PREDICTING COLLEGE STUDENTS' DIFFERENTIATION OF SELF WITH DIMENSIONS OF EXECUTIVE FUNCTIONING SKILLS

By

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ABSTRACT

There is a shortage of research that investigates how, and to what extent, individuals' capacity for emotional and intellectual functioning, as well as autonomy within familial and intimate relationships (i.e., differentiation of self) is predicted by the core neurocognitive executive functioning dimensions of behavior regulation (i.e., inhibition) and metacognition (i.e., working memory). To address this, participants (*N* =184) were administered a differentiation of self measure, the *Differentiation of Self Inventory- Revised (DSI-R;* Skowron & Friedlander, 1998; Skowron & Schmitt, 2003) and an executive functioning measure, the *Behavior Rating Inventory of Executive Function Adult Version* (BRIEF-A; Roth, Isquith, & Gioia, 2005). In terms of differentiation of self (DoS) predicting dimensions of executive functioning, results indicated that global EF successfully predicted overall DoS. Additionally, when comparing how two core EF dimensions predicted DoS, EF behavior regulatory skills were a better predictor in comparison to EF meta-cognitive skills.

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CHAPTER I: INTRODUCTION

It is inherent in social relationships that there will be interpersonal conflict that may elicit intense emotions such as anger, fear, frustration, and disappointment, among others (Pronk, Karremans, Overbeek, Vermulst, & Wigboldus, 2010). In dealing with such "hot" emotions, more deliberate cognitive processes related to self-control are needed to manage emotions and behavior towards building and maintaining healthy relationships and intimacy (Goel & Vartanian, 2011; Gottman & Levenson, 2000). The quality of these interpersonal relationships, especially the complex inner workings of our family systems, profoundly affects our expectations of trust, reciprocity, and relationships and sharing goals throughout the lifespan (Lloyd, Wright, Suchet-Pearson, Burarrwanga, & Country, 2012). Multiple studies have documented that positive social relationships are significantly linked to a number of health and wellness variables related to psychological health (Jaremka et al., 2013; Umberson & Montez, 2010), physical health (Adam, Hawkley, Kudielka, & Cacioppo, 2006; Cacioppo et. al, 2002; Hawkley, Thisted, Masi, & Cacioppo, 2010), and even life expectancy (Holt-Lunstad, Smith, & Layton, 2010; Penninx et. al, 1997).

The field of psychology has extensively investigated the capacity for establishing and maintaining healthy relationships. Multiple studies have documented important variables that contribute to the development of nurturing relationships, such as, secure early parent-child attachment (McElwain, Booth-LaForce, Lansford, Wu, & Dyer, 2008), positive communicative abilities (Enns et al., 2016), de-escalation of conflict (Gottman,

Coan, Carrere, & Swanson, 1998), positive relationship expectations (Lemay & Venaglia, 2016), and empathy (Coutinho, Silva, & Decety, 2014) among others. Likewise, literature has documented various factors that impede the development of healthy relationships such as poor regulation of negative affect (Gottman et al., 1998), history of trauma (Zurbriggen, Gobin, & Kaehler, 2012), childhood maltreatment (Flynn, Cicchetti, & Rogosch, 2014), insecure parent-child attachment (Seibert & Kerns, 2015), and negative perceptions of relationship quality and conflict (Lemay, Lin, & Muir, 2015). The field of psychology, specifically the branch of family systems, has also identified differentiation of self, or the capacity to separate thoughts and feelings, as an important construct that relates to positive and negative aspects of building and maintaining interpersonal relationships. This construct, the first of two major constructs, is described in this chapter.

More recently the field of neuropsychology has begun to investigate the capacity for establishing and maintaining healthy relationships in terms of neurocognitive processes (e.g. Meyer, Wood, & Stanley, 2013; Swain et al., 2014). Neurological studies have identified a number of factors, such as emotional self-regulation (Samuelson, Krueger, & Wilson, 2012), social cognition (Campbell, McCabe, Melville, Strutt, & Schall, 2015), and theory of mind (Peterson, Slaughter, Moore, & Wellman, 2016; Yeh, 2013) as contributing to the quality of interpersonal relationships. Of particular interest in the current study are logical aspects of cognitive and behavioral control. These general abilities that are used to control and execute goal-oriented behavior are broadly termed executive functioning (EF) and comprise the second major construct described in this chapter. Previous research has documented that EF skills indeed implicate social

relationships (Alduncin, Huffman, Feldman, & Loe, 2014;Yüksel & Sazcı, 2015). However more work is needed to determine how overall EF skills and cognitive and behavioral subcomponents of EF predict individuals' differentiation of self.

Differentiation of Self

The first major construct in the current study is differentiation of self (DoS). This construct refers to an individual's capacity for self-regulation and autonomy within familial and intimate relationships (Bowen, 1978; Kerr & Bowen, 1988; Krycak, Murdock, & Marszalek, 2012; Shapiro, 2010). It is the core component of Murray Bowen's family systems theory and provides a comprehensive, transgenerational model to explain the complex patterns of relationships that emerge among family members (Brown, 1999; Kerr, 1988). Kerr (1988) described DoS as two counteracted and innate human instincts: the push to become an emotionally separate person, capable of thinking, feeling, and acting for themselves and conversely, the instinct for togetherness, which "keeps the members of a family emotionally connected and operating in reaction to one another" (p.5).

