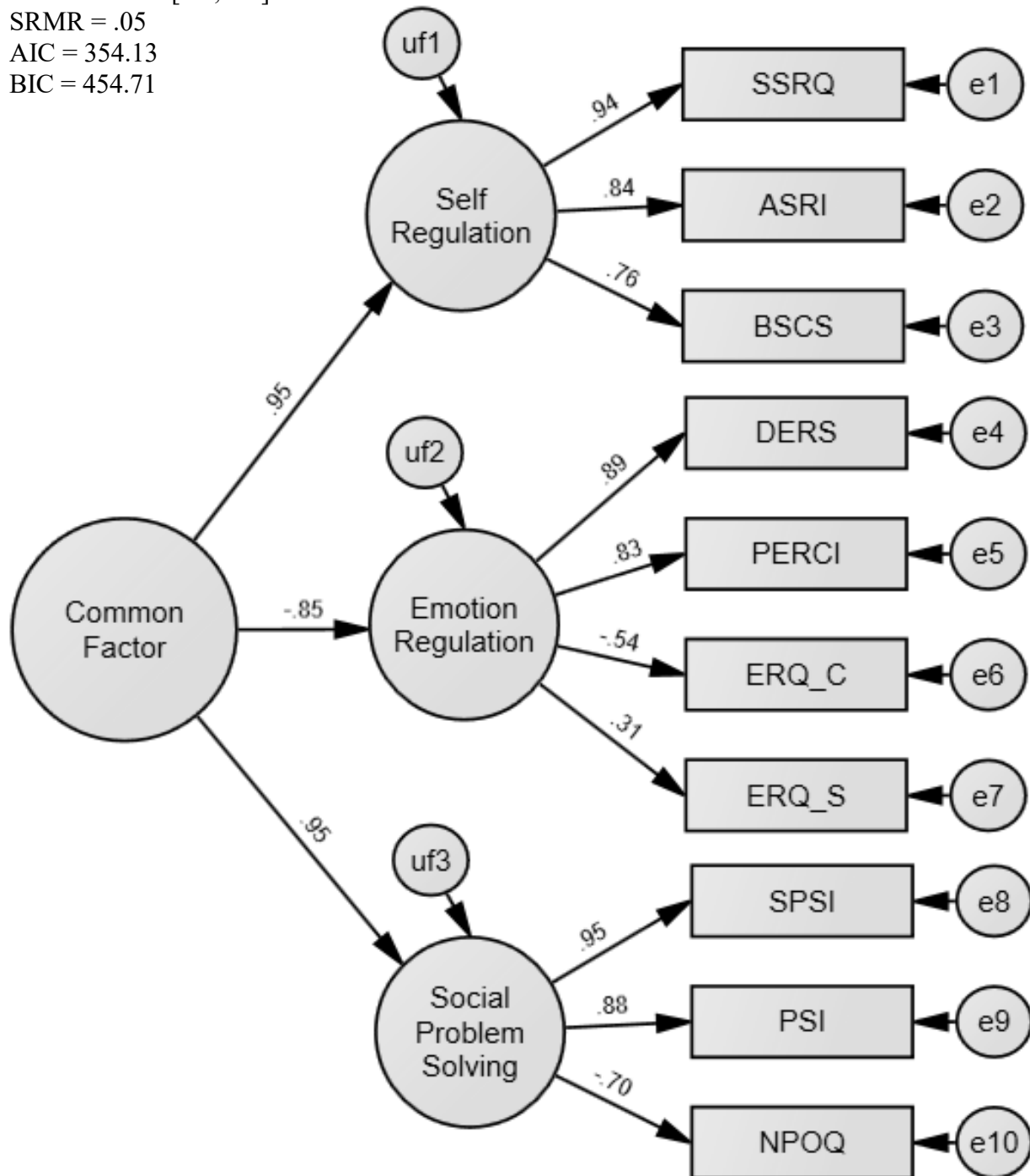


Table 12*Higher-Order CFA (Original) – Estimated Factor Loadings & Covariances*

Path	Unstandardized Estimate	Standardized Estimate	Standard Error	Critical Ratio
SR – SSRQ	1.00 (fixed)	.94	-	-
SR – ASRI	.64	.84	.02	30.57*
SR – BSCS	.99	.76	.04	24.35*
ER – DERS	1.00 (fixed)	.89	-	-
ER – PERCI	1.24	.83	.05	24.14*
ER – ERQ_C	-.92	-.54	.07	-13.65*
ER – ERQ_S	.60	.31	.08	7.41*
SPS – SPSI	1.00 (fixed)	.95	-	-
SPS – PSI	.18	.88	.01	34.79*
SPS – NPOQ	-.21	-.70	.01	-21.40*
SR – CF	.51	.95	.02	26.80*
ER – CF	-.53	-.85	.03	-21.17*
SPS – CF	2.76	.95	.10	27.19*

Note. * indicates significance at $p < .001$. CF = Common Factor. One loading for each first-order latent variable fixed to a value of 1.00 as per ULI method.

Figure 12

Higher-Order CFA Model (Modified)

$\chi^2(28, N = 586) = 119.13, p < .001$

TLI = .97

CFI = .98

RMSEA = .08 [.06, .09]

SRMR = .03

AIC = 173.11

BIC = 291.19

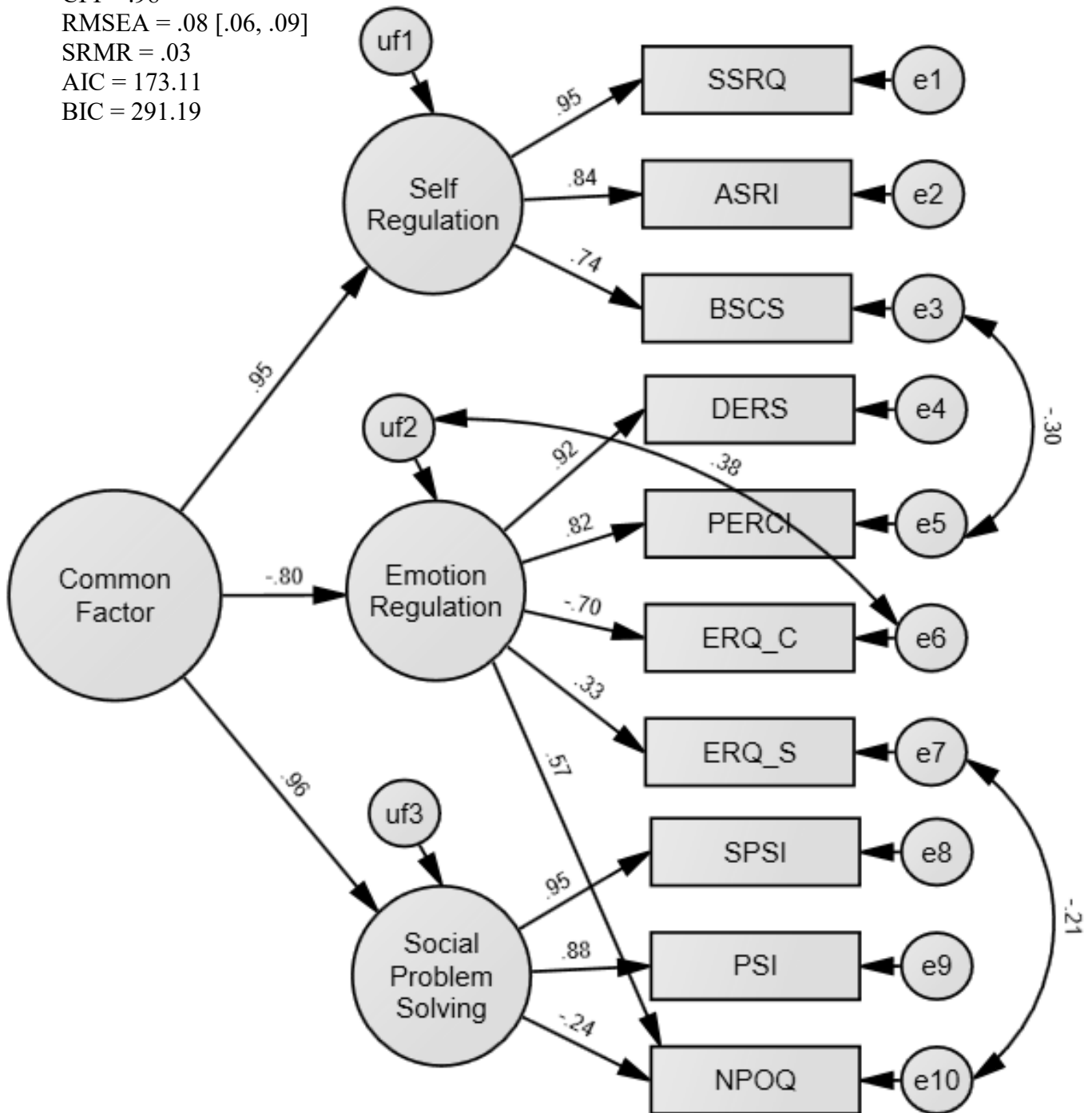


Table 13*Higher-Order CFA (Modified) - Change in Model Fit*

Modification	χ^2	<i>df</i>	TLI	CFI	RMSEA	SRMR	AIC	BIC
Original	308.13	32	.908	.935	.121	.0549	354.13	454.71
ER – NPOQ	218.41	31	.936	.956	.102	.0478	266.41	371.37
E3 – E5	178.73	30	.947	.965	.092	.0464	228.73	338.06
E6 – UF2	142.16	29	.958	.973	.082	.0358	194.16	307.87
E7 – E10	119.11	28	.965	.978	.075	.0329	173.11	291.19

Note. Modifications made in order of highest parameter change until goal fit index thresholds reached; began with notable cross-loadings then error terms (MI change > .20; .10).

Table 14*Higher-Order CFA (Modified) – Estimated Factor Loadings & Covariances*

Path	Unstandardized Estimate	Standardized Estimate	Standard Error	Critical Ratio
ER – NPOQ	.76	.57	.08	10.07*
E3 – E5	-.08	-.30	.01	-6.09*
E6 – UF2	.14	.38	.03	5.33*
E7 – E10	-.14	-.21	.03	-4.76*

Note. * indicates significance at $p < .001$.

Bifactor CFA Model

Similar to the higher-order model, the bifactor model represented a level “in between” convergence and divergence, such that it reflects the constructs as being distinct entities with a common element of shared variance. However, unlike the higher-order model, the bifactor model suggests the common factor is separate from the first-order factors. More specifically, the common factor reflected in the bifactor model represents shared features that impact all of the observed measures but that are separate from the three latent constructs of interest.

Model Results. The bifactor model as originally specified was not able to be estimated because the factor loading of the SPSI emerged as a Heywood case and its standardized regression weight exceeded 1.00. This resulted in the model being unidentified and the iteration limit was reached. To address this issue, the variance of the SPSI was constrained to zero (Keith, 2019). Subsequently, the model was determined to be overidentified (i.e., more measured parameters than parameters needing to be estimated). The results of the bifactor CFA model estimation (standardized) are displayed in [Figure 13](#). UVI was utilized to set the scale of the unmeasured variables. All factor loadings were significant, in the expected directions, and ranged from small to large in magnitude, with the exception of the ERQ_C and NPOQ factor loadings which were nonsignificant ([Table 15](#)). In addition, all common factor loadings were significant, in the expected directions, and considered medium to large in magnitude, with the exception of the ERQ_S which was considered small ([Table 15](#)).

The modified model is displayed in [Figure 14](#). Modifications were made in order of highest parameter change (MI change > 20) until the fit index threshold goals were reached ([Table 16](#)). Notable cross-loadings were evaluated first, followed by error terms. Two modifications were required in order to reach the *a priori* fit index thresholds, including: 1) adding a path from the ER latent variable to the NPOQ and 2) adding a path from the SR latent variable to the PERCI. These changes impacted the significance of the SPS latent variable to NPOQ path, such that the path became significant following the redistribution of variance. All modifications were significant and in the expected directions ([Table 17](#)).

Figure 13

Bifactor CFA Model (Original)

$\chi^2(26, N = 586) = 208.43, p < .001$

TLI = .93

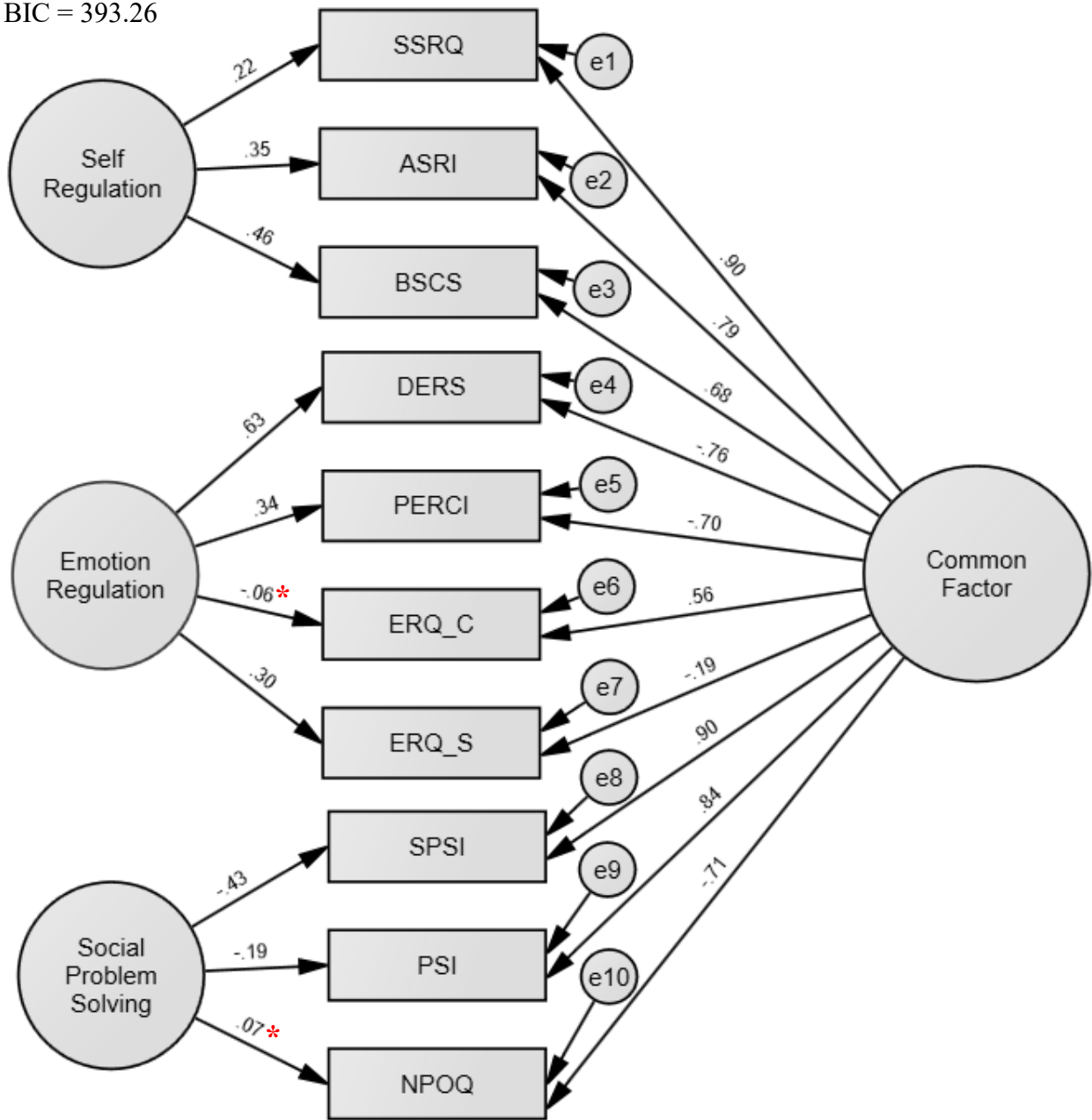
CFI = .96

RMSEA = .11 [.10, .12]

SRMR = .04

AIC = 266.43

BIC = 393.26



* Indicates nonsignificance

Table 15*Bifactor CFA (Original) – Estimated Factor Loadings & Covariances*

Path	Unstandardized Estimate	Standardized Estimate	Standard Error	Critical Ratio
SR – SSRQ	.13	.22	.02	6.22*
SR – ASRI	.14	.35	.02	7.61*
SR – BSCS	.33	.46	.04	8.41*
ER – DERS	.44	.63	.05	8.12*
ER – PERCI	.32	.34	.05	6.71*
ER – ERQ_C	-.07	-.06	.04	-1.63
ER – ERQ_S	.36	.30	.07	5.31*
SPS – SPSI	-1.32	-.43	.07	-18.48*
SPS – PSI	-.11	-.19	.02	-5.34*
SPS – NPOQ	.06	.07	.04	1.54
SSRQ – CF	.51	.90	.02	26.97*
ASRI – CF	.32	.79	.02	22.00*
BSCS – CF	.48	.68	.03	17.69*
DERS – CF	-.53	-.76	.03	-21.02*
PERCI – CF	-.66	-.71	.04	-19.03*
ERQ_C – CF	.60	.56	.04	14.28*
ERQ_S – CF	-.23	-.19	.05	-4.52*
SPSI – CF	2.75	.90	.10	27.09*
PSI – CF	.49	.84	.02	24.31*
NPOQ – CF	-.62	-.71	.03	-18.81*

Note. * indicates significance at $p < .001$. Nonsignificant paths are displayed in **bolded** font.
CF = Common Factor.

Figure 14

Bifactor CFA Model (Modified)

$\chi^2(24, N = 586) = 69.64, p < .001$

TLI = .98

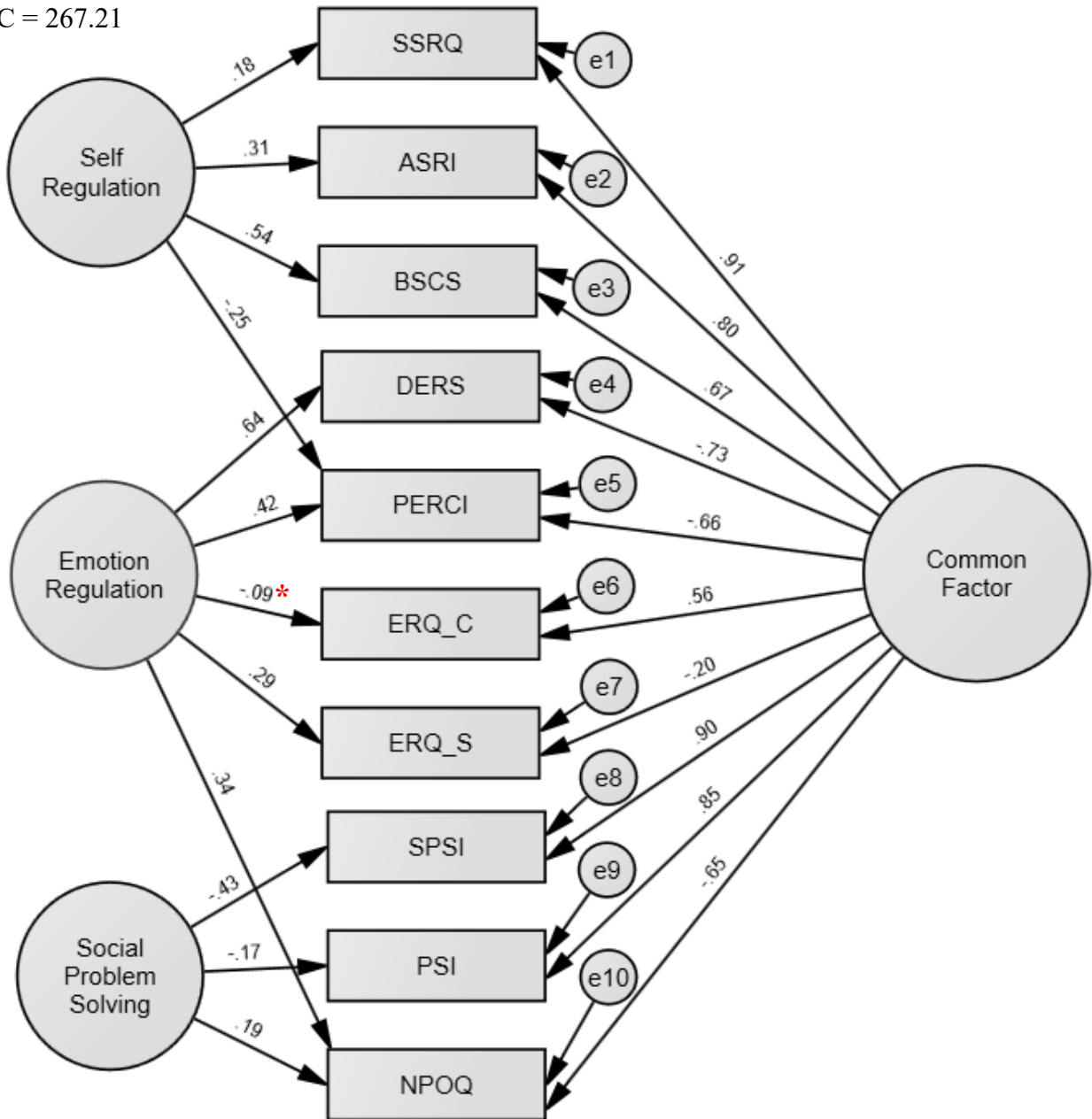
CFI = .99

RMSEA = .06 [.04, .07]

SRMR = .02

AIC = 131.64

BIC = 267.21



* Indicates nonsignificance

Table 16*Bifactor CFA (Modified) – Change in Model Fit*

Modification	χ^2	<i>df</i>	TLI	CFI	RMSEA	SRMR	AIC	BIC
Original*	202.18	25	.924	.958	.110	.0361	262.18	393.38
Original	208.43	26	.925	.957	.110	.0361	266.43	393.26
ER – NPOQ	115.18	25	.962	.979	.079	.0282	175.18	306.38
SR – PERCI	69.64	24	.980	.989	.057	.0227	131.64	267.21

Note. Modifications made in order of highest parameter change until goal fit index thresholds reached; began with notable cross-loadings then error terms (MI >20; .10).