Skowron and Friedlander (1998) defined DoS as the extent to which an individual is able to balance two key characteristics, namely, (a) emotional and intellectual functioning (i.e., intrapsychic dimensions) and (b) intimacy and autonomy in relationships (i.e., interpersonal dimensions). First, emotional and intellectual functioning refer to a person's intrapsychic capacity to discriminate between their thoughts and feelings. This capacity allows one to self-soothe stress and anxiety, withstand becoming emotionally reactive when faced with the emotionality of others, and provides the

flexibility to choose to utilize calm rationality as needed. Second, intimacy and autonomy in relationships refer to an interpersonal dimension that balances between independence and emotional connectedness in relationships. This dimension is assumed to allow for greater emotional intimacy without fear of abandonment or emotional fusion (Skowron & Dendy, 2004, Skowron & Friedlander, 1998). Together, these two inter- and intrapersonal dimensions make up DoS and are thought of as critical in the development of emotional maturity and independence within emotionally connected relationships (Charles, 2001).

Multigenerational/development

Bowen's family systems theory considers the individual and the family as one emotional unit (Day, 1988). As such, DoS is understood in the context of a person's family of origin. It is this family of origin where patterned responses to ideas, events, and people are passed from one generation to the next through the parent to child projection process (Brown, 1999; Day, 1988). According to this theory, the manner that parents relate to their offspring creates small differences in the levels of differentiation between parent and child. Over time, and across generations, differentiation is thought to influence pronounced differences in DoS between multigenerational members of a family (Roohi, 2008). Furthermore, Drake (2011) theorized that differentiation of self is a dynamic construct that changes continuously throughout the lifespan, especially during times of notable transition such as the beginning of new relationships, traumatic experiences, and other noteworthy life changes. However, many researchers consider

DoS to be mostly completed by early adulthood, when an individual leaves their family of origin (Kerr & Bowen, 1988).

DoS is hypothesized to reflect an individual's level of psycho- and physiological functioning on a continuum of emotion and behavior. To capture this continuum, Bowen (1978) proposed a hypothetical DoS scale, ranging from 0 to 100. On the high end, Bowen postulates that one may have a greater ability to regulate emotion, create emotional closeness, and cope under stress (Kerr & Bowen, 1988). In other words, high DoS effectively promotes the skill needed to respond to anxiety autonomously by regulating emotion with intellect while remaining emotionally intact. On the low end of DoS, individuals may experience increased chronic anxiety, selfishness, aggression, opposition, impulsivity, and decreased adaptability while under stress (Kerr & Bowen, 1988). Bowen (1978) postulated that a person with low DoS may be "highly fused," a term used to describe being unable to separate one's own thoughts and feelings from others and responds with emotionality and automaticity to stress. Essentially, those with low DoS, while not always in distress, are more likely to experience negative symptoms as a result of exposure to stress (Drake, 2011).

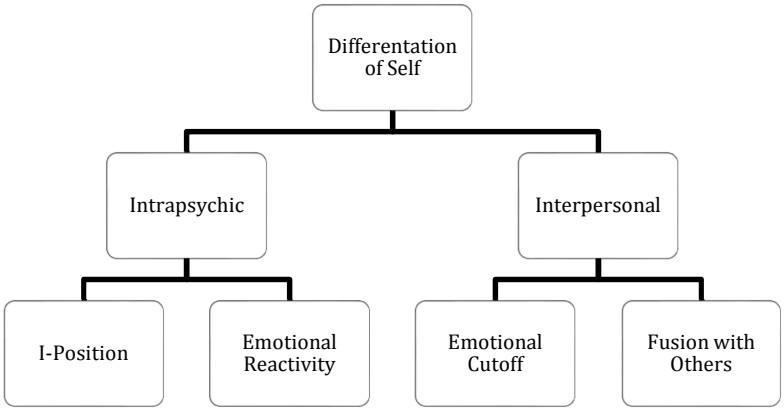
Differentiation of self varies in its presentation, with some who are able to appear emotionally stable despite low DoS. This is because, as Kerr and Bowen (1988) explained, DoS looks specifically at someone's level of adaptability to stress. Under limited stress, individuals with varying levels of DoS may exhibit similar physical, emotional, and social symptoms. However, under increased levels of stress and anxiety, individual differences in levels of DoS should become more apparent. Kerr and Bowen (1988) believed that this was because a person could better manage his or her own

internal anxiety the lower the level of external anxiety. As a result, the exact level of DoS at the time of measurement may be difficult to determine depending on the current level of external anxiety (Kerr & Bowen, 1988).

Theoretical Model of Differentiation of Self

Psychologists have attempted to develop a theoretical model of DoS by operationalizing subcomponents of the construct (e.g., Hovestadt, Anderson, Piercy, Cochran, & Fine, 1985; McCollum, 1991). For example, one of the leading models of DoS is based on Bowen's original continuum of behavioral and emotional functioning (Shapiro, 2010; Skowron & Friedlander, 1998). It is comprised of two components, namely (a) intrapsychic and (b) interpersonal (see Figure 1 below).

*Figure 1. DoS Hierarchy (*Skowron and Friedlander, 1998)



As described by Skowron and Friedlander (1998), the first DoS component is the intrapsychic dimension. As described previously, this refers to an individual's ability to separate thoughts and feelings. This dimension is composed of two subcomponents,

specifically, I-position and emotional reactivity. First, I-position refers to people's ability to delineate and express their individual perspective to others, particularly during times of high anxiety and social pressure. Individuals who have a strong I- position are able to stand by their personal convictions even in the presence of strong opposition or pressure from others. This strong I-position is thought to correspond with flexible boundaries that allow individuals to experience physical and emotional intimacy without fear of conflation. The second subcomponent of the intrapsychic dimension/subcomponent is termed emotional reactivity. This subcomponent relates to an individual's ability to regulate affect in response to another's emotionality. Those with high emotional reactivity are more likely to experience emotional flooding, emotional lability, or hypersensitivity to the emotions of others (Shapiro, 2010). Their emotions and intellect are fused, forcing them to make emotional decisions instead of utilizing calm, logical reasoning.