*First model was unidentified due to the SPSI being a Heywood case; thus, the variance of the SPSI was constrained to 0 (Keith, 2019).

Table 17*Bifactor CFA (Modified) – Estimated Factor Loadings & Covariances*

Path	Unstandardized Estimate	Standardized Estimate	Standard Error	Critical Ratio
ER – NPOQ	.29	.34	.03	9.48*
SR – PERCI	-.24	-.25	.04	-6.41*

Note. * indicates significance at $p < .001$.

Evaluation of Model Fit. With the exception of the RMSEA, fit indices indicated an overall adequate fit of the original model. The χ^2 value was significant as expected with sample sizes over $N = 400$ (Keith, 2019). The TLI (.93) was considered adequate, and the CFI (.96) and SRMR (.04) were considered good. However, the RMSEA (.11) was considered poor. The two modifications, while making the model less parsimonious (*df* decreased from 26 to 24), substantially improved the fit of the model. Again, the χ^2 value was significant as expected with sample sizes over $N = 400$. The TLI (.98), CFI (.99), and SRMR (.02) were considered good. The RMSEA (.06) was considered adequate but close to good (.05). The AIC and BIC both significantly decreased, indicating a better fit of the modified model.

As previously noted, the bifactor model suggests that a common factor separate from the first-order factors directly impacts the observed measures. Overall, the bifactor model fit the data well and required minimal modifications to achieve a good fit. This supports a conceptualization of the constructs as being comprised of both common and distinct features, with common features shared across all nine measures rather than underlying the three constructs.

One-Factor CFA Model

The one-factor model represented the highest level of convergence. In other words, this model suggests that the constructs converge to the extent that they should not be considered distinct constructs and instead function better as one common factor. This is reflected in all nine measures loading on to one factor, labeled the “Common Factor.”

Model Results. Prior to running the analysis, the model was determined to be overidentified (i.e., more measured parameters than parameters needing to be estimated). The results of the one-factor CFA model estimation (standardized) are displayed in [Figure 15](#). No Heywood cases or standardized factor loadings greater than one were detected. All factor loadings were significant, in the expected directions, and considered medium to large in magnitude ([Table 18](#)), with the exception of the ERQ_S which was considered small in magnitude. Of note, the standardized factor loadings for the common factor in this one-factor model are essentially the same as the loadings for the common factor in the bifactor model.

Figure 15

One-Factor CFA Model (Original)

$\chi^2(35, N = 586) = 564.46, p < .001$

TLI = .84

CFI = .88

RMSEA = .16 [.15, .17]

SRMR = .06

AIC = 604.46

BIC = 691.93

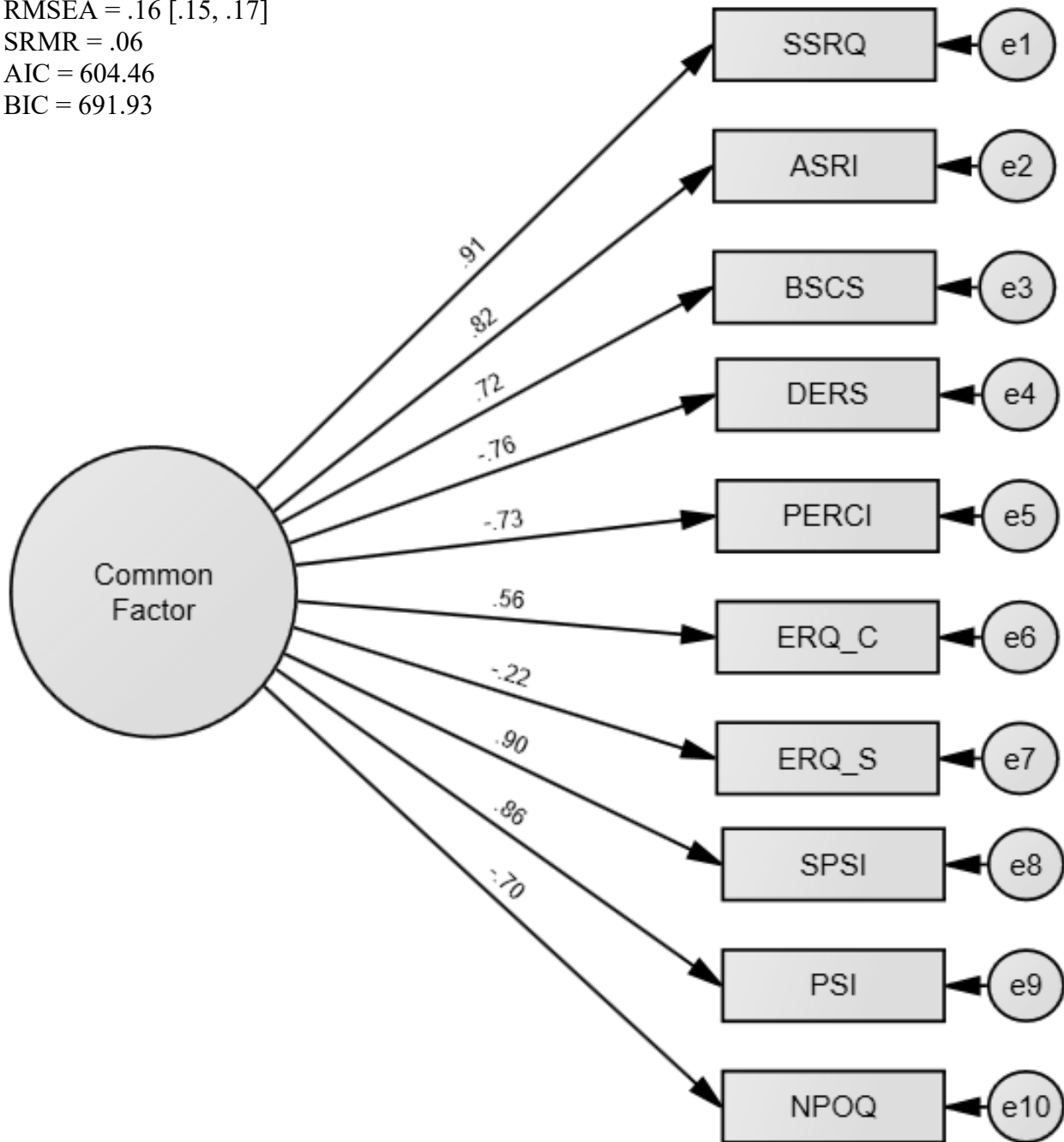


Table 18*One-Factor CFA (Original) – Estimated Factor Loadings & Covariances*

Path	Unstandardized Estimate	Standardized Estimate	Standard Error	Critical Ratio
SSRQ – CF	.52	.91	.02	28.28*
ASRI – CF	.33	.82	.01	23.96*
BSCS – CF	.51	.72	.03	19.94*
DERS – CF	-.53	-.76	.03	-21.53*
PERCI – CF	-.68	-.73	.03	-20.16*
ERQ_C – CF	.59	.56	.04	14.32*
ERQ_S – CF	-.26	-.22	.05	-5.19*
SPSI – CF	2.76	.90	.10	28.08*
PSI – CF	.49	.86	.02	25.63*
NPOQ – CF	-.61	-.70	.03	-19.12*

Note. * indicates significance at $p < .001$. CF = Common Factor.

A modified model is displayed in [Figure 16](#). Modifications were made in order of highest parameter change (MI change > 20) until the fit index threshold goals were reached ([Table 19](#)). Notable cross-loadings were evaluated first, followed by error terms. Eight modifications were required in order to reach the *a priori* fit index thresholds, including 1) correlating the DERS and PERCI error terms, 2) correlating the SPSI and PSI error terms, 3) correlating the DERS and NPOQ error terms, 4) correlating the DERS and ERQ_S error terms, 5) correlating the SPSI and NPOQ error terms, 6) correlating the PERCI and NPOQ error terms, 7) correlating the BSCS and PERCI error terms, and 8) correlating the ASRI and BSCS error terms. All modifications were significant and in the expected directions ([Table 20](#)).

Figure 16

One-Factor CFA Model (Modified)

$\chi^2(27, N = 586) = 110.36, p < .001$

TLI = .97

CFI = .98

RMSEA = .07 [.06, .09]

SRMR = .03

AIC = 166.36

BIC = 288.81

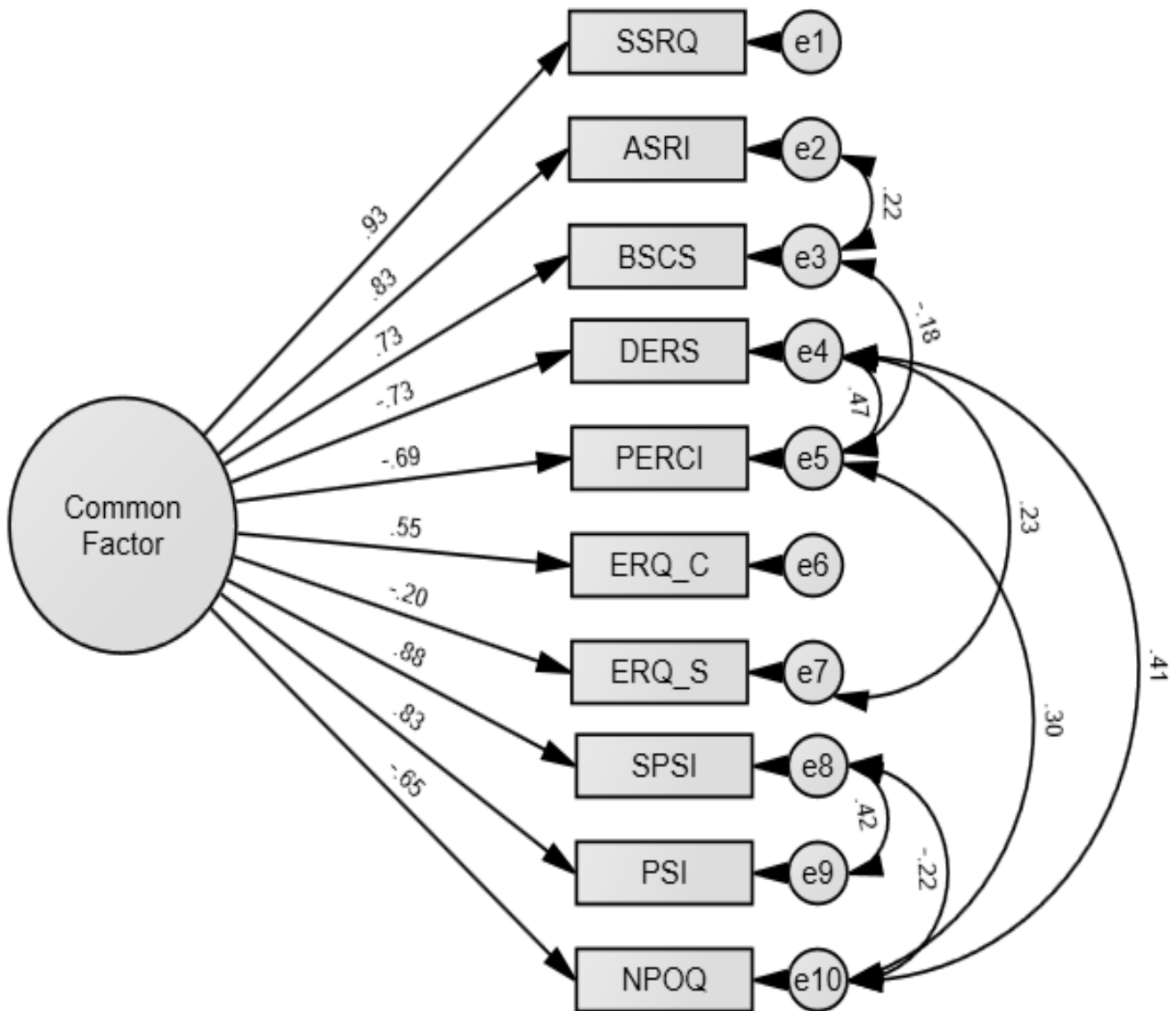


Table 19*One-Factor CFA (Modified) – Change in Model Fit*

Modification	χ^2	<i>df</i>	TLI	CFI	RMSEA	SRMR	AIC	BIC
Original	564.46	35	.839	.875	.161	.0578	604.46	691.93
E4 – E5	429.24	34	.876	.906	.141	.0532	471.24	563.08
E8 – E9	349.63	33	.898	.925	.128	.0516	393.63	489.84
E4 – E10	290.55	32	.914	.939	.118	.0468	336.55	437.14
E4 – E7	240.93	31	.928	.950	.108	.0401	288.93	393.89
E8 – E10	212.09	30	.935	.957	.102	.0395	262.09	371.43
E5 – E10	160.96	29	.952	.969	.088	.0339	212.96	326.67
E3 – E5	133.60	28	.960	.975	.080	.0331	187.60	305.68
E2 – E3	110.36	27	.967	.980	.073	.0294	166.36	288.81

Note. Modifications made in order of highest parameter change until goal fit index thresholds reached; began with notable cross-loadings then error terms (MI >20; .10).

Table 20*One-Factor CFA (Modified) – Estimated Factor Loadings & Covariances*

Path	Unstandardized Estimate	Standardized Estimate	Standard Error	Critical Ratio
E4 – E5	.15	.47	.02	9.95*
E8 – E9	.20	.42	.03	7.17*
E4 – E10	.13	.41	.01	9.13*
E4 – E7	.13	.23	.02	6.39*
E8 – E10	-.22	-.22	.04	-5.88*
E5 – E10	.14	.30	.02	6.91*
E3 – E5	-.06	-.18	.01	-4.79*
E2 – E3	.02	.22	.01	4.52*

Note. * indicates significance at $p < .001$.

Evaluation of Model Fit. Fit indices indicated an overall poor fit of the original model. The χ^2 value was significant as expected with sample sizes over $N = 400$ (Keith, 2019). The TLI (.84), CFI (.88), and RMSEA (.16) were considered poor, and the SRMR (.05) was considered adequate. The eight modifications, while making the model less parsimonious (df decreased from 35 to 27), substantially improved the fit of the model. Again, the χ^2 value was significant as expected with sample sizes over $N = 400$. The TLI (.97), CFI (.98), and SRMR (.03) were considered good. The RMSEA (.07) was considered adequate. The AIC and BIC both significantly decreased, indicating a better fit of the modified model compared to the original model.

As previously noted, the one-factor model suggests that the constructs converge to the extent that they should not be considered distinct constructs and instead function better as one common factor. Overall, the one-factor model did not fit the data well and required several modifications to achieve an adequate fit. This does not support a conceptualization of the constructs as being comprised of only shared features. As such, exploration of additional models was warranted.

Convergent and Discriminant Validity

The four CFA models were compared against one another to determine which model fit the underlying data best. Original model comparisons are displayed in [Table 21](#), and modified model comparisons are displayed in [Table 22](#). Contrary to prediction, the bifactor model emerged as the best-fitting model overall (Hypothesis 16). The bifactor model demonstrated better original fit indices, fewer modifications to reach the *a priori* thresholds, and better modified fit indices. Further, the AIC and BIC indices for the bifactor model were the lowest across all models in both the original and modified versions.

Table 21*Original Model Comparisons*

	χ^2	<i>df</i>	TLI	CFI	RMSEA	SRMR	AIC	BIC
1 st Order	308.13	32	.908	.935	.121	.0549	354.13	454.71
2 nd Order	308.13	32	.908	.935	.121	.0549	354.13	454.71
Bifactor	208.43	26	.925	.957	.110	.0361	266.43	393.26
One-Factor	564.46	35	.839	.875	.161	.0578	604.46	691.93

Table 22*Modified Model Comparisons*

	χ^2	<i>df</i>	TLI	CFI	RMSEA	SRMR	AIC	BIC	Modifications
1 st Order	119.11	28	.965	.978	.075	.0329	173.11	291.19	4
2 nd Order	119.11	28	.965	.978	.075	.0329	173.11	291.19	4
Bifactor	69.64	24	.980	.989	.057	.0227	131.64	267.21	2
One-Factor	110.36	27	.967	.980	.073	.0294	166.36	288.81	8

The one-factor model, which represented the highest level of convergence, demonstrated the poorest fit across models. The factor loadings for the common factor in the one-factor model were similar to the bifactor model, but the bifactor demonstrated a significantly better fit to the underlying data. This suggests that unique variance for each latent construct needs to be accounted for within the model. As previously discussed, the first-order and higher order models are mathematically equivalent, so they are unable to be compared against one another. Theoretically, the first-order model represents the highest level of divergence (i.e., no shared variance among the latent constructs), while the higher-order model represents a level “in between” convergence and divergence.

As discussed in Chapter V, the theoretical difference between the higher-order model and the bifactor model is nuanced. The higher-order model suggests that a common factor indirectly impacts the observed measures through the first-order factors, whereas the bifactor model suggests that a common factor separate from the first-order factors explains a portion of the shared variance amongst all nine measures. Both the first-order and higher-order models did not fit the data as well as the bifactor model.

Across all models, common patterns of variance emerged, including 1) a relationship between the SR latent variable and the PERCI, 2) a unique relationship between the ER latent variable and the ERQ_C, 3) low magnitudes of shared variance for the ERQ_S, and 4) a relationship between the ER latent variable and the NPOQ. These relationships, along with the identification of the bifactor model as the best fitting CFA model, suggests that while the constructs of SR, ER, and SPS are worth differentiating, a substantial amount of overlapping variance exists among them.

Structural Model

Latent Variable SEM

In the structural stage, the best-fitting measurement model—the bifactor model—was examined as a latent variable SEM model in the context of depressive symptoms. This model was tested as a stand-alone model, rather than compared to competing models. The latent variable SEM model was utilized to assess the relationships among the common and distinct features of SR, ER, and SPS and their connection to depressive symptoms, addressing the third and final goal of the study.

Model Results. The results of the latent variable SEM model estimation (standardized) are displayed in [Figure 17](#). UVI was utilized to set the scale of the unmeasured variables.

Figure 17

Latent Variable SEM

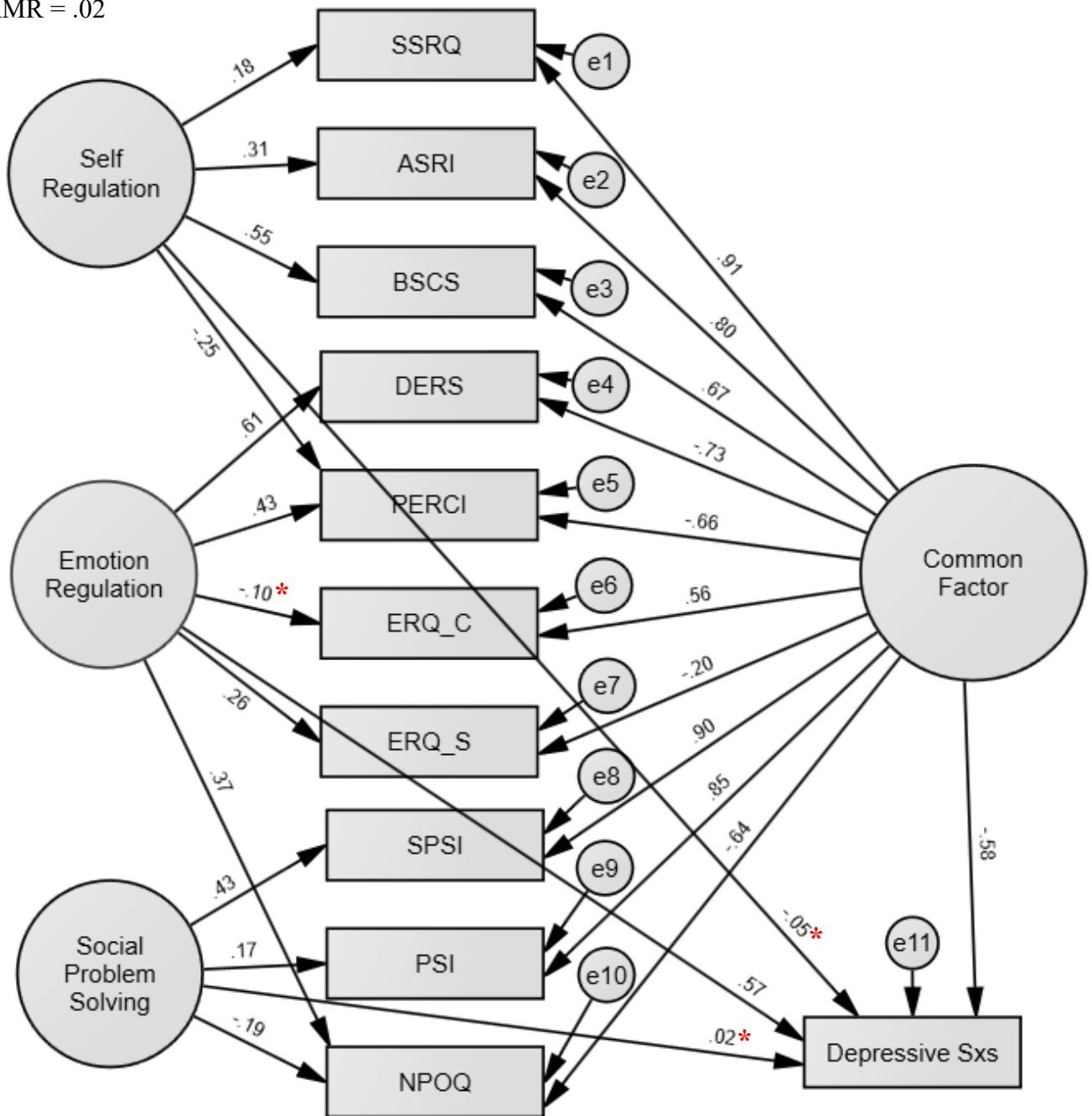
$\chi^2(30, N = 586) = 96.00, p < .001$

TLI = .98

CFI = .99

RMSEA = .06 [.05, .08]

SRMR = .02



* Indicates nonsignificance

Because the SPSI emerged as a Heywood case within the bifactor model as part of the measurement model stage, the variance of the SPSI was constrained to zero (Keith, 2019). No additional Heywood cases or standardized factor loadings greater than one were detected. Subsequently, the model was determined to be overidentified (i.e., more measured parameters than parameters needing to be estimated). All factor loadings were significant, in the expected directions, and ranged from small to large in magnitude, with the exception of the ERQ_C factor loading, which was nonsignificant (Table 23). In addition, all common factor loadings were significant, in the expected directions, and considered medium to large in magnitude, with the exception of the ERQ_S which was considered small (Table 23). Notably, only the ER latent variable and the common factor significantly predicted depressive symptoms; the SR and SPS latent variables did not significantly predict depressive symptoms.