According to Skowron and Friedlander (1998), the second DoS component is the interpersonal dimension, which refers to how an individual balances autonomy and intimacy in relationships. This dimension is composed of two subcomponents, which are emotional cutoff and fusion with others. First, emotional cutoff indicates the amount an individual reactively distances from others in order to quell anxiety. People with low emotional cutoff may feel excessively vulnerable in their relationships and distance themselves while simultaneously remaining aloof. They may find emotional intimacy threatening, present an independent front, and deny the importance of family. Second, fusion with others is described as the level of emotional closeness in a person's interpersonal relationships. Highly fused individuals find emotional separateness

overwhelming. Those with high levels of fusion are overly emotionally involved with others, in particular in issues of triangulation and over identification with parents. They are also unable to move from the positions they occupy from within their families of origin and place the utmost of importance on the acceptance and approval of others. In essence, both emotional cutoff and fusion with others reveal themselves during times of overwhelming emotionality within relationships and are thought to be determinate factors in the degree of autonomy and intimacy someone has within relationships.

DoS Research

A number of empirical studies have asserted that increased DoS is associated with a variety of positive or healthy outcomes (Bohlander, 1996; Harrison, 2003; Keller, 2006; Lyons, 1999; Sandage, Crabtree, & Schweer, 2014). For example, increased DoS has been linked to an increased ability to navigate complex emotional relationships (Murdock & Gore, 2004), greater levels of marital satisfaction (Gubbins, Perosa, & Bartle-Haring, 2010), greater ability to cope with workplace stress (Beebe & Frisch, 2009), and better ability to regulate negative emotions (Jankowski & Sandage, 2012). Those with higher levels of DoS also appear to experience less anxiety, lower levels of perceived stress, and increased personal resilience (Krycak, Murdock, & Marszalek, 2012;Tuason & Friedlander, 2000; Skowron, Wester, & Azen, 2004). In general, these and other studies suggest that increased DoS is linked to a variety of positive outcomes that facilitate emotion regulation, balanced relationships, personal exploration and fulfillment.

Empirical studies have also demonstrated that decreased DoS is associated with a number of problematic outcomes related to relationships and mental and physical health.

Regarding, relationships, researchers have documented that low DoS is linked with less emotional control and lack of security within relationships (Lambert & Friedlander, 2008) and an increased likelihood for violence in intimate relationships (Walker, 2005). Research has also indicated that lower levels of DoS are linked to chronic stress and anxiety (Bray & Harvey, 1992; Knauth, Skowron, & Escobar, 2006), depression and low self-esteem (Chung & Gale, 2006), and increased psychiatric dysfunction in clinical populations (Maser, 2011). Pertaining to physical health, researchers have linked lower levels of DoS and an increase in health risks for adolescent mothers, as measured by the School Health Risk Inventory (McFarland, 1997). Similarly, Lal (2006) found that patient levels of DoS were predictive of symptom level for those with chronic lung disease. Broadly speaking, research suggests that low DoS is related to increases in difficulty in relationships, stress, anxiety, and poor health outcomes.

Neuropsychological Skills Associated with Differentiation of Self

Recently, the field of psychology has focused on the neurocognitive processes that promote and prevent the capacity to establish and maintain healthy relationships (e.g. Meyer et al., 2013; Swain et al., 2014). As such, the link between core neuropsychological processes and DoS dimensions is currently an area of scientific investigation. This growing interest is to be anticipated as the capacity to create, navigate, and nurture familial and intimate relationships theoretically implicates many neuropsychological aspects such as the self-regulation of thought and behavior, empathic processing, and the capacity to think into the future to consider the consequences of actions (Shapiro, 2010; Skowron & Dendy, 2004). For example, when forming and

navigating interpersonal relationships, individuals are bound at times to feel hurt by others. This may evoke a number of negative responses such as emotional reactivity, withdrawal, defensiveness, or fear of abandonment, and retaliatory impulses (Pronk et al., 2010; Skowron & Friedlander, 1998). Gliebe (2011) explains that, during the lifespan, individuals gradually develop the ability to self-control and emotionally regulate. This fundamental capacity assists in the management of negative responses and cultivates the ability to trust and empathize with others. Essentially, the inhibition of emotional responses necessitates that individuals override the harmful and potentially damaging impulses that can have long-term negative consequences on the health of relationships. In turn, this places great demands on self-regulatory neurocognitive processes associated with controlling thought, emotion, and behavior.

Executive Function

The second major construct in this study is executive function (EF). This neuropsychological construct refers to a broad category of supervisory cognitive processes responsible for the organization and execution of higher order mental functioning (Anderson, 2008). Rather than a unitary construct, EF is generally viewed as a multifaceted construct. That is, researchers acknowledge a variety of EF cognitive capacities such as the ability to organize, set goals, inhibit, shift, and hold information in working memory (Diamond, Barnett, Thomas, & Munro, 2007; Willoughby, Pek, & Blair, 2013). Together, these EF processes support the self-regulation needed to function in a variety of environments that require flexible and goal-oriented action, behaviors that

are necessary for an independent and productive life (Lezak, 1982; Willoughby et al., 2013).

Research indicates that the frontal lobes of the brain, particularly the prefrontal cortex largely support the application of many EF related skills (Laine, et al., 2009; Miyake, Friedman, Emerson, Witzki, & Howerter, 2000; Phelps, 2006). This is not to suggest that the frontal lobes work in isolation from the rest of the brain. Instead, the frontal lobes appear to interlock with many other areas of the brain such as the limbic system, sometimes referred to as the emotional center of the brain (Meyer et al., 2013); the reticular activating or arousal system (van den Heuvel et al., 2005); the posterior association cortex (Markowitsch & Kessler, 2000), and the motor regions of the frontal lobes (Cameron et al., 2012). Thus, EF does not imply a single skill, but refers to the regulation of a complex set of interrelated higher-order tasks that assist in the execution of goal-oriented behavior (Anderson, 2008).