Evaluation of Model Fit. Fit indices indicated an overall good fit of the model. The χ^2 value was significant as expected with sample sizes over $N = 400$ (Keith, 2019). The TLI (.98), CFI (.99) and SRMR (.02) were considered good. The RMSEA (.06) was considered adequate but close to good (.05).

Common vs. Distinct Pathways to Depressive Symptoms

In general, it was hypothesized that either the common and/or distinct features of SR, ER, and SPS would predict depressive symptoms (Hypothesis 17). Somewhat contrary to this prediction, only the common features and distinct features of ER emerged as significant predictors of depressive symptoms. After accounting for the shared variance within the common factor, SR and SPS did not significantly predict depressive symptoms. This pattern of results should be considered within the context of the additional paths from the SR latent variable to the PERCI (a measure of ER) and from the ER latent variable to the NPOQ (a measure of SPS).

Table 23 Latent Variable SEM – Estimated Factor Loadings & Covariances

Path	Unstandardized Estimate	Standardized Estimate	Standard Error	Critical Ratio
SR – SSRQ	.10	.18	.02	5.10*
SR – ASRI	.12	.31	.02	7.30*
SR – BSCS	.39	.55	.04	10.04*
SR – PERCI	-.23	-.25	.04	-6.25*
ER – DERS	.42	.61	.02	21.17*
ER – PERCI	.41	.44	.03	13.64*
ER – ERQ_C	-.11	-.10	.04	-2.61
ER – ERQ_S	.32	.27	.05	5.87*
ER – NPOQ	.32	.37	.03	11.08*
SPS – SPSI	1.32	.43	.07	18.05*
SPS – PSI	.10	.17	.02	4.58*
SPS – NPOQ	-.17	-.19	.03	-5.40*
SSRQ – CF	.52	.91	.02	27.38*
ASRI – CF	.33	.80	.02	22.43*
BSCS – CF	.47	.67	.03	17.34*
DERS – CF	-.51	-.73	.03	-20.08*
PERCI – CF	-.62	-.66	.04	-17.17*
ERQ_C – CF	.59	.56	.04	14.24*
ERQ_S – CF	-.24	-.20	.05	-4.73*
SPSI – CF	2.75	.90	.10	27.04*
PSI – CF	.49	.85	.02	24.61*
NPOQ – CF	-.56	-.65	.03	-16.69*
CF – Dep Sx	-6.85	-.58	.48	-14.32*
SR – Dep Sx	-.60	-.05	.48	-1.25
ER – Dep Sx	6.80	.57	.42	16.20*
SPS – Dep Sx	.28	.02	.43	.65

Note. * indicates significance at $p < .001$. Nonsignificant paths are displayed in **bolded font**. CF = Common Factor.

Specifically, these added paths indicate that the SR latent variable included shared variance with a measure of ER, and the ER latent variable included shared variance with a measure of SPS. These findings suggest that, apart from the shared variance amongst all nine measures, unique variance related to the construct of ER is the most predictive of depressive symptoms.

Multigroup Analysis (Gender)

Multigroup analyses were conducted for both the measurement and structural model portions to examine possible differences between females and males. As discussed in Chapter V, examining these differences in CFA/SEM involves consideration of invariance, or whether the models are invariant across groups (Byrne, 2016). This analysis involves systematically allowing paths to either vary or be constrained to equivalent values and then comparing differences in model fit (Keith, 2019). In the present study, multigroup analysis was utilized to address whether the constructs SR, ER, and SPS are being measured the same between females and males, as well as address whether any of the paths predicting depressive symptoms differ by gender.

Differences in model fit were assessed using the χ^2 difference test for nested models as well as the $\Delta CFI \leq .01$ criterion (Keith, 2019). Of note, the χ^2 difference test is considered quite sensitive, particularly for large sample sizes. Thus, many authors recommend focusing on the ΔCFI as a more reasonable indicator of invariance (e.g., Chen, 2007). Additional supporting criteria include $\Delta RMSEA \leq .015$ and $\Delta SRMR \leq .010$ (Putnick & Bornstein, 2016).

First-Order CFA

Configural Invariance. First, the data file was split into females ($n = 303$) and males ($n = 274$), and the first-order CFA model was analyzed separately for each group in order to establish baseline models. As per the recommendations of Keith (2019), the ULI method was

utilized. The baseline model fit statistics are displayed separately in [Table 24](#). The results suggest the baseline structure is well-fitting across females and males and represents similarity between groups.

Table 24

Measurement Invariance Testing – First-Order CFA

Model	$\chi^2(df)$	$\Delta\chi^2(df)$	CFI	Δ CFI	RMSEA	SRMR	AIC
1. Configural	331.94(64)*	-	.935	-	.120 [†]	.0530	423.94
1a. Females	189.44(32)*	-	.934	-	.128	.0530	235.44
1b. Males	142.50(32)*	-	.936	-	.112	.0706	188.50
2. Metric	341.23(71)*	9.29(7)	.935	.000	.115 [†]	.0513	419.23
3. Intercept	422.54(78)*	81.3(7)*	.917	.018	.124 [†]	.0506	526.54
3a. Partial	385.29(77)*	44.08(6)*	.925	.010	.117 [†]	.0520	491.29

Note. $N = 577$ ($n_{\text{female}} = 303$; $n_{\text{male}} = 274$); * indicates significance at $p < .05$; [†] indicates RMSEA corrected for two groups ($RMSEA \times \sqrt{2}$; Keith, 2019).

To assess configural invariance, a multigroup model without parameter constraints across groups was analyzed, such that all paths were allowed to vary. The configural model fit statistics are displayed separately in [Table 24](#). The fit of the configural model was similar to the fit of the baseline models, which indicates the same configuration of estimated parameters holds across groups (Keith, 2019). More specifically, this demonstration of configural invariance means the structure of what is being measured is the same across females and males. Standardized factor loadings for the configural model are displayed separately for females ([Figure 18](#)) and males ([Figure 19](#)). Importantly, while the magnitude of factor loadings differed across relationships, none of the patterns or directions of the relationships differed between groups. Whether or not the differences in factor loading magnitude between groups was statistically significant was evaluated via the next step, metric invariance.

Figure 18

First-Order CFA – Configural Model, Females

$\chi^2(64, N = 577) = 331.94, p < .001$

TLI = .91

CFI = .94

RMSEA = .09 [.08, .10]

SRMR = .05

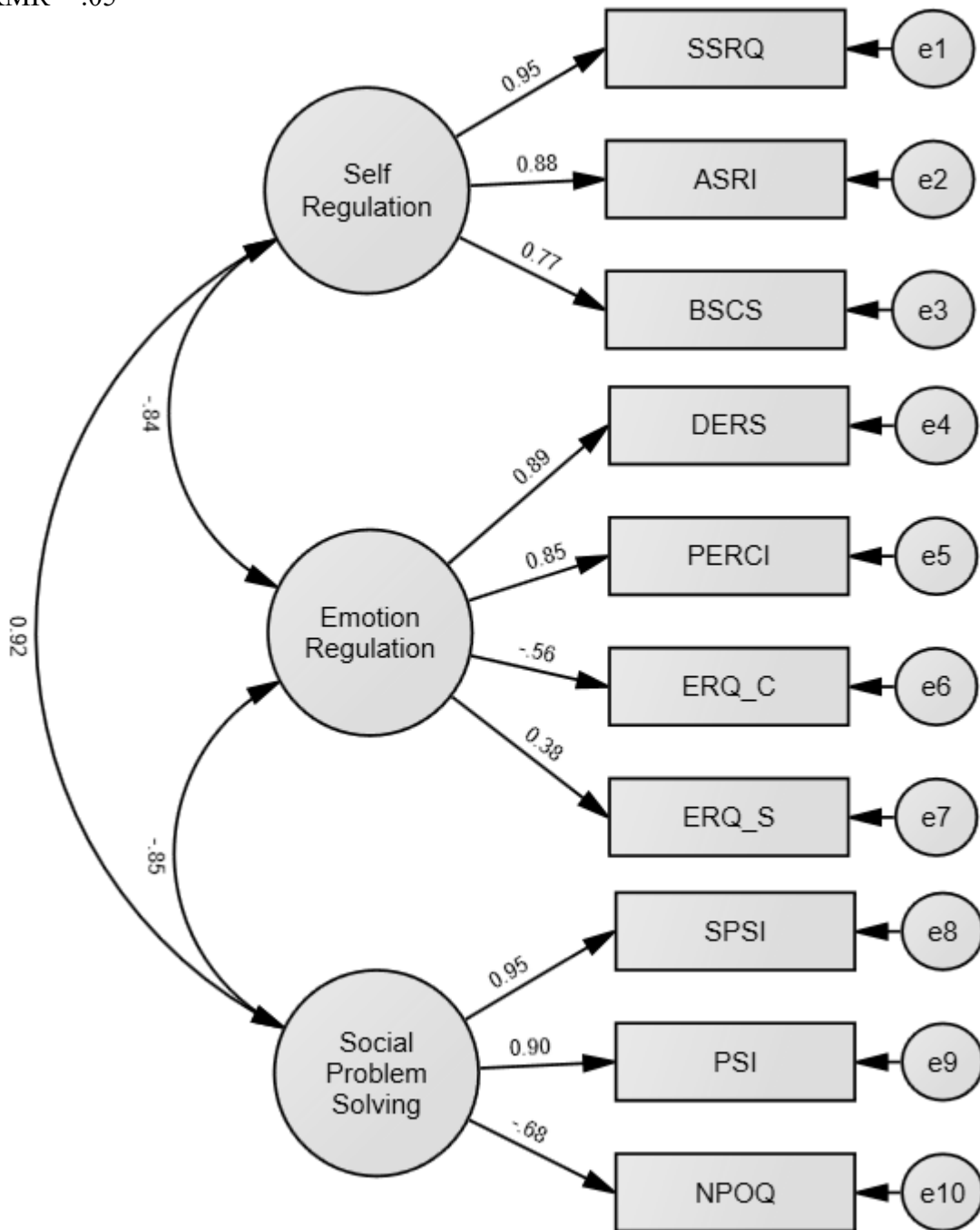


Figure 19

First-Order CFA – Configural Model, Males

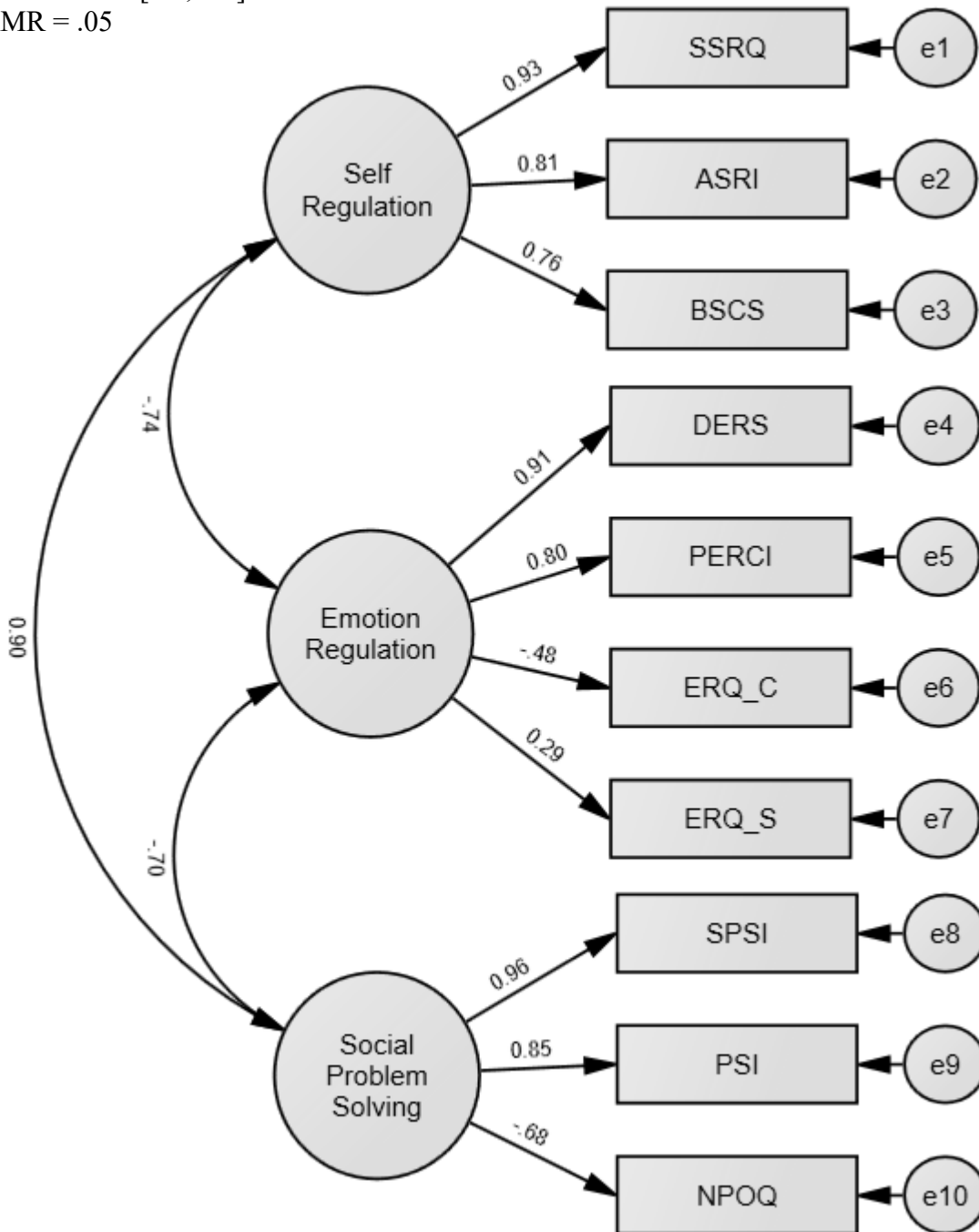
$\chi^2(64, N = 577) = 331.94, p < .001$

TLI = .91

CFI = .94

RMSEA = .09 [.08, .10]

SRMR = .05



Metric Invariance. To assess metric invariance, all factor loadings were constrained to be equal between females and males. The metric model fit statistics are displayed in [Table 24](#). The increase in χ^2 between the configural and metric models was not statistically significant, $\Delta\chi^2(7) = 9.29, p = .233$. Further, when compared to the configural model, the ΔCFI was $\leq .01$, the ΔRMSEA was $\leq .015$, and the ΔSRMR was $\leq .010$. These findings suggest that the scales of the latent variables are the same for both females and males, such that for every unit change in the latent variable, scores on the measures change by the same amount for females and males (Keith, 2019). In addition, given that the factor loadings were constrained to be equal across groups without disrupting model fit, the differences in factor loading magnitude identified in the configural model are therefore not statistically significant. This provides sufficient evidence to assess intercept invariance and is a necessary requirement prior to comparing the effects of one variable on another (i.e., SEM paths) across groups (Keith, 2019).

Intercept Invariance. To assess intercept invariance, all intercepts of measured variables were constrained to be equal across females and males. The male latent factor means were constrained to zero, whereas the female factor means were allowed to differ from the male factor means (Keith, 2019). This is to facilitate the interpretation of mean differences, such that any differences in intercepts/means on the measures are the result of true differences in means of the latent variables. The intercept model fit statistics are displayed in [Table 24](#). The increase in χ^2 between the metric and configural models was statistically significant ($\Delta\chi^2[7] = 81.30, p < .001$) and the ΔCFI was greater than .01 ($\Delta\text{CFI} = .018$). These findings do not support complete intercept invariance; however, this type of invariance is considerably harder to establish than configural or metric invariance and is considered “strong” measurement invariance (e.g., Keith, 2019).

Modification indices were examined in order to evaluate the possibility of partial intercept invariance. The modification was to allow the ERQ_S intercept to vary. The partial intercept invariance fit statistics with this modification are displayed in [Table 24](#). Although the $\Delta\chi^2$ remained significant for the modified model, the ΔCFI was $\leq .01$, the $\Delta RMSEA$ was $\leq .015$, and the $\Delta SRMR$ was $\leq .010$. These results support partial intercept invariance, which is a necessary requirement prior to comparing composite means across groups. This indicates the measures have the same “zero” or start point across groups. As such, any difference in means between females and males on the majority of the measures stems from actual differences in the latent variables rather than something specific to the measure (Keith, 2019). There may be something specific about the ERQ_S that leads to differences between groups that is separate from the underlying construct of ER.

Overall, the demonstrated configural, metric, and partial intercept invariance at the measurement level indicates that 1) the structure of what is being measured is the same across groups; 2) the scales of the latent variables are the same across groups; and 3) that the differences in means of the measures stem from actual differences in SR, ER, and SPS, with the exception of the ERQ_S measure. In other words, the latent variables as measured appear to represent the same constructs for females and males.

Latent Variable SEM

Configural Invariance. First, the data file was split into females ($n = 303$) and males ($n = 274$), and the latent variable SEM model was analyzed separately for each group to establish baselines models. As per the recommendations of Keith (2019), the ULI method was utilized. The baseline model fit statistics are displayed in [Table 25](#). The results suggest the baseline structure is well-fitting across females and males and represents similarity between groups.

Table 25*Measurement Invariance Testing – Latent Variable SEM*

Model	$\chi^2(df)$	$\Delta\chi^2(df)$	CFI	Δ CFI	RMSEA	SRMR	AIC
1. Configural	129.62(60)*	-	.985	-	.062 [†]	.0294	273.62
1a. Females	81.62(30)*	-	.981	-	.075	.0294	153.62
1b. Males	47.98(30)*	-	.991	-	.047	.0248	119.98
2. Metric	162.63(82)*	33.01(22)	.983	.002	.058 [†]	.0298	262.63
3. Intercept	230.10(89)*	67.47(89)*	.970	.013	.075 [†]	.0362	360.10
3a. Partial	183.48(88)*	20.85(88)*	.979	.004	.061 [†]	.0302	315.48

Note. $N = 577$ ($n_{\text{female}} = 303$; $n_{\text{male}} = 274$); * indicates significance at $p < .05$; [†] indicates RMSEA corrected for two groups ($RMSEA \times \sqrt{2}$; Keith, 2019).

To assess configural invariance, a multigroup model without parameter constraints across groups was analyzed, such that all paths were allowed to vary. The configural model fit statistics are displayed separately in [Table 25](#). The fit of the configural model was similar to the fit of the baseline models, which indicates the same configuration of estimated parameters holds across groups (Keith, 2019). More specifically, this demonstration of configural invariance means the structure of what is being measured is the same across females and males. Standardized factor loadings for the configural model are displayed separately for females ([Figure 20](#)) and males ([Figure 21](#)).

Importantly, while the magnitude of factor loadings differed across relationships, none of the patterns or directions of the relationships differed between groups. Whether or not the differences in factor loading magnitude between groups was statistically significant was evaluated via the next step, metric invariance.

Figure 20

Latent Variable SEM – Configural Model, Females

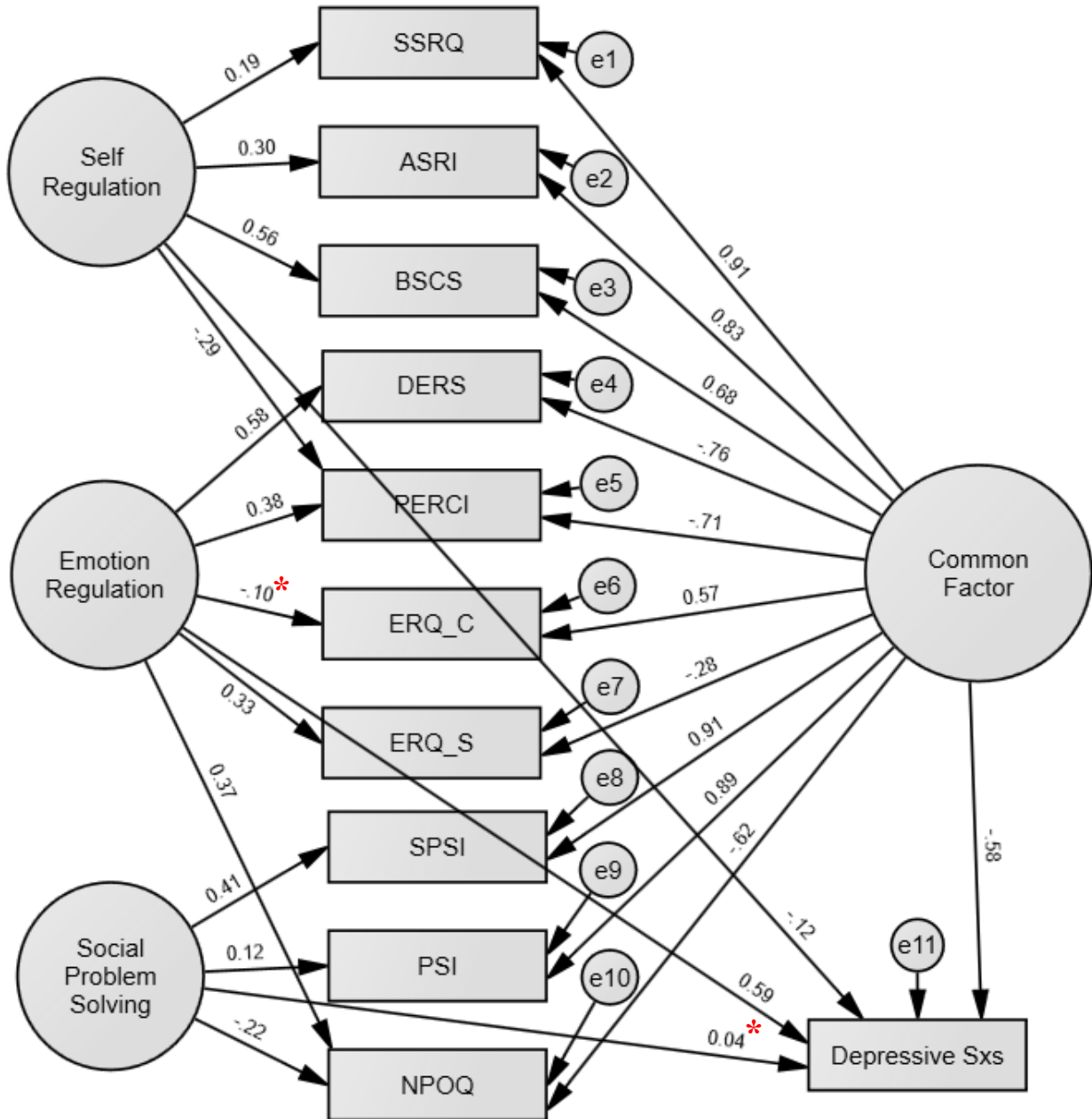
$\chi^2(60, N = 577) = 129.62, p < .001$

TLI = .97

CFI = .99

RMSEA = .05 [.03, .06]

SRMR = .03



* Indicates nonsignificance

Figure 21

Latent Variable SEM – Configural Model, Males

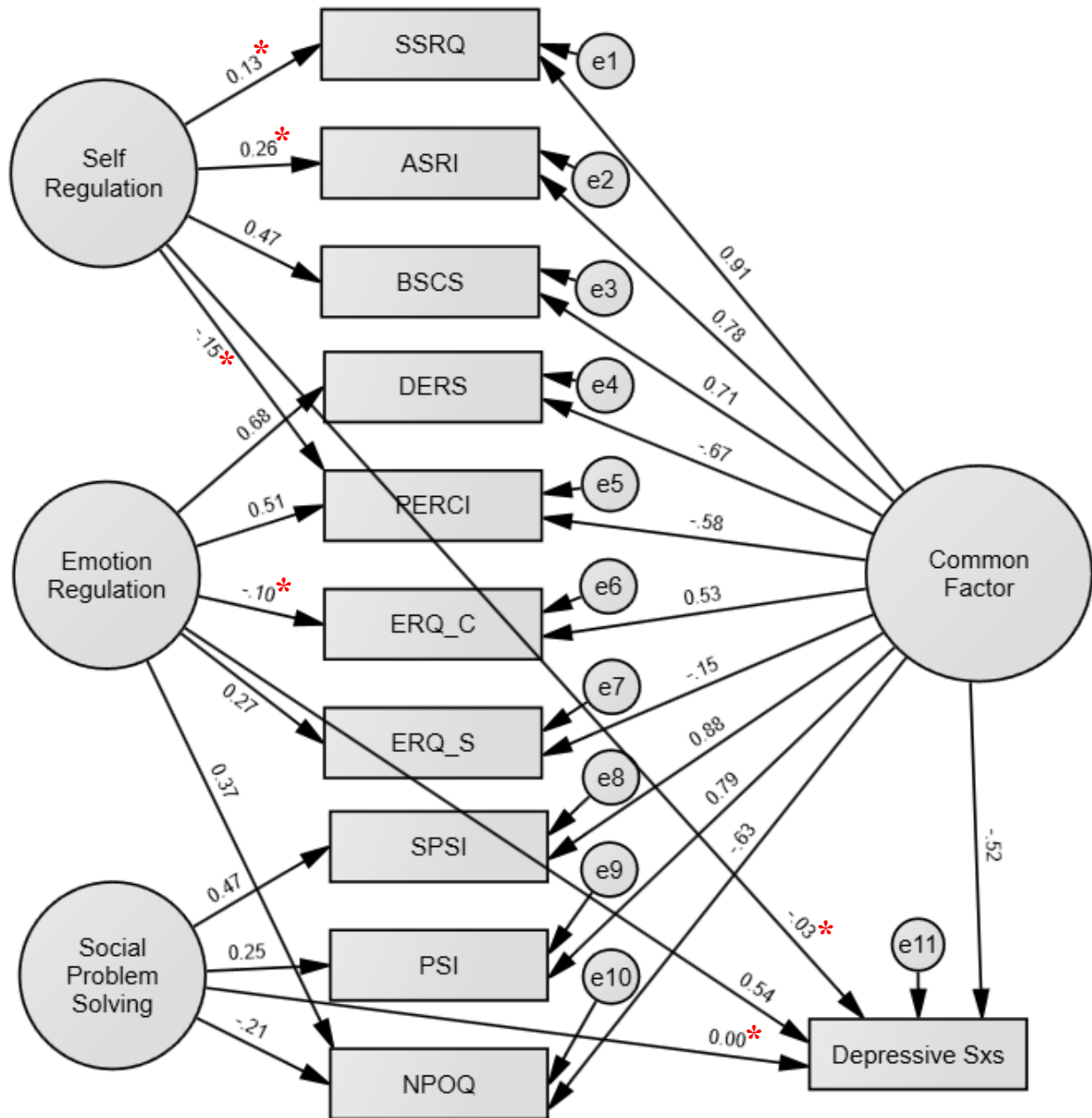
$\chi^2(60, N = 577) = 129.62, p < .001$

TLI = .97

CFI = .99

RMSEA = .05 [.03, .06]

SRMR = .03



* Indicates nonsignificance

Metric Invariance. To assess metric invariance, all factor loadings were constrained to be equal between females and males. The metric model fit statistics are displayed in [Table 25](#). The increase in χ^2 between the configural and metric models was not statistically significant, $\Delta\chi^2(22) = 33.01, p = .062$. Further, when compared to the configural model, the ΔCFI was $\leq .01$, the ΔRMSEA was $\leq .015$, and the ΔSRMR was $\leq .010$. These findings suggest that the scales of the latent variables are the same for both females and males, such that for every unit change in the latent variable, scores on the measures change by the same amount for females and males (Keith, 2019). In addition, given that the factor loadings were constrained to be equal across groups without disrupting model fit, the differences in factor loading magnitude identified in the configural model are therefore not statistically significant. Contrary to prediction, the relationship between ER and depressive symptoms was invariant across groups (Hypothesis 18). This provides sufficient evidence to assess intercept invariance and is a necessary requirement prior to comparing the effects of one variable on another (i.e., SEM paths) across groups (Keith, 2019).

Intercept Invariance. To assess intercept invariance, all intercepts of measured variables were constrained to be equal across females and males. The male latent factor means were constrained to zero, whereas the female factor means were allowed to differ from the male factor means (Keith, 2019). The intercept model fit statistics are displayed in [Table 25](#). The increase in χ^2 between the metric and configural models was statistically significant ($\Delta\chi^2[7] = 67.47, p < .001$) and the ΔCFI was greater than .01 ($\Delta\text{CFI} = .013$). These findings do not support complete intercept invariance; however, as previously noted, this type of invariance is considerably harder to establish than configural or metric invariance and is considered “strong” measurement invariance (e.g., Keith, 2019).

Modification indices were examined in order to evaluate the possibility of partial intercept invariance. Parallel to the first-order CFA model, the modification was to allow the ERQ_S intercept to vary. The partial intercept invariance fit statistics with this modification are displayed in [Table 25](#). Although the $\Delta\chi^2$ remained significant for the modified model, the ΔCFI was $\leq .01$, the ΔRMSEA was $\leq .015$, and the ΔSRMR was $\leq .010$. These results support partial intercept invariance, which is a necessary requirement prior to comparing composite means across groups. This indicates the measures have the same “zero” or start point across groups. As such, any difference in means between females and males on the majority of the measures stems from actual differences in the latent variables rather than something specific to the measure (Keith, 2019). The correspondence between these findings and the first-order CFA model provides additional support that there may be something specific about the ERQ_S that leads to differences between groups that is separate from the underlying construct of ER.

Overall, the demonstrated configural, metric, and partial intercept invariance for the latent variable SEM model align with the results of the higher-order CFA model invariance testing. These findings provide strong evidence that the proposed models and corresponding relationship patterns do not differ between females and males despite differences in factor loading magnitude between groups.

CHAPTER VIII

DISCUSSION

The present study examined the relationships among three psychological constructs: SR, ER, and SPS, and their connection to depressive symptomology. Each construct has an independent literature base comprised of varied theoretical models and empirical investigations demonstrating links to psychopathology. Despite this independence in theory and measure development, however, these constructs do appear to overlap in that each requires the ability to monitor, evaluate, and adjust behavior to reach a goal or solve a problem (Barkley, 1997a; D’Zurilla & Nezu, 2010; Gross, 2015). These shared features suggest commonalities in both the underlying mechanisms and functional outcomes of SR, ER, and SPS. Nonetheless, no studies to date have empirically examined the measurement or predictive ability of these constructs in the context of one another.

The present study aimed to bridge this gap in the literature by addressing three interrelated research questions:

1. How well do commonly used measures capture the underlying constructs of SR, ER, and SPS as intended?
2. Given the significant theoretical overlap and range of operational definitions among SR, ER, and SPS, is their measurement more so reflective of (a) three distinct constructs, (b) three constructs containing both distinct and common features, (c) three distinct constructs with an external common influence, or (d) one common construct?
3. When considered in the context of one another, how do the common and/or distinct features of SR, ER, and SPS relate to depressive symptomology?

These questions relate to Cronbach and Meehl's (1955) notion of *construct validity*, which refers to the process of determining whether variation in a measure reflects variation in a latent construct. This type of validity is particularly important when a latent construct's nomological net is not universally agreed upon, as is the case for complex, higher-order constructs like SR, ER, and SPS (e.g., Weems & Pina, 2010). There is no direct test of construct validity, rather, it is an ongoing process that involves the accumulation of evidence from a variety of sources. Information that speaks to construct validity includes overall measure content, as well as within-construct, between-construct, and criterion-related relationships (Strauss & Smith, 2009). Cronbach and Meehl (1955) emphasize that the evaluation of this information cannot be an entirely quantitative process, such that the accumulated evidence needs to be integrated and interpreted by the researcher. Over time, the process of evaluating construct validity helps to sharpen measurement tools and, in some cases, can serve to reshape a construct's nomological net and underlying theory.

An important distinction to note is that validity is a property of measures, not constructs (Foster & Cone, 1995). A construct is more than its operationalization or measurement; that is, measures do not equal theory (Cronbach & Meehl, 1955). This is, in part, because measures of latent constructs depend on the process of operationalization, which can be subjective and prone to error (Strauss & Smith, 2009). It is also because a construct is more than the total of its collection of traits and behaviors (i.e., more than the sum of its parts; Clark & Watson, 2019). For example, depression is comprised of symptoms such as low mood, sleep disturbance, and feelings of worthlessness, but the concept of depression exceeds the totality of these symptoms (e.g., Kessler & Bromet, 2013). Thus, in the present discussion, construct validity applies to measurement in practice, which, in turn, speaks to the construct's nomological net.

A useful approach to organizing the accumulation of evidence relevant to construct validity is through the lens of Foster and Cone's (1995) two-phase evaluation of representational validity followed by elaborative validity. *Representational validity* refers to how well a measure captures an underlying construct and includes consideration of content, convergent, and discriminant validity (Foster & Cone, 1995). *Elaborative validity* refers to a measure's utility in predicting or monitoring other constructs (Foster & Cone, 1995). These two phases can be useful in framing the integration and interpretation of diverse information relevant to construct validity gathered across within-construct, between-construct, and criterion-related sources.

The present study progressed in two stages, measurement and structural, which aptly correspond to Foster and Cone's (1995) phases of representational and elaborative validity. The measurement stage involved an evaluation of the relationships among commonly used measures of SR, ER, and SPS. This included consideration of convergent and discriminant validity via an examination of a first-order CFA model and a comparison of rival CFA models. In the structural stage, the identified pattern of relationships among these constructs was considered from a utility perspective. Specifically, how well the common and distinct elements of SR, ER, and SPS were able to predict depressive symptoms was assessed via a latent variable SEM model. Overall, the conclusions drawn across these stages provided information relevant to the construct validity of the SR, ER, and SPS measures.

The purpose of this chapter is to discuss implications of the present findings in the context of past theoretical and empirical work involving the constructs of SR, ER, and SPS. First, a summary of the findings is provided, followed by an in-depth evaluation of implications. Consistent with the above, the discussion is divided into two sections as per Foster and Cone (1995): (1) the measurement stage and considerations of representational validity and (2) the

structural stage and considerations of elaborative validity. The chapter concludes with a discussion of limitations and future directions.

Summary of Findings

The data collected in the present study were considered representative of a typical undergraduate population (e.g., Auerbach et al., 2018; NCES, 2019), sufficient in size (e.g., Melka et al., 2011; Schreiber et al., 2006), and comparable to past empirical work utilizing the measures of interest (see [Table 5](#)). Preliminary analyses at the correlational level supported predictions regarding relationships among the constructs, such that measures of adaptive SR, ER, and SPS were positively related to one another and negatively related to depressive symptoms. Findings from the first-order CFA model indicated that seven out of nine measures loaded on to their intended factors as predicted. The exceptions were the ERQ (a measure of ER) and NPOQ (a measure of SPS).

Contrary to prediction, the bifactor model was identified as the best-fitting CFA model. This suggests that each construct is comprised of distinct variance, as well as common variance separate from SR, ER, and SPS that is shared among all nine measures. Interestingly, only the common factor variance and distinct variance of ER significantly predicted depressive symptoms. Regarding gender differences, independent *t* tests indicated that females reported significantly higher levels of NPO, emotional dysregulation, and depressive symptoms than males. In addition, females reported lower levels of SR, use of suppression as an ER strategy, and overall problem-solving ability than males. Despite these mean-level differences, multigroup analyses at the measurement (first-order CFA) and structural levels (latent variable SEM model) demonstrated configural, metric, and partial intercept invariance between females and males.

Implications of Findings

Stage 1: Measurement & Representational Validity

The measurement stage included assessment of within-construct variance (i.e., relationships among measures of the same construct) and between-construct variance (i.e., relationships among measures of different constructs). First, within-construct variance was evaluated via same-construct correlations and the first-order CFA model. Next, between-construct variance was evaluated via cross-construct correlations and the comparison of rival CFA models. Results of this stage are considered in the context of representational validity, overall construct validity, and theoretical implications.

Within-Construct Variance. The first goal of the present study was to assess how well commonly used measures capture the underlying constructs of SR, ER, and SPS as intended. All three constructs are comprised of both bottom-up and top-down processes and include cognitive, emotional, and behavioral components (Barkley, 1997a; D’Zurilla & Nezu, 2010; Gross, 2015). Given the complexity of these constructs, developing fully representative measures is a challenge. A first-order CFA model can be used to examine the extent to which this is accomplished. CFA models have been the method of choice in both item-level and measure-level investigations of construct validity (DiStefano & Hess, 2005; Lance & Fan, 2016). This is because CFA allows for an evaluation of how much variance in observed variables is generated by latent constructs based on theoretical predictions (Byrne, 2016). At the measure level, CFA demonstrates whether measures of the same construct indeed share variance with each other (Keith, 2019). This is a necessary but not sufficient step in the process of evaluating construct validity.

A primary reason CFA is not sufficient as a stand-alone assessment of construct validation is that the demonstration of shared variance does not provide information regarding the composition of that variance (Keith, 2019). That is, whether the shared variance captured by a latent construct is reflective of that construct's nomological net remains unknown (Cronbach & Meehl, 1955). From a methodological perspective, an individual's inherent abilities related to the constructs of interest are assumed to drive variation in item responses on self-report measures of those constructs (Foster & Cone, 1995). However, variation in item responses can be impacted by a multitude of factors, such as aspects of the measurement process (e.g., Campbell & Fiske, 1959), social desirability (e.g., King & Bruner, 2000), and any other potential confounds related to the variables of interest (e.g., intelligence, socioeconomic status; Foster & Cone, 1995). Although CFA models provide useful information regarding construct validation, caution is warranted when interpreting the composition of shared variance captured by latent constructs.

Though concerns have been raised about the construct validity of SR, ER, and SPS (e.g., Duckworth & Kern, 2011; Weems & Pina, 2010), the present study was the first to examine these constructs from a measure-level perspective via CFA. Results of the within-construct correlational analyses demonstrated most measures were related as predicted. This was supported by the first-order CFA model, which indicated seven out of nine measures loaded on to their intended factors. In general, measures of each construct were related to one another, and shared underlying variance as would be expected based on theory and past empirical work. These findings provide some of the evidence necessary to establish representational validity and offer preliminary support for the construct validity of measures of SR, ER, and SPS. Each construct will be discussed in more detail next.

Self-Regulation. SR is the ability to monitor, evaluate, and adjust one's behavior to achieve desired outcomes and avoid undesired outcomes (Bandura, 1991; Barkley, 1997a). This process includes a collection of skills and systems required to maintain progress toward goals in dynamic environments (Nigg, 2017). The inherent complexity of this construct understandably complicates the process of operationalization and measurement (Duckworth & Kern, 2011). In particular, the underlying mechanisms of SR (e.g., EFs) are typically measured separately from the functional outcomes of SR (e.g., goal attainment; Allom et al., 2016). Assessment of SR is often accomplished through self-report measures and behavioral tasks. Evidence suggests self-report measures are better able to capture multiple aspects of SR simultaneously as compared to behavioral tasks (Duckworth & Kern, 2011; Paap & Sawi, 2016).

The present study investigated three commonly used self-report measures of SR: SSRQ (Carey et al., 2004), ASRI (Moilanen, 2007), and BSCS (Tangney et al., 2004). Though they are based on differing conceptualizations of SR and are comprised of multifactorial structures, the total scores of these measures all have been utilized across studies as general indicators of SR (e.g., Lazuras et al., 2019; Tangney et al., 2018). In past work, the SSRQ was found to be positively correlated with the BSCS (Gonzalez et al., 2019). The ASRI had not been included in published studies with the SSRQ or BSCS but was found to be positively correlated with the original, 63-item SRQ in a pilot study conducted by the thesis author (Buffie & Nangle, 2018). These previous correlations were considered large in magnitude (as per Cohen, 1988; .10 is “small,” .30 is “medium,” and above .50 is “large”). In the present study, correlations among measures of SR were considered large and in the expected directions. This indicated the measures were related to each other as predicted and provided initial support for within-construct convergence of measures of SR.

Consistent with the findings at the correlational level, the results of the first-order CFA suggested that all three measures loaded onto the latent factor thought to represent the underlying construct of SR. All factor loadings were considered large in magnitude and did not differ between the original and modified models. In particular, the lack of modifications requiring additional paths to other constructs suggested the measures were more related to each other than the other constructs included in the model (Keith, 2019). This indicated the measures share underlying variance as predicted and, in conjunction with correlational findings, provides additional support for within-construct convergence.

The SSRQ (Carey et al., 2004) and the ASRI (Moilanen, 2007) were both designed as comprehensive measures of overall SR, but the BSCS focuses specifically on top-down or effortful SR, an element termed ‘self-control’ (Tangney et al., 2004). This difference in operationalization was not reflected at the correlational level but was apparent in the somewhat lower factor loading for the BSCS on the latent construct thought to represent SR in the first-order CFA model. This could be due to the broad measures sharing additional variance relevant to bottom-up SR (e.g., stimulus-driven responses), whereas self-control only includes top-down elements (e.g., effortful responses; Evans & Stanovich, 2013; Shulman et al., 2016). Though the composition of shared variance and the significance of this difference in magnitude were not directly tested, this pattern provides an additional piece of evidence that the measures are functioning as predicted based on measure development and theory.

Overall, an examination of the within-construct variance of SR demonstrated that the measures were related, and shared underlying variance as would be expected based on theory. These findings provide support for representational validity, such that measures designed to assess SR should correlate with one another (Foster & Cone, 1995). Further, these results offer

preliminary support for the construct validity of SR given that a significant amount of the variance in SR measures was generated by the same latent construct (Byrne, 2016). Theories of SR would suggest that the shared variance among measures of SR is driven by underlying EFs (e.g., inhibition, attention, planning), as well as functional outcomes (e.g., balance of consequences, short- versus long-term goal attainment; Barkley, 1997a; Nigg, 2017). However, it is unclear whether the shared variance observed in the present model is reflective of SR's theorized nomological net. Information regarding convergent, discriminant, and predictive validity to be discussed later in this chapter provides additional information regarding the construct validity of measures of SR. Future investigations that include multiple traits (e.g., self-efficacy, impulse control, delay of gratification), as well as multiple methods (e.g., behavioral EF tasks), can further enhance understanding of SR as a construct.

Emotion Regulation. ER is the ability to monitor, evaluate, and adapt emotional responding to be in line with goals (Thompson, 1994). Emotional responding includes both the experience and expression of emotions, which require regulation across behavioral, cognitive, and physiological modalities (Gross, 2014). Like SR, the wide range of elements involved in ER have been operationalized and measured in a multitude of ways (Bridges et al., 2004; Weems & Pina, 2010). For instance, a variety of methods are utilized to assess emotional responding (e.g., induction techniques, physiological indicators), whereas the underlying skills needed for regulation (e.g., EFs) are often assessed via behavioral tasks (Adrian et al., 2011; Fernandez et al., 2016). Regarding self-report, some measures focus on overall ER ability, some focus on specific modalities of ER (e.g., cognitive, behavioral), whereas others focus on strategy implementation (Bridges et al., 2004). Despite the variety of methods used to tap ER, self-report

measures are widely utilized, and, the DERS and ERQ are the two most well-validated measures of ER (e.g., Ireland et al., 2017; Preece et al., 2018).

The present study investigated three commonly used self-report measures of ER: DERS (Gratz & Roemer, 2004), PERCI (Preece et al., 2018), and ERQ (Gross & John, 2003). These measures are comprised of multifactorial structures and reflect differing operationalizations of ER, yet their total scores are widely used as indicators of general ER (e.g., Lafrance et al., 2014; Wasylkiw et al., 2020). The DERS and the PERCI have not previously been compared, but previous investigations have found small correlations between the ERQ subscales and both the DERS and the PERCI (Preece et al., 2018; Salsman & Linehan, 2012). In the present study, the correlation between the DERS and the PERCI was considered large and in the expected direction. The correlations between the ERQ subscales and DERS and PERCI ranged from small to medium. Though this is in line with past studies investigating the ERQ, relationships between measures purporting to capture the same construct were expected to be stronger. Overall, except for the ERQ, correlational analyses provided partial support for within-construct convergence of measures of ER.