Theoretical Models of EF

Researchers have proposed a variety of EF theoretical models. Denckla (1996), one of the first to use executive function as a clinical term, described EF as a set of control processes involving response delay and inhibition used to organize and assimilate cognitive and output processes across time. The control processes have three components: interference control, effortful and flexible organization, and strategic planning or readiness to act. First, interference control refers to one's capacity to neglect extraneous information while engaged in goal-oriented tasks. This ability supports the ability to selectively focus attention and sift through extraneous information. Second,

effortful and flexible organization is the ability to move towards goal achievement though the continuous rearrangement and organization of thought. Third, strategic planning or the readiness to act is one's capacity for future orientation though articulate and appropriate responses. Together, these three core components allow for the performance of higher cognitive processes though thought and behavior regulation.

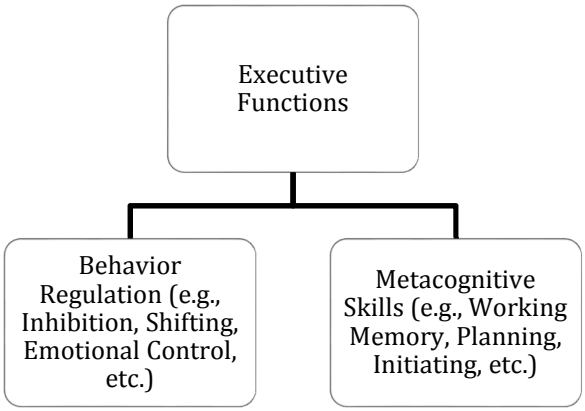
Miyake et al. (2000) postulates that EF is comprised of three basic cognitive functions that "modulate the actions of several cognitive subprocesses and thereby regulate the dynamics of human cognition" (p. 50). Specifically, these functions are: shifting, updating, and inhibition.

First, shifting, also called attention switching or task switching, is the ability to engage in a relevant task set despite proactive interference. Shifting is essential to learning as it enables the ability to think simultaneously about multiple pieces of information and switch between methods of cognition (Boger-Mehall, 1996). Second, updating is the capacity to actively manipulate the contents of working memory by replacing old, irrelevant information with relevant information. This skill relates to the ability to manipulate the contents of working memory by monitoring and coding incoming information. Third, inhibition is the deliberate halting of dominant, automatic, or prepotent responses when needed. This cognitive skill frees up the mental resources needed for goal completion by shutting out irrelevant information. In summary, Miyake et al. (2000) explained overall EF as the three basic functions of shifting, updating, and inhibition that support the ability to perform complex cognitive tasks.

According to Gioia, Isquith, Guy, & Kenworthy (2000), EF is comprised of two core factors, namely, behavioral regulation and metacognitive skills. This study will rely

upon this EF model as it most closely aligns with our research. First, behavior regulation is the ability to modulate emotional and behavioral reactions. These skills are important in supporting a variety of abilities that allow individuals to control impulses and behaviors, switch between tasks and endure change, and regulate emotional responses in a socially appropriate manner. Individuals who are able to override or regulate the type, frequency, intensity, and duration of their behavioral responses display higher levels of social competence. This requires a number of behavior regulation skills such as inhibition, flexible shifting between problem solving abilities, tempering emotional responses, and self-monitoring one's actions (see Figure 2 below).

*Figure 2. EF Hierarchy (*Gioia, Isquith, Guy, & Kenworthy, 2000)



Of the skills related to behavior regulation, researchers identify inhibition as a core component (Garavan, Ross, Murphy, Roche, & Stein, 2002; Roth et al., 2005). Inhibition is defined as the ability to deliberately override or stop a mental process as it works towards a specific goal or outcome (Gioia et al., 2000; MacLeod, 2007; Miyake et al., 2000). This skill is typically theorized to correspond to the orbitofrontal area of the prefrontal cortex, which is responsible for "selecting an appropriate course of action in the face of competing or interfering demands" (Garavan et al., 2002). Fundamentally,

inhibitory control involves the regulation of initial prepotent responses; halting ongoing responses, effectively creating a delay between impulse and action; and preventing interfering events and responses during the delay in order to preserve goal-oriented responses (Barkley, 1997). Inhibitory control deficits have been linked and a variety of conditions such as attention deficit hyperactivity disorder (Alderson, Hudec, Patros, & Kasper, 2013; Barkley, 1997), obsessive-compulsive disorder (Bannon, Gonsalvez, Croft, & Boyce, 2002), and drug and alcohol addiction and abuse (Berkman, Falk, & Lieberman, 2011; De Wit, 2009). In contrast, robust inhibitory control is associated with positive outcomes such as educational achievement increases (Barkley, 1997), increased capacity for internalization of values and conscience in developing children (Kochanska, Murray, & Coy, 1997; Kochanska, Murray, Jacques, Koenig, & Vandegeest, 1996), and better ability to manage behavior and strong emotions (Rand, Kraft-Todd, & Gruber, 2015).

The second core EF factor according to Gioia et al. (2000) is metacognition. Metacognitive skills are conceptualized as the capacity to manage attention and problem solve through systematic planning and organization, which are actively maintained within working memory (Gioia et al., 2000). These metacognitive processes are often thought of as the core of executive functions and directly relate to the capacity for problem solving within a variety of settings (Bewick, 1995). These capacities allow for a variety of abilities, such as the ability to identify performance issues during tasks, anticipate possible problems, and initiate compensatory approaches (Ownsworth & Fleming, 2005).