The results of the first-order CFA corresponded with these findings, such that two out of the three measures loaded onto the latent factor thought to represent the underlying construct of ER. The factor loadings for the DERS and PERCI were considered large in magnitude and did not differ between the original and modified models. In contrast, the factor loadings for the ERQ subscales were lower in magnitude and required additional modifications to account for unique variance. This indicates variance captured by the ERQ does not map cleanly onto the latent construct thought to represent ER. Despite these considerations for the ERQ, no modifications involving additional paths to other constructs were required, which suggests the constructs were

more related to each other than the other included constructs (Keith, 2019). In line with findings at the correlational level and when considering discrepancies with the ERQ, these findings provided partial support for within-construct convergence.

Similar to SR, the included measures of ER were intended to capture somewhat different elements of the construct. The DERS (Gratz & Roemer, 2004) and the PERCI (Preece et al., 2018) were designed to assess overall ER abilities, whereas the ERQ was designed to assess specific strategy implementation (Gross & John, 2003). The ERQ is divided into two subscales that assess the ER strategies of cognitive reappraisal (ERQ_C) and suppression (ERQ_S; Gross & John, 2003). This difference in operationalization could explain discrepancies with the ERQ at the correlational and factor-analytic levels. This pattern could be due to the broad measures sharing variance relevant to emotional responding or underlying EFs (e.g., inhibition, attention, planning), whereas the ERQ only includes behaviors specific to the strategies assessed (i.e., cognitive reappraisal and suppression; Gross, 2014; McRae et al., 2012). It is therefore possible that the observed pattern indicates the measures are functioning as would be expected based on theory. The ERQ was included in the present study due to its wide use in the field as general indicator of ER abilities (e.g., Joormann & Gotlib, 2010). However, concern regarding the quality of the ERQ as a measure of ER surfaces in a variety of ways across models and warrants further consideration. Thus, the ERQ will be specifically addressed in a later section.

With the exception of the ERQ, examination of the within-construct variance of ER demonstrated that the measures were related, and shared underlying variance as predicted. Representational validity was partially supported, such that measures designed to assess ER should correlate with one another, but only two out of three demonstrated strong relationships (Foster & Cone, 1995). The significant amount of variance shared between the DERS and the

PERCI offers preliminary support for the construct validity of ER (Byrne, 2016). Theories of ER might suggest this shared variance stems from elements of emotional responding (e.g., positive and negative affective states, emotional cognitions) or skills related to regulation (e.g., EFs, ER-specific strategies; Barkley, 2015; Gross, 2014; McRae et al., 2012). Not enough information was gathered in the present study to determine whether this shared variance is reflective of ER's nomological net. However, examination of convergent, discriminant, and predictive validity can shed additional light on this question and discussed later in this chapter. To better understand ER as a construct, future studies might include a multitrait-multimethod investigation that separates emotional responding from regulation abilities and considers the roles of baseline mood, affect changes, and contextual stress.

Social Problem-Solving. SPS is the process by which individuals understand, appraise, and adapt to problems in daily living (D'Zurilla & Nezu, 1990). This involves skills across modalities related to problem-solving steps (e.g., gathering information, generating solutions, evaluating consequences), as well as problem orientation and style (D'Zurilla et al., 2004; Heppner et al., 2004). In comparison to the assessment of SR and ER, SPS has been confined to a smaller number of operationalizations and methods of measurement. SPS assessment primarily includes measures of process, or an individual's strengths or deficits in SPS, as well as measures of outcome, or the effectiveness or quality of solutions to specific problems (D'Zurilla et al., 2004). Questions have been raised as to whether process and outcome measures are assessing the same components of SPS, as well as the degree of overlap among measures within each category (Anderson et al., 2009; 2011). Typically, self-report measures focus on process elements and aim to capture broad SPS abilities; this is the most common approach to SPS assessment (Nezu, 2004).

The present study investigated three commonly used self-report measures of SPS: SPSI-R (D’Zurilla et al., 2002), PSI (Heppner & Peterson, 1982), and NPOQ (Robichaud & Dugas, 2005a). All three measures are based on different conceptualizations and elements of problem-solving, yet their total scores have been used as general indicators of SPS (e.g., D’Zurilla & Nezu, 2010; Hetrick et al., 2014). In past work, overall indices of the PSI and the SPSI-R were found to be positively correlated (Dreer et al., 2004; Hawkins et al., 2009; Maydeu-Olivares & D’Zurilla, 1997). The NPOQ was found to be correlated with the NPO subscale of the SPSI-R, as well as the two maladaptive problem-solving styles, but had not yet been included in studies with the overall indices of the SPSI-R or PSI (Pawluk et al., 2017; Robichaud & Dugas, 2005a). In the present study, correlations among measures of SPS were considered large and in the expected directions; one exception was the correlation between the NPOQ and the PSI, which was medium in magnitude. This indicated the measures were related as predicted and provided initial support for within-construct convergence of measures of SPS.

The results of the first-order CFA suggested that two out of the three measures loaded onto the latent factor thought to represent the underlying construct of SPS. The factor loadings for the SPSI-R and PSI were considered large and did not differ between the original and modified models. In contrast, the NPOQ’s factor loading was lower in magnitude and was substantially changed between the original and modified models. One of the modifications involved adding a path from ER to the NPOQ, suggesting a portion of the variance in the NPOQ is generated by the latent construct thought to reflect ER. Except for the NPOQ, these findings largely demonstrate shared variance among measures of SPS as predicted and provide partial support for within construct convergence.

Previous factor-analytic investigations of SPS have identified a multifactorial structure that includes elements related to problem-solving orientation, appraisal, approach, and implementation (e.g., Heppner et al., 2004; Maydeu-Olivares & D’Zurilla, 1996). As such, measures of this construct differentially reflect these complimentary elements. The SPSI-R and PSI were designed to capture general SPS abilities; thus, they include subscales as well as overall indices (D’Zurilla et al., 2002; Heppner & Peterson, 1982). In contrast, the NPOQ was designed to assess one specific element of SPS, NPO, which is a response set in which individuals view problems as a threat to well-being and doubt their ability to solve them (D’Zurilla & Nezu, 2010; Robichaud & Dugas, 2005a). Relationships at the correlational level, as well as within the first-order CFA model, reflected this difference.

Variance within the broad measures may reflect problem-solving steps (e.g., gathering information, generating solutions, evaluating consequences), as well as appraisal and style (D’Zurilla et al., 2004; Heppner et al., 2004), whereas the NPOQ likely only includes variance reflective of the behaviors, cognitions, and emotions related to problem orientation (D’Zurilla & Nezu, 2010). Thus, it is possible these within-construct relationships suggest the measures are functioning as would be expected based on theory. The NPOQ was included in the present study due to NPO’s identified role in the relationship between SPS and psychopathology (e.g., Fergus et al., 2015; Humphrey, 2016) as well as limited measures that capture overall SPS (e.g., D’Zurilla & Nezu, 2010). However, the indication that the NPOQ additionally shares variance with the latent construct of ER is a question that surfaces across models and warrants further consideration. Like the ERQ, the NPOQ will be specifically addressed in a later section.

With the exception of the NPOQ, examination of the within-construct variance of SPS demonstrated that the constructs were related, and shared underlying variance as predicted.

Representational validity was partially supported, such that measures designed to assess SPS should correlate with one another, but only two out of three demonstrated strong relationships (Foster & Cone, 1995). The significant amount of variance shared between the SPSI-R and the PSI offers preliminary support for the construct validity of SPS (Byrne, 2016). Theories of SPS might suggest this shared variance is generated by cognitions, emotions, and skills related to the appraisal, implementation, and evaluation of problems (D’Zurilla & Nezu, 2010; Heppner et al., 2004). Consideration of measures of SPS’s convergent, discriminant, and predictive validity discussed in the next section can provide more information regarding the possible composition of this shared variance. More work is needed that includes a multitrait-multimethod investigation of both process and outcomes measures of SPS, as well as a closer look at the pervasive contribution of NPO and its role within the construct.

Overall, findings at this stage largely support within-construct convergence of commonly used measures of SR, ER, and SPS at the correlational and factor-analytic levels. This offers support for the representational validity of these constructs and signifies a necessary but not sufficient step in evaluating their construct validity.

Between-Construct Variance. The second goal of the study was to assess how commonly used measures of SR, ER, and SPS relate to one another. Theoretically, these constructs share a significant amount of overlap. All three constructs involve skills related to self-monitoring, considering short- and long-term consequences, and adapting behavior across contexts (Barkley, 1997a; D’Zurilla & Nezu, 2010; Gross, 2015). Not only are the outcomes of regulation and problem-solving similar, but the overlap in required skillsets implies they also share underlying mechanisms (e.g., Barkley, 1997a; Duckworth & Kern, 2011). Despite these notable commonalities, each construct holds a unique place in theoretical models. That is, SR is

focused on balancing consequences to achieve goals, ER is specific to the experience of emotions, and SPS is limited to situations involving a problem (D’Zurilla & Nezu, 2010; Gross, 2014; Strauman, 2017). Whether or not these distinguishing features are captured in the measurement of SR, ER, and SPS is up for debate (Eisenberg et al., 2011; Weems & Pina, 2010; Zhou et al., 2012). Yet, no study to date has examined the theoretical overlap of these constructs from a measurement perspective.

Considering the common versus distinct elements of SR, ER, and SPS relates to the convergent and discriminant validity of their measures. *Convergent validity* demonstrates that a measure of a construct is related to measures of other constructs as expected, whereas *discriminant validity* indicates that a measure of a construct is not related to or can be distinguished from measures of other constructs (Foster & Cone, 1995). Convergent and discriminant evidence supports representational validity, such that if a measure captures what it aims to capture, its relationships with other measures should reflect that. This process is likened to “sharpening” the representative accuracy of measurement tools by demonstrating what the captured construct “is” and “is not” (e.g., Southam-Gerow et al., 2016). Ultimately, this provides evidence for construct validity by showing that the measure includes the necessary elements and does not include unnecessary elements as they relate to the construct’s nomological net (Cronbach & Meehl, 1955).

One approach to examining convergent and discriminant validity is through testing competing CFA models that reflect different possible relationships between observed variables and latent constructs (Byrne, 2016; e.g., Salekin et al., 2014). In other words, models that reflect cross-construct convergence, divergence, or possibilities in between can be compared against each other to determine which is most reflective of the underlying data (e.g., Credé & Harms,

2015). At the measure level, identifying the structure of latent variables can help to differentiate variance that is unique versus shared among the measures (Keith, 2019). This information can support constructs functioning as distinct entities or identify areas of overlap.

The present study was the first to examine the convergent and discriminant validity of measures of SR, ER, and SPS in the context of one another. It could be reasonably expected that relationships between measures of these constructs might be medium in magnitude (as per Cohen, 1988; .10 is “small,” .30 is “medium,” and above .50 is “large”). In other words, they should be related to one another, but not more related than measures of the same construct. Within-construct relationships should always be stronger than between-construct relationships (Campbell & Fiske, 1959; Foster & Cone, 1995). Results of correlational analyses and rival CFA model indicated a high level of convergence among measures of SR, ER, and SPS. Given the noted theoretical overlap and similar operationalizations of these constructs, congruence in their measurement was expected. However, the independent literature bases and distinguishing features of each suggest they should not be redundant constructs. The substantial amount of convergence observed in the present study calls into question the representational validity and ultimate construct validity of SR, ER, and SPS. This will be discussed first at the correlational level followed by the factor-analytic level. Then, additional alternatives to the underlying factor structure of these measures will be reviewed.

Cross-Construct Correlations. Most of the past work that focused on evaluating how measures of SR, ER, and SPS relate to one another investigated pairs of the constructs (e.g., SR and ER) rather than all three considered together (e.g., Gagne et al., 2021; Orobio de Castro et al., 2003). Published studies that utilized the specific measures included in the present study were limited and often demonstrated varied results. Within these studies, correlations between

measures of SR and ER were found to range from small to medium (e.g., Aka et al., 2020; Lazuras et al., 2019), and correlations between measures of ER and SPS ranged from small to large (Kuzucu, 2016; Turner et al., 2012). The selected measures of SR and SPS did not appear to have been included in published studies together. A pilot study conducted by the thesis author utilizing a subset of the included measures found correlations ranging from medium to large between the constructs (Buffie & Nangle, 2018).

The results of the present study identified several, large, cross-construct measure correlations. In fact, over half of the total between-construct correlations were considered large in magnitude, with estimates as high as $r = .82$. Further, though not directly tested, the magnitude of within-construct correlations did not appear to be substantially different from between-construct correlations. These findings indicate a high level of convergence among measures of the constructs. As noted, only a moderate level of convergence was expected, and the between-construct measure correlations should certainly not exceed within-construct correlations (Campbell & Fiske, 1959; Foster & Cone, 1995). This provides initial evidence that does not support against representational validity of these measures from a between-construct perspective. It is important to note that capturing the balance of distinct and common features of these constructs is likely more complicated than what can be reflected by correlational relationships. Thus, these questions will be explored in more detail in the context of the CFA results.

Rival CFA Models. The present study was the first empirical investigation of the common and distinct elements of SR, ER, and SPS via comparison of multiple measure-level CFA models. Four rival CFA models representing different underlying structures were tested against each other. The models were evaluated to determine whether the measures used to assess SR, ER, and SPS were more so reflective of: (a) three distinct constructs (first-order model), (b)

three constructs containing both distinct and common features (higher-order model), (c) three distinct constructs with an external common influence (bifactor model), or (d) one common construct (one-factor model). Identification of the best-fitting model by this approach provides valuable information regarding the extent to which measures of these constructs converge or diverge with each other.

It was predicted that measures of SR, ER, and SPS would be comprised of variance that is specific to each construct, as well as shared among the constructs (i.e., common and distinct features). Considering overlap in underlying mechanisms and connection to EFs highlighted in theoretical models of these constructs, it was thought that the variance shared among them would be generated by the constructs themselves. That is, the shared variance was predicted to stem from overlap in the core aspects of SR, ER, and SPS (i.e., skills related to monitoring, evaluating, and adjusting behavior; e.g., Barkley, 1997a). This balance of distinct and shared features generated by the constructs was best represented by the higher-order model, which was hypothesized to be the best-fitting model. Contrary to this prediction, however, the bifactor model emerged as the best-fitting model.

The bifactor model suggests that a common factor separate from the first-order factors explains a portion of the shared variance among all nine measures of the constructs. The loadings for most measures onto the common factor were stronger in magnitude than the loadings onto the latent constructs thought to represent SR, ER, and SPS. This pattern corresponds with the high level of convergence among measures observed at the correlational level. Taken together, these findings indicate the nine measures share substantial overlap in what they capture. Although the bifactor model supports the general prediction that SR, ER, and SPS are comprised of common and distinct elements, it suggests that the extent to which measures of these constructs reflect this

balance is limited. Instead, the present results indicate that measures of SR, ER, and SPS are largely reflective of commonalities among the constructs. These results will be considered first from a methodological perspective, then a theoretical perspective.

The substantial overlap among measures of SR, ER, and SPS raises questions regarding the accuracy of the path from theory to operationalization to measurement for these constructs. From a representational validity perspective, high convergence indicates measures are not sufficiently capturing what a construct “is” and “is not” (Campbell & Fiske, 1959; Foster & Cone, 1995). When measures do not function as predicted, Cronbach and Meehl (1955) note it is challenging to determine whether the issue is a result of inadequate measures or if the theories underlying the constructs need to be redefined. These concerns have been evident in past studies and call for clarification in the measurement of these constructs have been numerous. In particular, concerns regarding a siloed approach (e.g., Zhou et al., 2012), contrasting operationalizations (e.g., Eisenberg et al., 2019), and shared method variance (e.g., Weems & Pina, 2010) have been voiced regarding the measurement of these constructs across areas of study.

These possibilities can be problematic in a variety of ways. If the measures are inadequate, their development in terms of operationalization and content validity should be reexamined (Foster & Cone, 1995). In addition, concern regarding redundancy in measurement is warranted. If measures of two constructs are largely reflective of the same nomological net, it is inefficient to interpret them as unique constructs (Strauss & Smith, 2009). In other words, if measures of ER and SPS are capturing the same collection of behaviors, characteristics, or traits, then only one measure is necessary to include in future investigations. On the other hand, if not enough work has been done at the theoretical level to differentiate the constructs, then cross-

construct communication or consensus as to the common and distinct features of each is needed (Cronbach & Meehl, 1955). An evaluation of what comprises the variance shared among measures of these constructs may provide more information regarding possible areas of adjustment along the path from theory to measurement.

It is important to note that it is possible the bifactor model was identified as the best fitting model over the higher-order model due to mathematical reasons. Notably, bifactor models have been found to fit data well across studies, in large part because they allow for high complexity with minimal constraints (e.g., Cucina & Byle, 2017; Reise, 2012). That is, they account for differing forms of shared variance without the need for several individual paths between multiple observed variables. However, a study involving Monte Carlo simulations found that bifactor models did not generally produce a better fit when the true underlying structure was not a bifactor one (Morgan et al., 2015). The bifactor models were found to fit best when the correlations among latent factors were roughly equal, but when they were unequal, models that allowed relationships among latent factors to vary seemed to fit the data best. This pattern of fit with a bifactor structure aligns with the present results, as the correlations among latent factors were found to be strong and similar.

Theoretically, ER and SPS can be conceptualized within the framework of Barkley's (1997a) model of SR, mapping on to the affect/motivation/arousal and reconstitution components, respectively. Within this framework, SR, ER, and SPS all depend on the EF of response inhibition (i.e., stopping an initial response to a stimulus) and work in conjunction with other EFs (e.g., working memory, internalized speech, task-switching) to adapt behavior (Barkley, 1997a; Riggs et al., 2006; Schmeichel & Tang, 2015). The shared features and underlying mechanisms contribute to similar functional outcomes for these constructs, namely

reaching goals and solving problems (Barkley, 1997a; D’Zurilla & Nezu, 2010; Thompson, 1994). Still, each construct holds its own theoretical foundation, operational definition, and range of dedicated assessment tools. The existing literature bases of SR, ER, and SPS therefore reflect a complicated balance of common and distinct features of these constructs.

The data collected, and models tested, in the present study do not provide enough information to be able to characterize what comprises the shared variance within the common factor. As such, what underlies the common elements of SR, ER, and SPS remains unknown; hypotheses can be generated, but future investigations are needed to gain a deeper understanding of the shared variance. Considering these limitations, two possible explanations will be briefly explored: (1) potential unmeasured variables and (2) the influence of shared method variance.

The bifactor model fitting better than the higher-order model suggests the common variance stems directly from the measures rather than the latent constructs thought to represent SR, ER, and SPS. Throughout earlier chapters, it was hypothesized that the shared variance depicted in the bifactor model could not underly the first-order factors and instead had to be a separate entity. Possible features proposed included constructs like self-efficacy, baseline affect, or stress (e.g., Bandura, 1991; D’Zurilla & Nezu, 2010). Indeed, connections between these constructs and SR, ER, and SPS have been identified in past investigations (e.g., Chang, 2017; Buruck et al., 2014; Zhang et al., 2018). Additional considerations include constructs that tend to have a pervasive impact on psychological functioning, such as intelligence, years of education, or socio-economic status (e.g., Foster & Cone, 1995). It is possible that any of these unmeasured variables could influence an individual’s responding on all nine measures in a manner that is separate from the latent constructs thought to reflect SR, ER, and SPS and contribute to the shared variance captured by the common factor.

Investigations of global intelligence offer an alternative perspective. Historically, global intelligence (i.e., the *g* factor) was understood within the framework of a higher-order model, such that *g* was generated by shared variance among broad abilities (e.g., fluid intelligence, crystallized intelligence, processing speed), which in turn were generated by shared variance among related subtests of intelligence assessments (e.g., vocabulary, coding; Canivez & Watkins, 2010). However, recent investigations have found substantial support for a bifactor model of global intelligence (Beaujean, 2015; Cucina & Byle, 2017; Gignac & Watkins, 2013). These alternative conceptualizations do not propose *g* is comprised of something different because it is separated from the broad abilities in the bifactor model, but rather it is viewed as more directly impacting performance on the subtests (Cucina & Byle, 2017). By this line of reasoning, it is possible the common factor in the present study could be reflective of the same elements hypothesized in the higher-order model, namely EFs (Barkley, 1997a). Perhaps the bifactor model indicates that a common, underlying factor (e.g., EFs, intelligence) has a direct impact on all nine measures.

It is also certainly possible the common factor is inflated by shared method variance, as all nine measures are self-report assessments of one's own cognitions, emotions, and behaviors. Shared method variance suggests that demonstrated relationships between constructs may be due to similar measurement formats rather than an underlying relationship between the constructs themselves (Campbell & Fiske, 1959). In other words, variation in scores on a measure could reflect variation in underlying abilities the measure aims to capture, or they could reflect factors related to how the measure was completed, or a combination of these factors. The present study utilized self-report measures, which typically overlap methodologically via two pathways: similar formats and the influence of response bias (Fernandez-Ballesteros, 2004). Structurally, all

measures were administered electronically, included a set of relative statements, and were rated based on Likert scales. Response biases that could impact self-report might include factors related to social desirability (e.g., King & Bruner, 2000) or tendencies to fake good, fake bad, or fake mad (e.g., Furnham & Henderson, 1982).

Despite these concerns, self-report continues to be the most widely utilized form of assessment in psychological research, and methods to maximize fidelity are numerous (Crano et al., 2014; Turkkan, 2000). Further, regardless of whether the common factor was inflated due to shared method variance, the measures included in the present study are widely used in practice as predictors of outcomes also typically assessed via self-report (e.g., Duckworth & Kern, Weems & Pina, 2010). Thus, this issue extends beyond considerations of the present study and relates to how much of psychological research is typically conducted. These concerns and potential ways to address them will be discussed in more detail in the limitations and future directions sections.

Alternative Models. In addition to the bifactor model, three other CFA models were tested in the present study. The higher-order model has been discussed throughout as it is the most conceptually similar model to the bifactor model, such that both models represent a level “in between” convergence and divergence. In comparison, the first-order model represented the highest level of divergence, such that the constructs of interest were conceptualized as being distinct entities that are related without sharing underlying variance. This was not the best-fitting model, which provides support for the hypothesis that the constructs as measured are not just related, but indeed share underlying variance (e.g., Barkley, 1997a). In fact, shared underlying variance helps to explain the strong correlational relationships observed between measures of the constructs (Keith, 2019).

On the other end of the spectrum, the one-factor model represented the highest level of convergence, such that the constructs of interest were conceptualized as converging to the extent that they do not function as distinct entities and instead should be considered one common factor. This was also not the best-fitting model, which provides support for the hypothesis that the constructs as measured include distinguishing features that should be differentiated (e.g., D’Zurilla & Nezu, 2010; Gross, 2014). Taken together, the patterns across all four models indicate measures of SR, ER, and SPS are capturing both common and distinct features of these constructs and as such, a model that blends convergence and divergence is most appropriate.

It is important to highlight that only four possible CFA models reflecting different levels of convergence and divergence were evaluated. There are additional possibilities that could be explored, both in terms of the configuration of constructs as well as the constructs included. For example, only one common factor was depicted in the models, but it is possible that more than one construct could impact the shared variance among the nine constructs. In addition, shared variance was evaluated at the predictor level, but not the outcome level. That is, depressive symptoms may also share common variance with SR, ER, and SPS, either stemming from theory or measurement, that was not able to be investigated in the chosen models. A combination of the higher-order and bifactor models is also possible, such that the three first-order constructs may share underlying variance in addition to separate shared variance across the nine measures. Future empirical work is needed to evaluate these alternative possibilities.

Measurement Summary. Most of the work differentiating SR, ER, and SPS has been at the theoretical level rather than the measurement level (e.g., D’Zurilla & Nezu, 2010; Gross, 2014; Nigg, 2017). The present study addressed this gap in the literature through an in-depth evaluation of the within-construct and between-construct relationships among commonly used

measures of SR, ER, and SPS. Although within-construct findings largely supported the representational validity of the included measures, between-construct findings highlighted a substantial amount of convergence. Results of the bifactor model indicated the convergence stemmed from a common factor generated by variance shared among all nine measures. These findings raise important questions regarding the adequacy of the included measures and the possible need for theoretical refinement. Overlap in the measurement of SR, ER, and SPS has significant implications for the interpretation of predictive findings. To draw connections between observed variables and outcomes, fully understanding what measures capture is critical. These concerns are addressed in more detail in the next section.

Stage 2: Structure & Elaborative Validity

In the structural stage, the predictive ability of commonly used measures of SR, ER, and SPS was examined. Specifically, how well common and distinct elements of the constructs as structured by the best-fitting CFA model were able to predict depressive symptoms was assessed via a latent variable SEM model. This allowed for the measures to be evaluated from a utility perspective. Results from the structural stage are considered in the context of elaborative validity, overall construct validity, and theoretical implications.

Common & Distinct Pathways to Depression. The third and final goal of the study was to evaluate how well measures of SR, ER, and SPS predict depressive symptoms in the context of one another. These constructs have all been identified as significant contributors to depressive symptoms and integrated into multiple models of depression (Anderson et al., 2009; Joormann & Stanton, 2016; Strauman, 2017). Given the noted concerns regarding measurement overlap, it is possible that common elements might better explain observed connections between the constructs and depressive symptoms. Conversely, if each construct holds a unique connection to

depressive symptoms, it may be more efficient to target the unique aspects directly. Despite these overlap concerns, most past investigations have examined the connection between each construct and depression in isolation (e.g., Hasegawa et al., 2018; Noreen et al., 2015; Pyszczynski & Greenberg, 1987). The present study was the first to examine how well the common and distinct elements of SR, ER, and SPS predict depressive symptoms in the context of one another.

Evaluation of a measure's ability to predict other constructs relates to *criterion-related validity*, which involves linking scores on a measure to a practically useful criterion (Foster & Cone, 1995). This can be examined via several methods, one of which being latent variable SEM. This approach has notable advantages, namely that it allows for an evaluation of predictive relationships free of measurement error (Byrne, 2016). Further, the two-stage process of measurement (CFA) and structural (latent SEM) considerations permitted questions of convergent and discriminant validity to be addressed prior to predictive questions (Keith, 2019). These advantages provide a clear picture of how much variance in an outcome can be accounted for by a predictor. A measure's predictive ability (i.e., criterion-related validity) is the primary component of elaborative validity and helps to justify the measure's reason for being (Foster & Cone, 1995). This is another necessary but not sufficient step in the process of evaluating construct validity (Cronbach & Meehl, 1955).

Within the bifactor model, predictive paths between each of the constructs and depressive symptoms, as well as between the common factor and depressive symptoms were evaluated. Results indicated that only the common factor and the latent construct thought to reflect ER emerged as significant predictors of depressive symptoms. The ER latent variable also included shared variance with a measure of NPO, suggesting that element of SPS is also predictive of depressive symptoms; this finding will be discussed in more detail in a later section focused on

NPO. After accounting for the common factor, the general constructs of SR and SPS did not significantly predict depressive symptoms. These results will be considered first from a methodological perspective, then from a theoretical perspective.

The substantial overlap among measures of SR, ER, and SPS identified in the measurement stage had predictive implications that emerged in the latent variable SEM model. After accounting for the variance within the common factor, the distinct features of SR and SPS were not predictive of depressive symptoms. This does not support the elaborative validity of these measures and calls into question their utility (Foster & Cone, 1995). That is, if measures of SR and SPS are more so reflective of common elements (highly convergent) and are unable to predict relevant outcomes (lack criterion-related validity) then their value becomes limited (e.g., Strauss & Smith, 2009). It is possible this issue can be addressed from a measure development perspective, such that commonly used tools could be sharpened to better capture what their intended constructs “are” or “are not” (Foster & Cone, 1995). It is also possible this issue calls for a reconsideration of theory, such that clearer boundaries between related constructs are warranted.

As discussed in the context of representational validity, whether the issue is with inadequate measures or a need for theoretical recasting is unclear (Cronbach & Meehl, 1955). What is clear, however, is that studies investigating the predictive ability of these constructs in isolation may be misattributing findings to the construct’s distinct features when in fact, it appears that common features are driving predictive relationships. Notably, it is rare for measurement considerations relevant to construct validity to be raised in limitation sections of studies. Instead, measures that are widely used in practice are assumed to capture the constructs they purport to assess. It is ultimately the responsibility of the researcher to evaluate and balance

these considerations prior to selecting measures to be used in criterion-related studies (Foster & Cone, 1995).

Theoretically, the predictive ability of the common factor in relation to depressive symptoms is not surprising given the strong connections among SR, ER, SPS, and depression (Anderson et al., 2009; Joormann & Stanton, 2016; Strauman, 2017). As noted earlier in this chapter, the data collected, and models tested, in the present study do not provide enough information to be able to characterize what comprises the shared variance within the common factor. The possible constructs proposed as potentially being reflected in the common factor (i.e., EFs, intelligence, years of education, socio-economic status, self-efficacy, baseline affect, stress) would all have intuitive connections to depressive symptoms. It is also possible that shared method variance between the construct measures (SR, ER, and SPS) and outcome measure (depressive symptoms) inflates the predictive relationship (Campbell & Fiske, 1959). Without a deeper understanding of what comprises the shared variance among the nine measures, interpretation of this relationship should be approached with caution.

The finding that ER significantly predicted depressive symptoms aligns with the body of literature suggesting that depression is a disorder of ER. In fact, it has been suggested that individuals with depression do not necessarily experience higher levels of negative emotions than other people, but that they are less able to regulate those emotions (Joorman & Stanton, 2016). The maladaptive ER strategy of rumination and its connection to depression has a particularly prominent, well-established evidence base (e.g., Nolen-Hoeksema, 2012). Given these strong connections between this construct and depression, ER has been integrated into diverse conceptualizations of depressive symptoms. Evidence suggests impairment at any stage of the ER process can serve to initiate or maintain depressive episodes, including deficits in the

engagement of ER abilities, the selection of maladaptive strategies, and failure to effectively implement ER strategies (Sheppes et al., 2015; Zhou et al., 2020).

If an individual fails to engage ER abilities, the original emotion persists, which could contribute to prolonged periods of negative affect (Sheppes et al., 2015). In the case of emotional impulsivity (i.e., failure to inhibit an immediate emotional reaction), inability to engage ER could create negative consequences for the individual (Barkley & Fischer, 2010). For instance, if an individual receives negative feedback from their boss and they are unable to inhibit their initial reaction and employ ER, they may make an inappropriate comment and be reprimanded, leading to additional negative consequences. Regarding the selection of ER strategies, evidence from meta-analyses suggest that individuals with depression tend to select more maladaptive strategies, such as rumination or suppression, than non-depressed individuals (Visted et al., 2018; Zhou et al., 2020). Deficits at this stage are particularly detrimental, as the individual believes they are addressing the issue by employing a strategy, but the strategy serves to exacerbate the problem (e.g., Nolen-Hoeksema et al., 2008). Finally, if an individual fails to effectively implement an ER strategy, a similar accumulation of consequences can occur. For instance, cognitive reappraisal can be a challenging skill, thus if an individual attempts this strategy but is unable to execute it, their original emotion is likely to persist (e.g., Joorman & Stanton, 2016).

Extensive evidence therefore suggests that deficits at any stage of the ER process can impact the onset or development of depression (Sheppes et al., 2015). Further, the overlap between the experience of emotions captured by the constructs of ER and depression could contribute to similarities in their operationalization and measurement (e.g., Kessler & Bromet, 2013). More specifically, measures that assess ER and depression likely both contain content related to one's emotional experience. Overall, the established connection between deficits in ER

and depressive symptoms, the overlap in emotional content, and the possibility of inflation due to shared method variance might all contribute to the significant, predictive relationship observed between the latent construct thought to represent ER and depressive symptoms.

In contrast to ER, the finding that SR and SPS did not significantly predict depressive symptoms was unexpected given the extensive literature bases connecting these constructs to depression. Regarding SR, Strauman (2017) presented a model of depression that suggests the onset of a depressive episode may follow a failure in goal attainment due to deficits in SR. Similarly with SPS, Nezu (1987) presented a model of depression positing a negative cycle in which deficits in SPS lead to an accumulation of problems and related negative consequences that can elicit and exacerbate depressive symptoms over time. There are several potential reasons why these robust connections between SR, SPS, and depression did not emerge in the context of distinct variance predictions. It is possible that the underlying mechanisms of the relationships between SR, SPS, and depression can be fully accounted for by shared variance between regulation and problem-solving. Indeed, both processes involve self-monitoring, evaluation of consequences, and adjusting behavior (D’Zurilla & Nezu, 2010; Strauman, 2017). Differences in shared variance (accounted for by the common factor) could therefore reflect both processes.

It is also possible that ER deficits serve to disrupt SR and SPS abilities to the extent that their influence on depressive symptoms is no longer impactful. This relates to the load hypothesis proposed by Muraven and Baumeister (2000) which suggests that resources directed toward ER come at the cost of other available resources, or resources that could otherwise be directed toward SR or SPS. For example, say an individual is working toward a goal or attempting to solve a problem. If the individual becomes distressed, they then must employ ER abilities while maintaining progress toward the goal or problem resolution. This not only

decreases the overall cognitive resources available but is more challenging when deficits in ER are present (Muraven & Baumeister, 2000). On the other hand, ignoring the distress could serve to disrupt SR or SPS abilities (Bridget et al., 2013; D’Zurilla & Nezu, 2010). With either possibility, SR and SPS abilities are impeded, and the individual is left with an unmet goal or an unsolved problem. In this manner, the pervasive impact of ER deficits could serve to exacerbate depressive symptoms over time. This pattern could lead to ER abilities being more crucial to the development or maintenance of depressive symptoms than domain-general SR or SPS.

Structural Summary. Most of the work examining the effects of SR, ER, and SPS on depression has been done in isolation, rather than inclusion of all three constructs (e.g., Hasegawa et al., 2018; Noreen et al., 2015). The present study addressed this gap in the literature through evaluation of a model that allowed for the common and distinct elements of these constructs to differentially predict depression. Results indicated the common features and distinct features of ER significantly predicted depressive symptoms. This pattern fails to provide evidence for the elaborative validity of measures of SR or SPS. These findings extend questions raised in the measurement stage regarding the adequacy of the included measures and the possible need for refinement. Regardless, given the lack of clarity as to what comprises the common factor underlying all nine measures, caution is warranted when making interpretations regarding the predictive ability of the included measures. As Campbell and Fiske (1959) emphasized, one must have confidence in a measure of a trait before using it to test relationships between traits.

Emotion Regulation Questionnaire (ERQ)

Across analyses, the ERQ stood out as a measure that did not seem to function in the same way as the other included measures. At the correlational level, the ERQ demonstrated low

within-construct relationships with other measures of ER, as well as low between-construct relationships with measures of other constructs. The low magnitude of relationship strength carried over into the CFA and SEM models, with factor loadings for the ERQ being the lowest across models. This was the case for both paths to the latent construct thought to reflect ER and the common factor thought to reflect shared variance among all nine measures. The path between the ER latent variable and the ERQ_C (cognitive reappraisal subscale) was one of the only nonsignificant paths identified across models. Interestingly, added modifications indicated the ERQ_C shared variance with the ER latent variable that is separate from the shared variance among the other measures of ER. Finally, the ERQ_S (suppression subscale) was the only measure that required its intercept be allowed to vary when investigating invariance between males and females. This suggests the ERQ_S might not have the same “zero” or start point across groups. As such, the observed mean-level difference (males reported higher use of suppression than females) could be attributed to the measure itself rather than true underlying differences (e.g., Keith, 2019).

The ERQ is described as one of the most well-validated measures of ER (e.g., Ireland et al., 2017; Preece et al., 2018) and is frequently utilized in overall investigations of ER (e.g., Joormann & Gotlib, 2010; Meyer et al., 2014). Importantly, the ERQ operationalizes the construct of ER in a different manner than the other included measures of ER, with a specific focus on strategy implementation rather than overall abilities (Gross & John, 2003). When measures are the result of differing operationalizations, interpretation of small correlations between them becomes challenging (Foster & Cone, 1995). Small correlations could represent a disconnect between theory and measurement, or it could indicate specific issues with the reliability or validity of the measures. On the other hand, all three included measures could be

appropriate assessments of ER that happen to operationalize and capture different aspects of ER's nomological net (e.g., Cronbach & Meehl, 1955). Indeed, calls for clarification in the measurement of ER have suggested that ER is likely best accounted for by multiple measures (e.g., Weems & Pina, 2010). Whether the concerns that emerged with the ERQ in the present study are the result of the ERQ being an inadequate measure of ER, a reflection of differing operationalizations, or a disconnect between theory and measurement, caution is warranted when utilizing this measure as a general indicator of ER abilities, and further clarification of its intended use is needed.

Negative Problem Orientation Questionnaire (NPOQ)

The second measure that stood out, the NPOQ, demonstrated a unique relationship with measures of ER. Across models, it was apparent that a portion of the variance underlying the NPOQ was generated by the latent construct thought to reflect ER, rather than being solely generated by its overarching construct, SPS. This either involved correlating the NPOQ error term with the error terms of ER measures or directly adding a path from the ER latent variable to the NPOQ measure. Without this added path, the factor loading between the NPOQ and the latent variable thought to reflect SPS was nonsignificant in the bifactor model. Taken together, these findings highlight a unique relationship between the NPOQ and measures of ER.

The NPOQ specifically measures NPO, an element of SPS that reflects a maladaptive set in which an individual tends to appraise problems as a threat to well-being, believe that problems are unsolvable, doubt one's own ability to solve problems, and become frustrated or upset when confronted with problems (Maydeu-Olivares & D'Zurilla, 1996). From this definition, the overlap between ER and NPO, particularly in terms of the emotional experience, is clear. In fact, similarities in content between measures of ER and NPO helped to generate the impetus for the

present study. For example, one of the NPO items on the SPSI-R is, “I feel threatened and afraid when I have an important problem to solve” (D’Zurilla et al., 2002). Another example is, “When my first efforts to solve a problem fail, I get very frustrated.” These items help to demonstrate potential similarities in the content these measures are capturing. Specifically, both measures may be assessing the individual’s emotional experience and skills needed for regulation or problem-solving in the face of negative affect.

The shared variance between NPO and ER emerged in the context of predicting depressive symptoms, such that the latent variable thought to reflect ER included a path (and thus shared variance) to the NPOQ. This latent variable was the only distinct construct that significantly predicted depressive symptoms. Of note, the shared content identified at the item level between NPO and ER additionally overlaps with the assessment of depressive symptoms (e.g., Kessler & Bromet, 2013). For instance, example items on the CES-D include, “I felt sad,” and “I felt that everything I did was an effort” (Radloff, 1977). A closer look at the overlap among NPO, ER, and depressive symptoms at the measure level and theoretical level appears to be warranted.

As an independent construct, NPO has been identified as being a particularly influential component of the effect of SPS on internalizing symptoms (Robichaud & Dugas, 2005a). It is therefore possible that the combined impact of ER and NPO depicted in the latent variable SEM model overtook the predictive ability of the other measures. Evidence from past studies suggests the interaction between high NPO and ER deficits could function to disrupt SR and SPS abilities. When problems are viewed as unsolvable and frustration is elicited, ER abilities must be employed, detracting resources from SR and SPS abilities (Muraven & Baumeister, 2000). Indeed, the interaction between deficits in SR and high NPO have been found to exacerbate

depressive symptoms (Buffie & Nangle, 2021), and high NPO has been found to hamper the SPS process (Chang, 2017). Thus, the pervasive influence of both high NPO and deficits in ER (both captured by the latent ER variable) could potentially account for the decreased impact of domain-general SR and SPS in predicting depressive symptoms.

Gender Differences

Although examining gender differences was not a primary goal of the present study, past investigations of SR, ER, SPS, and depression indicated possible variation between genders should be evaluated across relationships. As such, differences between males and females were examined at the mean level and at the measurement level. Previous studies have demonstrated that females tend to report more difficulties with ER and higher NPO compared to males, whereas males tend to employ the ER strategy of suppression more than females (Bell & D’Zurilla, 2009; Nolen-Hoeksema, 2012). Further, it is well-established that females experience depression at a rate of 2:1 as compared to males (Salk et al., 2017). In the present study, these patterns were supported at the mean level. Contrary to prediction, however, females reported lower levels of SR and overall SPS ability than males.

Results of past empirical work examining gender differences in SR and SPS have been mixed (Anderson et al., 2009; Hosseini-Kamkar & Morton, 2014; Nezu, 2004). More specifically, studies investigating gender differences in SR have not identified clear patterns of differences (Hosseini-Kamkar & Morton, 2014). In terms of related elements, a meta-analysis of 277 studies found no gender differences in EF and only a small advantage for females in the domain of effortful control (Cross et al., 2011). Regarding SPS, multiple studies have failed to find gender differences related to overall SPS abilities (e.g., Anderson et al., 2009; Haugh, 2006; McCabe et al., 1999; Reinecke et al., 2001), but some have found that females report higher NPO

and lower PPO than males (Bell & D’Zurilla, 2009; Roy et al., 2019). It is possible the even distribution of sample size between males and females in the present study allowed for gender differences to emerge. It is also possible that the previously noted impact of COVID-19 pandemic could have differentially impacted males and females (Deng et al., 2021). Future work should examine variation across the gender spectrum for a more nuanced understanding of these mean-level differences.

Despite mean-level differences, multigroup analyses at the measurement (first-order CFA) and structural levels (latent variable SEM model) demonstrated configural, metric, and partial intercept invariance between females and males. These findings suggest that the latent variables as measured appear to represent the same constructs for females and males, and that proposed models and corresponding relationship patterns do not differ between groups. This is in line with past theoretical and operational work in which no structural differences between males and females were observed (e.g., Grissom & Reyes, 2019; Nezu, 2004; Nolen-Hoeksema, 2012). Though gender continues to be an important, the results of the present study do not suggest differences in underlying relationships or structure for the constructs of interest.

Limitations

Although the present study had notable strengths, its limitations should also be considered. Possible limitations, including measure selection (e.g., self-report, shared method variance), construct selection, sample characteristics (e.g., focus on undergraduate students, representation of racial/ethnic and gender minorities, and non-clinical sample), and cross-sectional design are described in the following sections.

Measure Selection

Perhaps the most important limitation to consider is the notion of shared method variance, which was first introduced in Chapter I and discussed at length throughout the present chapter. When common methods are utilized to evaluate different constructs, it is impossible to disentangle the influence of the method from the true underlying relationship between constructs (Campbell & Fiske, 1959). This can be due to both a shared format (i.e., online administration, Likert scales) as well as overlapping concerns related to response bias (i.e., social desirability, tendency to fake good/bad/mad; Fernandez-Ballesteros, 2004; Furnham & Henderson, 1982; King & Bruner, 2000). Shared method variance can interfere with interpretations related to convergent, discriminant, and overall construct validity (Foster & Cone, 1995). Further, shared method variance can muddle relationships between predictors and outcomes (Williams & McGonagle, 2016). Potential ways to address these pervasive issues will be considered in the context of future directions.

Despite concerns related to shared method variance, a primary goal of the study was to evaluate the construct validity of measures of SR, ER, and SPS that are commonly used in practice. Self-report continues to be the most widely utilized form of assessment in psychological research (Crano et al., 2014; Turkkan, 2000) and is a particularly prominent method in investigations of SR, ER, and SPS (e.g., Duckworth & Kern, Weems & Pina, 2010). Not only do self-report measures capture different elements of the constructs than behavioral tasks, but they can also be uniquely informative regarding individual's self-perceptions of adaptive skills, deficits, and psychological experiences (Allom et al., 2016; Friedman & Banich, 2019; Keefer, 2015). Thus, although the noted concerns warrant consideration, use of self-report measures in the present study was deemed justified.