Of the skills related to metacognition, working memory is thought to be a central EF skill (Kirk, Gray, Riby, & Cornish, 2015). Working memory is defined as the capacity

for holding, manipulating, and acting upon information (Barkley, 1997; Baddeley, 2007; Conway, Jarrold, Kane, Miyake, & Towse, 2007). These skills are central to the ability to reason, understand, and learn. As such, working memory is considered to be an essential contributor to general intellectual functioning and everyday cognitive tasks like understanding spoken language, reading, and general problem solving (Conway, Jarrold, Kane, Miyake, & Towse, 2007). Studies suggest that working memory is associated with the dorsolateral region of the prefrontal cortex (D'Esposito et al., 1995; Fuster, 1989; Petrides, 2000). Deficits in working memory have been related to difficulties with tasks or directions that are multi-step as they are thought overload the upper limit of the amount of information that can be held in the mind at any given time (Holmes et al., 2010; Roth et al., 2005). These deficits have been linked to a variety of conditions such as attention deficit hyperactivity disorder (Barkley, 1997), learning difficulties with reading, writing, and math (Gathercole & Pickering, 2000; Holmes et al., 2010), dyslexia (Menghini, Finzi, Carlesimo, & Vicari, 2011), and Alzheimer's disease (Geldorp et al., 2015). On the contrary, increased working memory abilities are associated with positive effects like strong direction following facilities (Engle, Carullo, & Collins, 1991), better math performance (Swanson, Lussier, & Orosco, 2015), and reading ability (Pham & Hasson, 2014).

As previously stated, there are multiple theoretical models of EF, including the three reviewed in this section. While sometimes ambiguous and difficult to define, EF is generally viewed as complex and multifaceted and its functions as relevant to daily activities, able to control cognition and behavior (Anderson, 2008; Miyake et al., 2000; Moran and Gardner, 2007). Each model shares its view that EF is made up of control

processes vital to successful problem solving, execution, and completion of long-term goals.

Theoretically Linking Executive Function and DoS

Theoretically, strong EF skills may promote self-regulation, autonomy, and intimacy within intimate and familial relationships. In other words, essential EF dimensions may underlie DoS subcomponents that support the ability to form and maintain healthy relationships. Specifically, it is theorized that the two core EF dimensions (i.e., behavior regulation and metacognition) each support the four DoS subcomponents (i.e., I-position, emotional reactivity, emotional cutoff, fusion with others).

First, DoS I-position is important in maintaining the ability to communicate one's ideas and perspectives to others, especially when experiencing stress and anxiety. Under such forces, individuals may experience a strong inclination to buckle under social pressure and not stand by their opinions and convictions. In relationships, this can be problematic as the boundary between "self" and "other" may become blurred. EF behavior regulation, or the ability to change or adjust emotional and behavioral responses, may serve to support I-position by inhibiting the tendency to fuse or conflate with another person in a problematic fashion. For example, an individual who previously managed anxiety through emotional fusing in order to avoid conflict with others may utilize inhibitory skills to create a delay between emotion and behavioral responses. This might allow the individual time to employ calm, rational thought to aid in the preservation of individual identity. Likewise, strong EF metacognitive skills may support

DoS I-position. Metacognitive skills, such as working memory, allow an individual to think through time and systematically plan and organize. These metacognitive skills may help an individual to more fully rely on their previous experience, both positive and negative, and plan in the future to express themselves to others in a more effective manner. Essentially, EF behavior regulation and metacognition may support DoS I-position by inhibiting emotional and behavioral reactions that prevent healthy expression of thoughts and by relying on the past experience and future planning to communicate in a healthy fashion.

Second, DoS emotional reactivity refers to the ability to regulate emotional affect in response to another's emotionality. Intimate relationships are often fraught with intense interpersonal conflict that can trigger strong emotional lability, flooding, and behavioral responses. If acted upon, these emotional and behavioral impulses can be damaging. For example, Carrere and Gottman (1999) successfully predicted marital outcome (e.g., staying married or divorcing) based on the degree of negative and positive affect during the first three minutes of a marital conflict. Specifically, couples that became emotionally reactive and demonstrated a variety of negative behaviors such as becoming accusatory, criticizing, or becoming defensive were 91% more likely to divorce within six years.

EF behavior regulation may be vital in creating a delay between impulse and response. This delay may facilitate the ability to inhibit negative behaviors and better handle the strong emotionality within oneself and others. Similarly, strong EF metacognitive skills may support DoS emotional reactivity. These working memory related skills might aid an individual in better understanding their own emotional and

behavioral functioning. For example, an individual may know that they are prone to emotional flooding when talking about particularly sensitive topics with another person. Robust EF working memory may aid the individual in thinking about the potentially harmful consequences of their actions and selecting coping techniques (e.g., soothing self- talk) to prevent emotional flooding. Both EF behavior regulation and metacognition may underlie an individual's ability to better regulate their emotional affect by creating a delay between emotional response and the onset of harmful behavioral responses, as well as the selection and application of helpful techniques during future conflicts.

Third, DoS emotional cutoff is the propensity and degree to which an individual reactively distances from others in order to subdue anxiety. A high degree of emotional cutoff is viewed as harmful in interpersonal relationships. Gottman & Levenson (2000) reported that stonewalling, essentially a term that connotes a type of emotional cutoff or refusal to engage or communicate, was associated with increases in marital dissatisfaction and divorce. Moreover, researchers view stonewalling as one of the most harmful barriers to relational growth because it is thought to prevent resolution and opportunities for intimacy building by creating emotional isolation between partners (Gottman, 1994). An individual with the tendency for emotional cutoff may have overwhelming feelings of vulnerability when faced with intimacy, and may reactively create distance to self-soothe. In this sense, a high level of emotional cutoff creates a kind of false emancipation from the emotional dependence and anxiety experienced in a family of origin (Goldenberg & Goldenberg, 1985). Conceptually, EF behavior regulation may serve to help override powerful urges to flee or cutoff emotionally. As an individual inhibits this predilection, it may promote the ability to remain engaged and work towards resolving the underlying

issues of fusion with the family of origin. EF metacognitive skills may also assist in lowering emotional cutoff through the systematic evaluation of one's performance in the past, present, and future. This self-evaluation or awareness may help in identifying problematic, avoidant behaviors and assist in developing the positive strategies that help work towards the goal of remaining emotionally connected. Together, EF behavior regulation and metacognition can support an individual's ability to resist the urge to emotionally disconnect while helping identify behavioral patterns and techniques that support the development of intimacy in relationships.