Construct Selection

Another important limitation to consider is the scope of constructs included in the present study. As noted, the common and distinct features of SR, ER, and SPS were investigated due to the previously established connections between constructs (Duckworth & Kern, 2011; Nigg, 2017), as well as their connection to depressive symptoms (Anderson et al., 2009; Joormann & Stanton, 2016; Strauman, 2017). However, other related constructs, such as intelligence, foundational EFs, self-efficacy, baseline affect, or general stress could also have been included in the proposed models and likely would have been informative. Decisions regarding the included constructs necessitated an evaluation of scope. Future investigations should include a wider range of constructs to help establish a more comprehensive picture of these relationships.

Sample

It is important to note that a non-clinical sample was utilized. Data regarding formal diagnoses of depressive disorders was not collected, and participants with any level of depressive symptoms were included in the study. In addition, co-occurring concerns were not assessed. Though undergraduate samples have historically been considered ‘healthy,’ accumulating findings have raised questions regarding the overall mental health of today’s students (Conley et al., 2014). Estimates suggest approximately one-fourth of incoming undergraduate students in the US experience some form of psychopathology (Auerbach et al., 2018). The present study found endorsement of depressive symptoms to be like past undergraduate samples, if not slightly higher ([Table 5](#)). Though not a formally clinical sample, the high rates of mental health concerns experienced by undergraduate students suggest investigations utilizing this population can provide valuable insight into clinical concerns.

Another factor to consider was that participants in the present sample identified primarily as White (89.9%); the remaining individuals identified as 3.5% Asian, 2.9% Multiple Racial Identities, 1.5% Black, 1.5% Latinx, and .3% American Indian/Native American or Alaska Native. While this is reflective of a typical undergraduate population in New England, it is limited when compared to the demographics of undergraduate populations nationwide. As of 2022, only 54.3% of college students in the US identified as White (Hanson, 2022). The sample is also limited when compared to the demographics of the general population. As of 2022, the U.S. Census Bureau estimated the racial demographics of the general population as follows: White 76.3%, Hispanic or Latinx 18.5%, Black or African American 13.4%, Asian 5.9%, Multiple Identities 2.8%, American Indian or Alaska Native 1.3%, and Native Hawaiian or Other Pacific Islander 0.2%. These differences suggest racial/ethnic minorities were not adequately represented in the present study.

Importantly, no differences across racial/ethnic groups were identified across the literature for the measures of interest. However, an individual's racial/ethnic identity could impact their experience of emerging adulthood, particularly in terms of differences in cultural values, approaches to family functioning, and the interacting element of socioeconomic status (Syed & Mitchell, 2013). Further, racial/ethnic identity differentially impacts stress and overall well-being during emerging adulthood through the effects of potential discrimination (e.g., Lee et al., 2020), health disparities (e.g., NeMoyer et al., 2020), and access to resources (e.g., Museus & Neville, 2012). These differences have implications for the study results given the detrimental impact of stress on both regulation (e.g., Park et al., 2012) and problem-solving (e.g., Creswell et al., 2013). Thus, future research is needed to examine the influence of racial/ethnic identity on the relationships examined in the present study.

A strength of the sample was the even distribution of individuals who identified as female (51.9%) and male (46.6%). This allowed for gender differences at the mean level and construct measurement level to be explored. However, gender minorities, including non-binary (1.0%), female to male transgender (.3%), not sure (.2%), and male to female transgender (0%) individuals were less well-represented. The prevalence of gender minority identification in the U.S. ranges from 100 to 500 per 100,000 individuals, thus low sample size is a common issue across research studies (Glick et al., 2018). Future investigations could consider using a targeted sampling approach to better capture the perspectives of these populations (Bonevski et al., 2014).

A final limitation to consider within this domain is that an undergraduate student sample was utilized to investigate the relationships of interest during emerging adulthood. Several developmental theorists posit the proposed characteristics associated with emerging adulthood do not generalize to those 18- to 29-year-olds who do not pursue higher education (Bynner, 2005). While it is likely there are several trajectories for emerging adulthood that differ across individuals, a significant portion of emerging adults do engage in post-secondary education (NCES, 2019). Nonetheless, it is important to emphasize that the developmental period of emerging adulthood is not synonymous with a population of undergraduate students. The present sample was comprised of mostly younger students ($M_{age} = 19.02$, $SD_{age} = 1.50$) enrolled in introductory psychology courses. Although samples of this type are typical in psychological research, this limitation should be considered when generalizing results beyond undergraduate populations (Henrich et al., 2010).

Cross-Sectional Design

It is important to consider the study results within the context of a cross-sectional design. Cross-sectional studies capture a single timepoint of processes that develop continuously over

the lifespan. As such, temporal associations between variables can be assumed but should not be conceptualized as causal (Keith, 2019). Longitudinal studies are therefore considered the gold standard in terms of assessing relationships among developmental processes (Knowland et al., 2015). The present study only assessed one set of predictive relationships that were dependent on a temporal process: the connections between SR, ER, SPS and depressive symptoms. Within the model, it was assumed the underlying skills related to the constructs of interest developed first, and that adaptive skills versus deficits in these domains would lead to depressive symptoms over time. This assumption is in line with the directionality proposed in models of the constructs (e.g., Barkley, 1997a; D’Zurilla & Nezu, 2010; Gross, 2015), as well as past investigations connecting the constructs to depressive symptoms (e.g., Anderson et al., 2009; Joormann & Stanton, 2016; Strauman, 2017).

This temporal limitation also leads to a lack of clarity regarding reciprocal relationships among variables; for example, depression is thought to negatively affect SR abilities over time (Strauman, 2017). Specifically, as depressive episodes accumulate, the individual’s approach-avoidance system is thought to be permanently altered, which impacts motivational processes and ultimately the ability to work towards goals (Strauman & Wilson, 2010). This direction of effects was unable to be evaluated in the present study given the single timepoint of data collection. Future studies should explore these relationships across at least two time points to better evaluate the temporal relationship between the constructs of interest and the onset of symptoms.

Future Directions

As noted throughout this chapter, several questions raised by the present findings warrant further investigation. Perhaps the most logical next step to better understand the shared variance

among SR, ER, and SPS would be an investigation via a multitrait-multimethod matrix approach (MTMM; Campbell & Fiske, 1959). The MTMM is a proposed framework that can help to organize evaluations of validity, namely convergent and discriminant, as they relate to construct validity (Foster & Cone, 1995). A key feature of this approach is the inclusion multiple traits and multiple methods. This allows for an evaluation of relationships specific to each trait and specific to each method, as well as relationships across traits and across methods (Campbell & Fiske, 1959). Comparison of these relationships via an MTMM helps to sharpen measurement tools and aids in the process of determining what a construct “is” and “is not” (Foster & Cone, 1995).

Though multiple traits were included, a multimethod approach was not incorporated into the present study but would serve to significantly extend the present findings. This is because convergent and divergent validity are best assessed via independent methods to remove the potential influence of shared method variance (Campbell & Fiske, 1959). Take for example the latent construct of SR: in the context of a monomethod approach, there is not enough information to determine whether shared variance among the measures is reflective of SR’s nomological net or variance related to all measures being administered in a survey format. With a multimethod approach, shared variance within the latent construct could not be due to features of the method and are more likely to reflect variation in the construct (e.g., Cronbach & Meehl, 1955).

Say, for example, one wanted to use a two-by-two MTMM approach (i.e., two methods, two traits) to further investigate the constructs of SR and ER. Potential methods that have historically been used to assess both traits are self-report measures and behavioral EF tasks (e.g., Duckworth & Kern, 2011; Weems & Pina, 2010). For SR, the SSRQ (Carey et al., 2004) could be selected as the self-report measure, and the Go/No-Go task (Newman et al., 1985) as the behavioral EF task. To assess ER, the DERS (Gratz & Roemer, 2004) could be used as a self-

report measure, and the Emotional Go/No-Go task (Murphy et al., 1999) could be used as a behavioral EF task. Evaluation of the correlation matrix generated by this two-by-two MTMM approach would generate valuable information regarding the validity of SR and ER assessment (Campbell & Fiske, 1959). Specifically, the following elements can be evaluated: (a) convergence within traits (e.g., relationship between the SSRQ and Go/No-Go task), (b) convergence within methods (e.g., relationship between the Go/No-Go and Emotional Go/No-Go tasks), (c) and a comparison of relationships across methods and traits. By including maximally different methods, this approach helps to clarify trait- versus method-specific contributions to relationships between constructs (Foster & Cone, 1995).

Interestingly, recent investigations have utilized CFA as an approach to evaluating MTMM data (e.g., Dickinson & Adelson, 2016; Montero-Marin et al., 2018). CFA models generate covariance matrices demonstrating relationships among the included variables, which aligns with the information evaluated as part of an MTMM approach (Campbell & Fiske, 1959). A major advantage of a CFA-MTMM approach is the opportunity to distinguish systematic method variance from measurement error (Kyriazos, 2018). That is, the inclusion of multiple methods (i.e., core element of MTMM approach) and the ability to estimate and separate out measurement error (i.e., core element of CFA analyses) allow for a thorough examination of the contributions of extraneous variance that may impact relationships among variables of interest. Further, CFA models are founded in testing theoretical predictions (in contrast to EFA, which is exploration-based) and thus allow for predicted relationships among measures to be directly tested (Keith, 2019). A CFA-MTMM approach would therefore be a logical and informative next step in this line of research.

As noted in the MTMM example, alternatives to self-report exist for the assessment of SR, ER, and SPS. For SR, a multimethod approach might include a battery of EF tasks, such as measures of inhibition, planning, or decision-making (e.g., Duckworth & Kern, 2011). In the case of ER, affective/emotion/mood induction techniques could be utilized to generate an emotional experience, and biological or physiological indicators could be used to capture the physical elements of emotion (e.g., Adrian et al., 2011; Britton et al., 2012). Regarding SPS, measures of both the SPS process and outcomes of problem-solving could be included (e.g., D’Zurilla & Nezu, 2010). Inclusion of these alternative methods would help to clarify convergence both within constructs and between constructs. Ultimately, this would speak to the construct validity of measures of SR, ER, and SPS and would likely lead to a deeper understanding of the substantial overlap observed in the present study.

In addition to including multiple methods, several other traits were identified that would provide valuable information if included in future studies. Constructs such as underlying EFs, self-efficacy, baseline affect, or stress have demonstrated relationships with the variables of interest and could be considered (e.g., Bandura, 1991; Barkley, 1997a; D’Zurilla & Nezu, 2010). As noted, connections between these constructs and SR, ER, and SPS have been identified in past investigations (e.g., Chang, 2017; Buruck et al., 2014; Zhang et al., 2018). Further, traits that pervasively impact psychological functioning, such as intelligence, years of education, or socio-economic status warrant inclusion (e.g., Foster & Cone, 1995). Future investigations might also consider the outcome variable of depressive symptoms as a trait to be included in the examination of convergent and discriminant validity of measures of SR, ER, and SPS given the overlap in common methods (e.g., self-report) and shared item content (e.g., emotional experience) with that particular criterion (e.g., Joorman & Stanton, 2016).

A final worthwhile focus of future studies is on the specific role of NPO across these relationships. As noted, NPO has been identified as a key element of SPS in the context of depressive symptoms (Robichaud & Dugas, 2005a). Moreover, given the evidence that NPO can interact with and even hamper regulation and problem-solving abilities, it may have a pervasive influence across constructs (e.g., Buffie & Nangle, 2021; Chang, 2017). If multiple measures of NPO were included, the distinct versus common elements of ER and NPO could be differentiated, both regarding the underlying latent structure as well as the impact of these variables on depressive symptoms. As noted, NPO shares a notable amount of theoretical and operational overlap with ER and depressive symptoms, as well as similar item-level content on assessment measures of these constructs. Thus, a more focused investigation of these relationships could be informative.

Conclusion

The present study sought to examine the relationships among three psychological constructs: SR, ER, and SPS, and their connection to depressive symptomology. These constructs arose from independent, well-established literature bases, yet they share several common features. This study was the first to empirically investigate the validity of these constructs in the context of one another. In addition, the combined influence of these constructs, including both their distinct and common elements, on depressive symptoms had not yet been assessed. A major advantage of the present study was the complexity of analyses conducted, which allowed for an error-free examination of the relationships of interest.

This study was the first to demonstrate and explore the high levels of convergence among SR, ER, and SPS as commonly measured in practice. Evaluation at the bivariate and structural levels indicated a substantial amount of shared variance among the constructs and provided a

complicated picture of construct validity. It appears that measures often used to assess these constructs are capturing more common features than investigators may be aware of, which has notable implications for the interpretation of findings. The goal of clinical research is to identify and characterize contributing factors that impact psychopathology to better inform effective prevention and intervention approaches. By empirically synthesizing these constructs and examining their combined influences on depressive symptoms, the present study took important steps in that direction. Future investigations that include a multitrait-multimethod examination of common and distinct pathways from SR, ER, and SPS to depressive symptoms would serve to further clarify these relationships.

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APPENDICES

Appendix A

Sona Recruitment Summary

You must be between the ages of 18 and 29 to participate in this study. This study will ask you to answer questions about your self-regulation, emotion regulation, problem-solving abilities, and psychological functioning. Additionally, you will be asked for demographic information and if you have experienced any distress related to the coronavirus. Your identity and responses will remain completely anonymous. Completion of the questionnaires should take approximately 90 minutes, and you will earn two Sona credits for your participation. If you have questions about participating in this project, please contact Michelle Buffie, michelle.buffie@maine.edu.

Appendix B

Informed Consent

Dear Participant,

You are invited to participate in a research project being conducted by Michelle Buffie, M.A., a psychology graduate student, and Dr. Douglas Nangle, a Professor in the Department of Psychology at the University of Maine. The purpose of this research is to learn more about how college students' ability to regulate behavior and solve problems affects psychological functioning. You must be between 18 and 29 years of age to participate in this study. Your participation will help further the understanding of the skills and processes that impact psychological functioning.

What will you be asked to do during this study?

If you decide to participate, you will be asked to take an anonymous survey. It should take you about 90 minutes to complete.

- You will be asked for demographic information about yourself (e.g., age, race, gender)
- You will be asked if you have experienced any anxiety related to COVID-19
- You will be asked to respond to items such as:
 - “I am able to accomplish goals I set for myself”
 - “When I’m upset, I acknowledge my emotions”
 - “Whenever I have a problem, I believe that it can be solved”
 - “I felt sad”

What are the Risks?

Some questions may make you feel uncomfortable or distressed. You may skip any question that you do not wish to answer and can elect to end your participation in the study at any time. If you would like to speak with a professional about your experiences, you are encouraged to contact the University of Maine Counseling Center (207-581-1392), which provides free services to UMaine students. Information about the Counseling Center, including their hours of operation, can be found at <http://umaine.edu/counseling/contact-us/>

The risks associated with completing the online questionnaires at Qualtrics are thought to be no greater than the risks encountered during routine internet access. Qualtrics has enhanced security and safety measures in place to protect the website and its users from fraud, and states that customers' information will not be used for any other purposes. You can find out more information about their security by clicking on the privacy statement found at www.qualtrics.com.

What are the Benefits?

Although there is no direct benefit to you for participating in this research, your responses will inform our understanding of behavior and well-being. This knowledge may help psychologists design more effective intervention programs for individuals experiencing psychological distress.

Is there Compensation?

You will receive two research (Sona) credits for your participation.

Confidentiality

Your answers are completely anonymous. No IP addresses will be collected. A unique ID code will be included in the survey link URL that will anonymously assign credit in Sona without the researchers ever seeing the data. Names will not be attached to the data collected and the information will only be used for research purposes. Participant responses will be downloaded to a desktop computer stored in a locked laboratory room that is only accessible to the principal investigators and research assistants. All data will be password protected. If the data are used for a research publication or conference presentation, they will be presented in a summary format only. The data will be kept indefinitely. The online data will be deleted from Qualtrics within one year of concluding the study (expected end date: 5/20/2022).

Is this Voluntary?

Your participation in this study is voluntary. You may choose to withdraw from the study at any point and skip any questions that you do not want to answer and will still receive compensation.

Questions or Concerns?

If you have any questions about this study, please contact me at michelle.buffie@maine.edu. You may also reach the faculty advisor on this study at dnangle@maine.edu. If you have any questions about your rights as a research participant, please contact the Office of Research Compliance, University of Maine, 207/581-2657 (or e-mail umric@maine.edu).

Sincerely,

Michelle Buffie, M.A.
Graduate Student in the Clinical Psychology Ph.D. Program
University of Maine

- I have read and understood the above information and I understand that clicking this box indicates my consent to participate in the project. I understand that I have the right to skip any questions that I wish and to stop my participation at any time.*

- I read and understood the above information and I do not consent to participate in this project.*

Appendix C

Demographic Questionnaire

1. Age _____

2. **What gender do you identify with?**
 - _____ Female
 - _____ Female to male transgender
 - _____ Male
 - _____ Male to female transgender
 - _____ Non-binary
 - _____ Not sure
 - _____ Other (please specify): _____

3. **What race do you identify with?**
 - _____ Multiple racial identities
 - _____ White
 - _____ Black
 - _____ Latino/a
 - _____ Asian
 - _____ American Indian/Native American
 - _____ Other (please specify): _____

Appendix D

Short Form Self-Regulation Questionnaire (SSRO)

Please answer the following questions by circling the response that best describes how you are. Remember, there are no right or wrong answers.

	Strongly Disagree	Disagree	Uncertain or Unsure	Agree	Strongly Agree
1. I usually keep track of my progress towards my goals.	1	2	3	4	5
2. I have trouble making up my mind about things.	1	2	3	4	5
3. I get easily distracted from my plans.	1	2	3	4	5
4. I don't notice the effects of my actions until it is too late.	1	2	3	4	5
5. I am able to accomplish goals I set for myself.	1	2	3	4	5
6. I put off making decisions.	1	2	3	4	5
7. It's hard for me to notice when I've "had enough" (alcohol, food, sweets).	1	2	3	4	5
8. If I wanted to change, I am confident that I could do it.	1	2	3	4	5
9. When it comes to deciding about a change, I feel overwhelmed by the choices.	1	2	3	4	5
10. I have trouble following through with things once I've made up my mind to do something.	1	2	3	4	5
11. I don't seem to learn from my mistakes.	1	2	3	4	5
12. I can stick to a plan that's working well.	1	2	3	4	5
13. I usually only have to make a mistake one time in order to learn from it.	1	2	3	4	5
14. I have personal standards, and try to live up to them.	1	2	3	4	5
15. As soon as I see a problem or challenge, I start looking for all possible solutions.	1	2	3	4	5
16. I have a hard time setting goals for myself.	1	2	3	4	5
17. I have a lot of willpower.	1	2	3	4	5
18. When I'm trying to change something, I pay a lot of attention to how I'm doing.	1	2	3	4	5
19. I have trouble making plans to help me reach my goals.	1	2	3	4	5
20. I am able to resist temptation.	1	2	3	4	5
21. I set goals for myself and keep track of my progress.	1	2	3	4	5
22. Most of the time I don't pay attention to what I'm doing.	1	2	3	4	5
23. I tend to keep doing the same thing, even when it doesn't work.	1	2	3	4	5
24. I can usually find several different possibilities when I want to change something.	1	2	3	4	5
25. Once I have a goal, I can usually plan how to reach it.	1	2	3	4	5
26. If I make a resolution to change something, I pay a lot of attention to how I'm doing.	1	2	3	4	5
27. Often I don't notice what I'm doing until someone calls it to my attention.	1	2	3	4	5
28. I usually think before I act.	1	2	3	4	5
29. I learn from my mistakes.	1	2	3	4	5
30. I know how I want to be.	1	2	3	4	5
31. I give up quickly.	1	2	3	4	5

Appendix E

Adolescent Self-Regulatory Inventory (ASRI)

Rate how true each statement is for you ranging from *Not at all true for me* to *Really true for me*. Circle the number under the rating that best applies to you.

	Not at all true for me	Not very true for me	Neither true nor untrue for me	Somewhat true for me	Really true for me
1. It's hard for me to notice when I've had enough (sweets, food, etc.)	1	2	3	4	5
2. When I'm sad, I can usually start doing something that will make me feel better.	1	2	3	4	5
3. If something isn't going according to my plans, I change my actions to try and reach my goal.	1	2	3	4	5
4. I can find ways to make myself study even when my friends want to go out.	1	2	3	4	5
5. I lose track of the time when I'm doing something fun.	1	2	3	4	5
6. When I'm bored I fidget or can't sit still.	1	2	3	4	5
7. It's hard for me to get started on big projects that require planning in advance.	1	2	3	4	5
8. I can usually act normal around everybody if I'm upset with someone.	1	2	3	4	5
9. I am good at keeping track of lots of things going on around me, even when I'm feeling stressed.	1	2	3	4	5
10. When I'm having a tough day, I stop myself from whining about it to my family or friends.	1	2	3	4	5
11. I can start a new task even if I'm already tired.	1	2	3	4	5
12. I lose control whenever I don't get my way.	1	2	3	4	5
13. Little problems detract me from my long-term plans.	1	2	3	4	5

14. I forget about whatever else I need to do when I'm doing something really fun.	1	2	3	4	5
15. If I really want something, I have to have it right away.	1	2	3	4	5
16. During a dull class, I have trouble forcing myself to start paying attention.	1	2	3	4	5
17. After I'm interrupted or distracted, I can easily continue working where I left off.	1	2	3	4	5
18. If there are other things going on around me, I find it hard to keep my attention focused on whatever I'm doing.	1	2	3	4	5
19. I never know how much more work I have to do.	1	2	3	4	5
20. When I have a serious disagreement with someone, I can talk calmly about it without losing control.	1	2	3	4	5
21. It's hard to start making plans to deal with a big project or problem, especially when I'm feeling stressed.	1	2	3	4	5
22. I can calm myself down when I'm excited or all wound up.	1	2	3	4	5
23. I can stay focused on my work even when it's dull.	1	2	3	4	5
24. I usually know when I'm going to start crying.	1	2	3	4	5
25. I can stop myself from doing things like throwing objects when I'm mad.	1	2	3	4	5
26. I work carefully when I know something will be tricky.	1	2	3	4	5
27. I am usually aware of my feelings before I let them out.	1	2	3	4	5
28. In class, I can concentrate on my work even if my friends are talking.	1	2	3	4	5
29. When I'm excited about reaching a goal (e.g., getting my driver's license, going to college), it's easy to start working toward it.	1	2	3	4	5
30. I can find a way to stick with my plans and goals, even when it's tough.	1	2	3	4	5
31. When I have a big project, I can keep working on it.	1	2	3	4	5
32. I can usually tell when I'm getting tired or frustrated.	1	2	3	4	5
33. I get carried away emotionally when I get excited about something.	1	2	3	4	5

34. I have trouble getting excited about something that's really special when I'm tired.	1	2	3	4	5
35. It's hard for me to keep focused on something I find unpleasant or upsetting.	1	2	3	4	5
36. I can resist doing something when I know I shouldn't do it.	1	2	3	4	5

Appendix F

Brief Self-Control Survey (BSCS)

For each of the following statements please indicate how much each of the following statements reflects how you typically are.