Fourth, DoS fusion with others is the act of becoming overly emotionally involved with others in interpersonal relationships. According to Bowen (1978), there is a level of separateness and individuality necessary for a person to grow and build healthy relationships. A high degree of fusion with others is problematic because the individual's self-esteem may become largely determined by the approval of others, contributing to increased vulnerability to feeling hurt or threatened in relationships. This fusion can be problematic because of its tendency to generate chronic anxiety and prevent the development of an individual identity.

Regarding behavioral regulation skills, EF inhibition skills may serve to support the balance between managing reactions to anxiety and sharing intimacy without the need to abandon individual identity. For example, an individual may have a strong impulse to give into their spouse's desires in order to avoid conflict, thereby loosing their autonomy and ability to express themselves without being dominated by a fear of abandonment. Behavior regulation skills may help inhibit the impulse to emotionally fuse in order to put to use techniques that support individual growth and identity. EF metacognition may also

facilitate lowering DoS fusion with others through the use of flexible problem solving techniques. For example, highly fused individuals may have a difficult time understanding and separating their own thoughts and feelings from the thoughts and feelings of others. EF metacognitive skills may help an individual to recognize behavioral patterns contributing to fusion and select techniques that help prevent this pattern in the future. They may recall increases in negative feelings like insecurity or loss of autonomy and may set goals to avoid such outcomes in the future. In essence, both EF behavioral regulation and metacognition may help support decreasing problematic DoS fusion by inhibiting emotional fusion and facilitating and building an understanding of past behavior patterns, which can be utilized to modify thought and behavior in the future to attach to others in a more healthy manner.

There is a lack of research that directly investigates the relationship between DoS subcomponents and EF indices. Shapiro (2010) appears to be the only study that incorporates this neuropsychological approach to DoS. In this study, participants (N = 100), ranging in age from 18 to 44 years (M = 21, SD = 3.6), completed the *Differentiation of Self Inventory (DSI;* Skowron & Friedlander, 1998*),* a self-report measure designed to assess level of DoS. Participants were also administered six laboratory EF tasks that measured a variety of EF skills including cognitive flexibility, sustained and divided attention, working memory, motor speed, and visuomotor tracking. Results indicated only one of the DoS subscales, namely, emotional reactivity, significantly predicted EF scores on the Trail Making Test- Part A, the measure of visual attention and task switching. The other five EF measures did not significantly predict DoS. The author concluded that overall, the investigation demonstrated little support for

the connection between DoS and EF. However, regarding the Trail Making Test, Part B is similar to Part A but is considered to be less affected by processing speed and instead, relies more on the executive processes associated with cognitive flexibility. This implies that participants with greater levels of emotional reactivity displayed worse attentional abilities and mental processing speeds. Conceptually, this is anticipated as individuals may process information less efficiently when dealing with increased emotional lability as a result of a greater likelihood to respond to environmental stimuli.

Despite the limited research, studies have linked DoS to a construct related to EF, namely, effortful control. Effortful control is viewed as a set of self-regulatory mechanisms related to human temperament responsible for the active regulation of emotional arousal and feelings (Rothbart, Sheese, Rueda, & Posner, 2011; Skowron & Dendy, 2004). Effortful control includes both voluntary, deliberate control, and more reactive, involuntary aspects of temperament like arousal and emotion. Individuals with the capacity for effortful control display the ability for conscious regulation of their emotions, behaviors, and attention. Skowron and Dendy (2004) studied the potential connection between effortful control and DoS. Adult participants (N= 225) completed multiples self-report measures assessing attachment style, level of DoS, and effortful control. Results demonstrated that increased DoS significantly predicted increased effortful control $\Delta F(4,215) = 16.27$, $\Delta R2 = .19$, $p < .0001$. Of the four indices of DoS, lower emotional reactivity and increased I-position in particular, were linked to increased effortful control.

Further research using self-report measures is needed to study how an individual's level of DoS is predicted by EF skills. Previous research relied upon clinical tasks in

order to measure EF skills, which may fail to capture an individual's functioning in their daily life. Using self-report measures allows for examination of the impact of an individual's EF skills as they relate to real-life scenarios. Additionally, studies are needed to examine how individual indices of DoS relate to discrete components of EF, specifically, behavior regulation (e.g., inhibition related variables) and metacognition (e.g., working memory related variables).

Hypotheses

Hypothesis One. It is hypothesized that overall DoS, as measured by the DSI-R Scale, will be predicted by overall EF, as measured by the BRIEF-A. This is predicted because DoS theoretically implicates the neurocognitive processes associated with regulating thought, emotion, and behavior. That is, the brain's supervisory processes responsible for the organization and execution of higher order mental functioning support how individuals go about differentiating thoughts and feelings, as well as balancing intimacy and autonomy in relationships.

Hypothesis Two. It is hypothesized that overall DoS, as measured by the DSI-R Scale, will be better predicted by EF Behavior Regulation Index, as measured by the BRIEF-A, in comparison to the Metacognitive Index of the BRIEF-A. This is predicted because DoS theoretically implicates inhibitory control of emotions and behavior more than the ability to plan and organize. In other words, it is hypothesized that the ability to delay powerful emotional and behavioral reactions plays a more critical role in preserving self-identity and maintaining intimacy in relationships than the ability to manage attention and systematically problem solve.

CHAPTER II: METHODOLOGY

Research Approval

The Institutional Review Board (IRB) at Middle Tennessee State University granted research permission preceding participant recruitment and data collection. See appendix A.

Participants

Participants were 184 undergraduate students, 40.7% males (n = 75) and 59.2% females (n = 109). Ages ranged from 18 to 34 with the majority (86.4%) falling between ages 18 and 22. The ethnic composition of the sample was 67.9% (n = 125) White or Caucasian, 22.8% (n = 42) Black or African American, 2.1% (n = 4) Asian or Pacific Islander, 3.8% (n = 7) Latino or Hispanic, 0.5% (n = 1) American Indian or Alaskan Native, and 2.7% (n = 5) identified as Other. All participants were enrolled at Middle Tennessee State University in psychology courses and received participation credit for their involvement. In addition, all participants were informed that participation wasn't mandatory and they had the option of leaving at any time.

An overview of the study was presented to the participants, as well as a consent form, demographic data form, and rating scales. Participants were given one hour to complete all forms and only fully completed rating scales were collected and analyzed.

Measures

Executive Function Measure

The *Behavior Rating Inventory of Executive Function-Adult Version (BRIEF-A)* is an 86 item self-report measure designed to assess executive functioning and self-regulation in adults ages 18-90 years old (Roth et al., 2005). Executive functions are a grouping of inter-connected processes that support goal-directed, problem solving behavior. The self-report version was utilized in this study. The *BRIEF-A* reports three scores: the Global Executive Composite, which is an overall summary score, and the Behavioral Regulation Index and Metacognition Index, which are broad index scores.

The Behavioral Regulation Index addresses one's capacity for maintaining control and regulation of behavior and emotional responses. The Behavior Regulation Index is comprised of 5 subscales, namely, Inhibit, Shift, Emotional Control, and Self-Monitor. Sample items for this index include "I have outburst at inappropriate places" and "I overreact emotionally." Next, the Metacognitive Index addresses the ability to initiate, problem solve, plan and organize within working memory. The Metacognitive Index is comprised of 5 subscales, namely, Initiate, Working Memory, Plan/Organize, Task Monitor, and Organization of Materials. Sample items for this index include "I have trouble completing tasks that require multiple planned steps" and "I have trouble remembering things, even for a few minutes". Respondents select answers on a three-point Likert scale based that best described their behaviors and emotions in the last month. Likert response choices include never a problem (N), sometimes a problem (S), or often a problem (O) (Roth et al., 2005).

A normative sample of 1,050 adults of varying ages, ethnicities, educational, financial, and geographic backgrounds, was used to demonstrate reliability and validity for the BRIEF-A self-report form. Alpha coefficients were calculated for each of the nine subscales in order to establish internal consistency: Inhibit ($\alpha = .73$), Shift ($\alpha = .78$), Emotional Control ($\alpha = .90$), Self-Monitor ($\alpha = .78$), Initiate ($\alpha = .79$), Working Memory ($\alpha = .80$), Plan/Organize ($\alpha = .85$), Task Monitor ($\alpha = .74$), and Organization of Materials ($\alpha = .84$). Test-retest reliability data was gathered using a subsample of 50 individuals (22 male and 28 female), across a 4-week period. Correlation coefficients, specifically Pearson product-moment, were calculated for all nine subscales: Inhibit ($\alpha = .91$), Shift ($\alpha = .89$), Emotional Control ($\alpha = .90$), Self-Monitor ($\alpha = .83$), Initiate ($\alpha = .85$), Working Memory ($\alpha = .92$), Plan/Organize ($\alpha = .82$), Task Monitor ($\alpha = .84$), and Organization of Materials ($\alpha = .93$) (Roth et al., 2005).

Validity of the BRIEF-A is demonstrated through item content, internal structure, and validity of scores within specific diagnostic groups. Ten executive function experts, regarding clinical practice and research, were recruited and given items to one of the BRIEF-A scales. Interrater agreement ranged from a mean of 35% to 98%: (a) Inhibit, 86%; (b) Shift, 92%; (c) Emotional Control, 98%; (d) Self-monitor, 35%; (e) Initiate, 81%; (f) Working Memory, 79%; (g) Plan/Organize, 77%; (h) Task Monitor, 88%; (i) Organization of Materials, 85%. An exploratory factor analysis of the normative data revealed that two factors, Metacognition and Behavioral Regulation, were strongly correlated with one another on both the Self-Report ($r = 0.783$, $p < .05$) and the Informant Report ($r = 0.799$, $p < .05$). The BRIEF-A also demonstrated sensitivity to the strengths

and weaknesses within clinical executive functioning of populations of those with medicated and un-medicated ADHD, Alzheimer's Disease, Mild Cognitive Impairment, Multiple Sclerosis, Traumatic Brain Injury, and Epilepsy. The BRIEF-A is not intended to be used in isolation to diagnose EF disorders, but can be useful tool in evaluating likelihood of dysfunction (Roth et al., 2005).

Differentiation of Self Measure

The Differentiation of Self Inventory- Revised (DSI-R; Skowron & Friedlander, 1998; Skowron & Schmitt, 2003) is 46-item self-report measure designed to assess an individual's current level of differentiation within their significant relationships. The DSI-R reports five scores: a DSI full-scale score, and four subscale scores; I-Position (IP), Emotional Reactivity (ER), Emotional Cutoff (EC), and Fusion with Others (FO). Both the overall DSI and subscale scores were utilized in the current study to explore research questions. Respondents were asked to describe their typical emotional and behavioral functioning in relationships using a 6-point Likert-type scale ranging from 1 (not true of me) to 6 (very true of me). The DSI-R overall score is calculated by reverse scoring specific items, summing all items, and dividing by the total number of items (46). Scores range 1 to 6, with higher scores representing increased differentiation of self. Subscale scores are determined by reverse scoring all items on the ER and EC scales, only item 35 on the IP scale is reversed, and all items on the FO except item 37. Next, raw scores are summed and divided by the number of items comprising each subscale (i.e., ER = 11, IP = 11, EC = 12, FO = 12), resulting in subscales scores ranging from 1 to

6. Higher subscale scores suggest lower emotional reactivity, emotional cutoff, lowered fusion with others, and an increased ability to take "I" positions.