	Not at all (1)	(2)	(3)	(4)	Very much (5)
1. I am good at resisting temptation.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. I have a hard time breaking bad habits.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. I am lazy.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. I say inappropriate things.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. I do certain things that are bad for me, if they are fun.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. I refuse things that are bad for me.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. I wish I had more self-discipline.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. People would say that I have iron self-discipline.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Pleasure and fun sometimes keep me from getting work done.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. I have trouble concentrating.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. I am able to work effectively toward long-term goals.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Sometimes I can't stop myself from doing something, even if I know it is wrong.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. I often act without thinking through all the alternatives.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Appendix G

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.

Appendix H

Perth Emotion Regulation Competency Inventory (PERCI)

This questionnaire asks about how you manage and respond to your emotions. Please score the following statements according to how much you agree or disagree that the statement is true of you. Circle one answer for each statement. The first half of the questionnaire asks about *bad* or *unpleasant* emotions, the means the emotions like sadness, anger, or fear. The second half asks about *good* or *pleasant* emotions, this means emotions like happiness, amusement, or excitement.

	Strongly disagree	---	---	Neither agree nor disagree	---	---	Strongly agree							
1	When I'm feeling <i>bad</i> (feeling an unpleasant emotion), I don't know what to do to feel better.							1	2	3	4	5	6	7
2	When I'm feeling bad, those feelings stop me from getting work done.							1	2	3	4	5	6	7
3	When I'm feeling bad, I do stupid things.							1	2	3	4	5	6	7
4	When I'm feeling bad, I believe I need to get rid of those feelings at all costs.							1	2	3	4	5	6	7
5	When I'm feeling bad, I'm powerless to change how I'm feeling.							1	2	3	4	5	6	7
6	When I'm feeling bad, I can't complete tasks that I'm meant to be doing.							1	2	3	4	5	6	7
7	When I'm feeling bad, my behavior becomes out of control.							1	2	3	4	5	6	7
8	When I'm feeling bad, I can't allow those feelings to be there.							1	2	3	4	5	6	7
9	When I'm feeling bad, I don't have many strategies (e.g., activities or techniques) to help get rid of that feeling.							1	2	3	4	5	6	7
10	When I'm feeling bad, I can't get motivated to do important things (work, chores, school etc.).							1	2	3	4	5	6	7
11	When I'm feeling bad, I have trouble controlling my actions.							1	2	3	4	5	6	7
12	When I'm feeling bad, I must try to totally eliminate those feelings.							1	2	3	4	5	6	7
13	When I'm feeling bad, I have no control over the strength and duration of that feeling.							1	2	3	4	5	6	7
14	When I'm feeling bad, I have trouble getting anything done.							1	2	3	4	5	6	7
15	When I'm feeling bad, I have strong urges to do risky things.							1	2	3	4	5	6	7
16	When I'm feeling bad, I believe those feelings are unacceptable.							1	2	3	4	5	6	7

		Strongly disagree	---	---	Neither agree nor disagree	---	---	Strongly agree
17	When I'm feeling <u>good</u> (feeling a pleasant emotion), I do stupid things.	1	2	3	4	5	6	7
18	When I'm feeling good, I don't have many strategies (e.g., activities or techniques) to increase the strength of that feeling.	1	2	3	4	5	6	7
19	When I'm feeling good, I have trouble completing tasks that I'm meant to be doing.	1	2	3	4	5	6	7
20	When I'm feeling good, part of me hates those feelings.	1	2	3	4	5	6	7
21	When I'm feeling good, my behavior becomes out of control.	1	2	3	4	5	6	7
22	I don't know what to do to create pleasant feelings in myself.	1	2	3	4	5	6	7
23	When I'm feeling good, I end up neglecting my responsibilities (work, chores, school etc.).	1	2	3	4	5	6	7
24	When I'm feeling good, I can't allow those feelings to be there.	1	2	3	4	5	6	7
25	When I'm feeling good, I have strong urges to do risky things.	1	2	3	4	5	6	7
26	When I'm feeling good, I have no control over whether that feeling stays or goes.	1	2	3	4	5	6	7
27	When I'm feeling good, I have difficulty staying focused during important stuff (at work or school, etc.).	1	2	3	4	5	6	7
28	When I'm feeling good, I believe those feelings are unacceptable.	1	2	3	4	5	6	7
29	When I'm feeling good, I can't keep control over myself (in terms of my behaviors).	1	2	3	4	5	6	7
30	When I'm feeling good, I don't have any useful ways to help myself keep feeling that way.	1	2	3	4	5	6	7
31	When I'm feeling good, I have trouble getting anything done.	1	2	3	4	5	6	7
32	When I'm feeling good, I must try to eliminate those feelings.	1	2	3	4	5	6	7

Appendix I

Emotion Regulation Questionnaire (ERQ)

We would like to ask you some questions about your emotional life, in particular, how you control (that is, regulate and manage) your emotions. The questions below involve two distinct aspects of your emotional life. One is your emotional experience, or what you feel like inside. The other is your emotional expression, or how you show your emotions in the way you talk, gesture, or behave. Although some of the following questions may seem similar to one another, they differ in important ways. For each item, please answer using the following scale:

1	2	3	4	5	6	7
strongly disagree			neutral			strongly agree

1. ____ When I want to feel more *positive* emotion (such as joy or amusement), I *change what I'm thinking about*.
2. ____ I keep my emotions to myself.
3. ____ When I want to feel less *negative* emotion (such as sadness or anger), I *change what I'm thinking about*.
4. ____ When I am feeling *positive* emotions, I am careful not to express them.
5. ____ When I'm faced with a stressful situation, I make myself *think about it* in a way that helps me stay calm.
6. ____ I control my emotions by *not expressing them*.
7. ____ When I want to feel more *positive* emotion, I *change the way I'm thinking about the situation*.
8. ____ I control my emotions by *changing the way I think about the situation I'm in*.
9. ____ When I am feeling *negative* emotions, I make sure not to express them.
10. ____ When I want to feel less *negative* emotion, I *change the way I'm thinking about the situation*.

Appendix J

Social Problem-Solving Inventory-Revised (SPSI-R)

Instructions: Below are some ways that you might think, feel, and act when faced with **PROBLEMS** in everyday living. We are **not** talking about the common hassles and pressures that you handle successfully every day. In this questionnaire, a **problem** is something important in your life that bothers you a lot but you don't immediately know how to make it better or stop it from bothering you so much. The problem could be something about yourself (such as your thoughts, feelings, behavior, appearance, or health), your relationships with other people (such as your family, friends, teachers, or boss), or your environment and the things that you own (such as your house, car, property, money). Please read each statement carefully and choose one of the numbers below which best shows how much the statement is true of you. See yourself as you **usually** think, feel, and act when you are faced with important problems in your life **these days**. Put the number that you choose on the line before the statement.

- 0 = Not at all true of me
- 1 = Slightly true of me
- 2 = Moderately true of me
- 3 = Very true of me
- 4 = Extremely true of me

- ___ 1. I spend too much time worrying about my problems instead of trying to solve them.
- ___ 2. I feel threatened and afraid when I have an important problem to solve.
- ___ 3. When making decisions, I do **not** evaluate all my options carefully enough.
- ___ 4. When I have a decision to make, I fail to consider the effects that each option is likely to have on the well-being of other people.
- ___ 5. When I am trying to solve a problem, I often think of different solutions and then try to combine some of them to make a better solution.
- ___ 6. I feel nervous and unsure of myself when I have an important decision to make.
- ___ 7. When my first efforts to solve a problem fail, I know if I persist and do not give up too easily, I will be able to eventually find a good solution.
- ___ 8. When I am attempting to solve a problem, I act on the first idea that occurs to me.
- ___ 9. Whenever I have a problem, I believe that it can be solved.
- ___ 10. I wait to see if a problem will resolve itself first, before trying to solve it myself.

- ___ 11. When I have a problem to solve, one of the things I do is analyze the situation and try to identify what obstacles are keeping me from getting what I want.
- ___ 12. When my first efforts to solve a problem fail, I get very frustrated.
- ___ 13. When I am faced with a difficult problem, I doubt that I will be able to solve it on my own no matter how hard I try.
- ___ 14. When a problem occurs in my life, I put off trying to solve it for as long as possible.
- ___ 15. After carrying out a solution to a problem, I do **not** take the time to evaluate all of the results carefully.
- ___ 16. I go out of my way to avoid having to deal with problems in my life.
- ___ 17. Difficult problems make me very upset.
- ___ 18. When I have a decision to make, I try to predict the positive and negative consequences of each option.
- ___ 19. When problems occur in my life, I like to deal with them as soon as possible.
- ___ 20. When I am attempting to solve a problem, I try to be creative and think of new or original solutions.
- ___ 21. When I am trying to solve a problem, I go with the first good idea that comes to mind.
- ___ 22. When I try to think of different possible solutions to a problem, I **cannot** come up with many ideas.
- ___ 23. I prefer to avoid thinking about the problems in my life instead of trying to solve them.
- ___ 24. When making decisions, I consider both the immediate consequences and the long-term consequences of each option.
- ___ 25. After carrying out my solution to a problem, I analyze what went right and what went wrong.
- ___ 26. After carrying out my solution to a problem, I examine my feelings and evaluate how much they have changed for the better.
- ___ 27. Before carrying out my solution to a problem, I practice the solution in order to increase my chances of success.

___ 28. When I am faced with a difficult problem, I believe I will be able to solve it on my own if I try hard enough.

___ 29. When I have a problem to solve, one of the first things I do is get as many facts about the problem as possible.

___ 30. I put off solving problems until it is too late to do anything about them.

___ 31. I spend more time avoiding my problems than solving them.

___ 32. When I am trying to solve a problem, I get so upset that I cannot think clearly.

___ 33. Before I try to solve a problem, I set a specific goal so that I know exactly what I want to accomplish.

___ 34. When I have a decision to make, I do **not** take the time to consider the pros and cons of each option.

___ 35. When the outcome of my solution to a problem is not satisfactory, I try to find out what went wrong and then I try again.

___ 36. I hate having to solve the problems that occur in my life.

___ 37. After carrying out a solution to a problem, I try to evaluate as carefully as possible how much the situation has changed for the better.

___ 38. When I have a problem, I try to see it as a challenge, or opportunity to benefit in some positive way from having the problem.

___ 39. When I am trying to solve a problem, I think of as many options as possible until I cannot come up with any more ideas.

___ 40. When I have a decision to make, I weigh the consequences of each option and compare them against each other.

___ 41. I become depressed and immobilized when I have an important problem to solve.

___ 42. When I am faced with a difficult problem, I go to someone else for help in solving it.

___ 43. When I have a decision to make, I consider the effects that each option is likely to have on my personal feelings.

___ 44. When I have a problem to solve, I examine what factors or circumstances in my environment might be contributing to the problem.

___ 45. When making decisions, I go with my "gut feeling" without thinking too much about the consequences of each option.

___ 46. When making decisions, I use a systematic method for judging and comparing alternatives.

___ 47. When I am trying to solve a problem, I keep in mind what my goal is at all times.

___ 48. When I am attempting to solve a problem, I approach it from as many different angles as possible.

___ 49. When I am having trouble understanding a problem, I try to get more specific and concrete information about the problem to help clarify it.

___ 50. When my first efforts to solve a problem fail, I get discouraged and depressed.

___ 51. When a solution that I have carried out does not solve my problem satisfactorily, I do **not** take the time to examine carefully why it did not work.

___ 52. I am too impulsive when it comes to making decisions.

Appendix K

Problem Solving Inventory (PSI)

Directions: People respond to personal problems in different ways. The statements on this inventory deal with how people react to personal difficulties and problems in their day-to-day life. The term “problems” refers to personal problems that everyone experiences at times, such as depression, inability to get along with friends, choosing a vocation, or deciding whether to get a divorce. Please respond to the items as honestly as possible so as to most accurately portray how you handle such personal problems. Your responses should reflect what you actually do to solve problems, not how you think you should solve them. When you read an item, ask yourself: Do I ever behave this way? Please answer every item.

Read each statement and indicate the extent to which you agree or disagree with that statement, using the scale provided. Mark your responses by circling the number to the right of each statement.

1. Strongly Agree
2. Moderately Agree
3. Slightly Agree
4. Slightly Disagree
5. Moderately Disagree
6. Strongly Disagree

___ 1. When a solution to a problem has failed, I do not examine why it didn't work.

___ 2. When I am confronted with a complex problem, I don't take the time to develop a strategy for collecting information that will help define the nature of the problem.

___ 3. When my first efforts to solve a problem fail, I become uneasy about my ability to handle the situation.

___ 4. After I solve a problem, I do not analyze what went right and what went wrong.

___ 5. I am usually able to think of creative and effective alternatives to my problems.

___ 6. After following a course of action to solve a problem, I compare the actual outcome with the one I had anticipated.

___ 7. When I have a problem, I think of as many possible ways to handle it as I can until I can't come up with any more ideas.

___ 8. When confronted with a problem, I consistently examine my feelings to find out what is going on in a problem situation.

- ___ 9. When confused about a problem, I don't clarify vague ideas or feeling by thinking of them in concrete terms.
- ___ 10. I have the ability to solve most problems even though initially no solution is immediately apparent.
- ___ 11. Many of the problems I face are too complex for me to solve
- ___ 12. When solving a problem, I make decisions that I am happy with later.
- ___ 13. When confronted with a problem, I tend to do the first thing that I can think of to solve it.
- ___ 14. Sometimes I do not stop and take time to deal with my problems, but just kind of muddle ahead.
- ___ 15. When considering solutions to a problem, I do not take the time to assess the potential success of each alternative.
- ___ 16. When confronted with a problem, I stop and think about it before deciding on a next step.
- ___ 17. I generally act on the first ideal that comes to mind in solving a problem.
- ___ 18. When making a decision, I compare alternatives and weigh the consequences of one against the other.
- ___ 19. When I make plans to solve a problem, I am almost certain that I can make them work.
- ___ 20. I try to predict the result of a particular course of action.
- ___ 21. When I try to think of possible solutions to a problem, I do not come up with very many alternatives.
- ___ 22. When trying to solve a problem, one strategy I often use is to think of past problems that have been similar.
- ___ 23. Given enough time and effort, I believe I can solve most problems that confront me.
- ___ 24. When faced with a novel situation, I have confidence that I can handle problems that may arise.
- ___ 25. Even though I work on a problem, sometimes I feel like I'm groping or wandering and not getting down to the real issue.

- ___ 26. I make snap judgments and later regret them.
- ___ 27. I trust my ability to solve new and difficult problems.
- ___ 28. I use a systematic method to compare alternatives and make decisions.
- ___ 29. When thinking of ways to handle a problem, I seldom combine ideas from various alternatives to arrive at a workable solution.
- ___ 30. When faced with a problem, I seldom assess the external forces that may be contributing to the problem.
- ___ 31. When confronted with a problem, I usually first survey the situation to determine the relevant information.
- ___ 32. There are times when I become so emotionally charged that I can no longer see the alternatives for solving a particular problem.
- ___ 33. After making a decision, the actual outcome is usually similar to what I had anticipated.
- ___ 34. When confronted with a problem, I am unsure of whether I can handle the situation.
- ___ 35. When I become aware of a problem, one of the first things I do is try to find out exactly what the problem is.

Appendix L

Negative Problem Orientation Questionnaire (NPOQ)

People react in different ways when faced with problems in their daily lives (e.g., health problems, arguments, lack of time, etc.). Please use the scale below to indicate to what extent each of the following items corresponds to the way you react or think when confronted with a problem. Please circle the number that best corresponds to you for each item.

	Not at all true of me	Slightly true of me	Moderately true of me	Very true of me	Extremely true of me
1. I see problems as a threat to my well-being.	1.....	2.....	3.....	4.....	5.....
2. I often doubt my capacity to solve problems.	1.....	2.....	3.....	4.....	5.....
3. Often before even trying to find a solution, I tell myself that it is difficult to solve problems.	1.....	2.....	3.....	4.....	5.....
4. My problems often seem insurmountable.	1.....	2.....	3.....	4.....	5.....
5. When I attempt to solve a problem, I often question my abilities.	1.....	2.....	3.....	4.....	5.....
6. I often have the impression that my problems cannot be solved.	1.....	2.....	3.....	4.....	5.....
7. Even if I manage to find some solutions to my problems, I doubt that they will be easily resolved.	1.....	2.....	3.....	4.....	5.....
8. I have a tendency to see problems as a danger.	1.....	2.....	3.....	4.....	5.....
9. My first reaction when faced with a problem is to question my abilities.	1.....	2.....	3.....	4.....	5.....
10. I often see my problems as bigger than they really are.	1.....	2.....	3.....	4.....	5.....

Not at all true of me Slightly true of me Moderately true of me Very true of me Extremely true of me

11. Even if I have looked at a problem from all possible angles, I still wonder if the solution I decided on will be effective.1.....2.....3.....4.....5.....

12. I consider problems to be obstacles that interfere with my functioning.1.....2.....3.....4.....5.....

Appendix M

Center for Epidemiological Studies Depression Scale (CES-D)

Below is a list of ways you might have felt or behaved. Please circle the number that indicates how often you have felt this way during the past week.

0	1	2	3
Rarely or none of the time (less than 1 day)	Some or a little of the time (1-2 days)	Occasionally or a moderate amount of time (3-4 days)	Most or all of the time (5-7 days)

1. I was bothered by things that didn't usually bother me.
2. I did not feel like eating; my appetite was poor.
3. I felt that I could not shake off the blues even with help from my family and friends.
4. I felt I was just as good as other people.
5. I had trouble keeping my mind on what I was doing.
6. I felt depressed.
7. I felt that everything I did was an effort.
8. I felt hopeful about the future.
9. I thought my life had been a failure.
10. I felt fearful.
11. My sleep was restless.
12. I was happy.
13. I talked less than usual.
14. I felt lonely.
15. People were unfriendly.
16. I enjoyed life.
17. I had crying spells.
18. I felt sad.
19. I felt that people dislike me.
20. I could not get "going."

Appendix N

Coronavirus Anxiety Scale (CAS)

CAS							
			<i>Not at all</i>	<i>Rare, less than a day or two</i>	<i>Several days</i>	<i>More than 7 days</i>	<i>Nearly every day over the last 2 weeks</i>
	How often have you experienced the following activities over <u>the last 2 weeks</u> ?						
1.	I felt dizzy, lightheaded, or faint, when I read or listened to news about the coronavirus.		0	1	2	3	4
2.	I had trouble falling or staying asleep because I was thinking about the coronavirus.		0	1	2	3	4
3.	I felt paralyzed or frozen when I thought about or was exposed to information about the coronavirus.		0	1	2	3	4
4.	I lost interest in eating when I thought about or was exposed to information about the coronavirus.		0	1	2	3	4
5.	I felt nauseous or had stomach problems when I thought about or was exposed to information about the coronavirus.		0	1	2	3	4
	Column Totals		_____ +	_____ +	_____ +	_____ +	_____ +
					Total Score _____		

Appendix O

Resources

Thank you for participating in this research study. If you would like to speak with a professional about your experiences, you are encouraged to contact the University of Maine Counseling Center (207-581-1392), which provides free services to UMaine students. Information about the Counseling Center, including their hours of operation, can be found at <http://umaine.edu/counseling/contact-us/>. A list of additional resources is provided below.

Campus Resources

The Counseling Center (Free to UMaine students only)	5721 Cutler Health Center	207-581-1392
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Psychological Services Center (Sliding fee scale)	330 Corbett Hall	207-581-2034
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Community Resources

Community Health & Counseling Services	42 Cedar Street Bangor, ME 04401	207-947-0366
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Penobscot Community Health Care	Locations in Old Town, Bangor, and Brewer	207-404-8000
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Acadia Hospital	268 Stillwater Ave Bangor, ME 04402	207-973-6100
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Maine Mental Health Services Locator: <http://www.mymainetherapist.com/>

Contact your Primary Care Provider (PCP)

Hotline and Crisis Resources

Local:	Community Health and Counseling Services Crisis Service	1-888-568-1112
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State:	Maine Statewide Crisis Hotline (24-hour Hotline)	1-888-568-1112
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National:	National Suicide Prevention Lifeline (24-hour Hotline)	1-800-273-8255
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(Note: Any fees charged for clinical services are your responsibility).

BIOGRAPHY OF THE AUTHOR

Michelle (Erhardt) Buffie was born in Willmar, Minnesota on August 16th, 1991. She was raised in Benson, Minnesota and graduated from Benson High School in 2009. She attended Augustana College in Sioux Falls, South Dakota and graduated in 2013 with a bachelor's degree in Biology and Psychology. After working for two years in Minneapolis, Minnesota as an applied behavior analysis (ABA) therapist for children with Autism Spectrum Disorder, Michelle moved to Colorado Springs, Colorado where she earned a master's degree in Clinical Psychology. She entered the University of Maine's Clinical Psychology doctoral program in the fall of 2017. She completed her pre-doctoral clinical internship in developmental pediatric psychology at Oregon Health & Science University in Portland, Oregon. After receiving her degree, Michelle will complete a post-doctoral fellowship at Boston Children's Hospital specializing in developmental pediatric assessment. Michelle is a candidate for the Doctor of Philosophy degree in Psychology from the University of Maine in August 2022.