The DSI (Skowron & Friedlander, 1998) was refined with the DSI-R to improve the reliability and construct-related validity of the FO subscale. A normative sample of 225 adults with varying demographic information was used to demonstrate reliability and validity for the DRI-R. Skowron and Schmitt (2003) reported internal consistency for the full-scale composite score, as well as each of the subscale scores were high. The DSI full scale has a Chronbach's α coefficient estimate of .92 The ER subscale, which measures an individual's penchant towards reacting with strong emotion to stressful situations, has an alpha coefficient of .89. The IP subscale measures an individual's ability to maintain independence in close relationships has an alpha coefficient of .81. The EC subscale, which looks at the extent that an individual reactively distances themselves from powerful emotions, reported an alpha coefficient of .84. Finally, the FO subscale measures the extent to which a person's identity is inherently dependent on others has an alpha coefficient of .86. Reliability estimates ranged from moderate to good, IP (α = .81), ER (α = .87), EC (α = .78), and FO (α = .85). Researchers addressed construct validity for the DSI-R and demonstrated a negative connection between high scores on the DSI-R and chronic anxiety, as well as a positive relationship with psychological functioning (Knauth et al., 2006; Skowron et al., 2004).

CHAPTER III: RESULTS

Hypothesis 1

Means, standard deviations, and correlations are presented for participants' DSI-R scores and BRIEF scores (see Table 1). This study's first aim was to investigate how individual's overall DoS scores (i.e., DSI-R full-scale) were predicted by overall EF ability scores (i.e., Global Executive Functioning Composite) by conducting one simple regression. Results confirmed that the Global Executive Functioning Composite significantly predicted DSI-R full-scale (R^2 = .10, adjusted R^2 = .11, F (1, 179) = 20.57, p = .00) (see Table 2) and accounted for approximately 10% of the variance in the sample.

Hypothesis 2

Next, a multiple regression was conducted to investigate how and to what extent overall DoS was predicted by each core dimension of EF, specifically, EF Behavioral Regulation (i.e., inhibition) and EF Metacognition (i.e., working memory). Results indicated that EF Behavior Regulation Index scores accounted for a significant proportion of the variance of overall DoS scores, R^2 = .21, adjusted R^2 = .20, F (1, 179) = 7.32, p = .00. The EF Metacognition Index (i.e., working memory) was then added to the regression equation and there was a significant change in the prediction of DoS subcomponent scores, R^2 = .22, adjusted R^2 = .21, F (2, 178) = 25.53, p = .00 (see Table 3). The slight, but significant increase in R^2 suggests that Metacognitive Index in conjunction with Behavioral Regulation Index is a meaningful predictor of DoS. However, the Behavioral Regulation Index is the best predictor of DoS in comparison to

Table 1: Means, Standard Deviations, and Correlations for DoS Measures and EF BRIEF Scores

(N = 184)

Measures	*M*	*SD*	1.	2.	3.	4.	5.	6.	7.	8.
1. DSI-R Total	3.71	.62		.70**	.82**	.61**	.78**	-.32**	.45**	-.47**
2. DSI I-position	4.16	.77			.42**	.21**	.51**	-.22**	-.28**	-.13
3. DSI emotional reactivity	3.33	.98				.34**	.57**	-.32**	-.51**	-.13
4. DSI emotional cutoff	4.11	.84					.21**	-.21**	-.27*	-.13
5.DSI fusion with others	3.28	.81						-.17*	-.26**	-.07
6. BRIEF Global	58.38	10.33							.85**	.92**
7. BRIEF behavioral regulation	57.84	10.64								.59**
8. BRIEF metacognition	57.74	10.75								

*Note. DSI-R scores based on raw scores; BRIEF scores based on t-scores * $p < .05$. ** $p < .01$*
BRIEF = Behavior Rating Inventory of Executive Functioning

Table 2: Simple Regression Analysis of DoS Predicted by BRIEF Global Executive Functioning

(N = 184)

Variable	*B*	*SEB*	*Beta*	*t*	*p*	Zero order
BRIEF behavior regulation	-.02	.00	-.32	-4.54	.00	-.32
R^2		.10				

BRIEF = Behavior Rating Inventory of Executive Functioning

the Metacognition Index. Interestingly, the behavior regulation index was a better predictor than both the metacognitive index and overall EF. In fact, using the Behavior Regulation index alone is a stronger statistical model than combining the Behavior Regulation and Metacognitive Indexes to create the EF Global Executive Composite. That is to say, the addition of the Metacognitive Index appears to weaken the statistical model. This supposition was further supported by the multiple significant correlations ($p < .01$) between EF Behavioral Regulation Index and the DoS core subcomponents. For example, the Behavioral Regulation Index was significantly correlated with DoS I-position ($r = -.28$), DoS emotional reactivity ($r = -.51$), DoS emotional cutoff ($r = -.27$), and DoS fusion with others ($r = -.26, p = .00$). In contrast, the EF Metacognition Index was not significantly correlated with any of the DoS subscales (e.g. I-position, emotional reactivity, emotional cutoff, and fusion with others).

Table 3: Simple Regression of DoS Predicted by BRIEF Behavior Regulation and Metacognition

(N = 184)

Variable	*B*	*SEB*	*Beta*	*t*	*p*	Zero order	Partial	Part
BRIEF behavior regulation	-.03	.01	-.55	-6.72	.00	-.45	-.45	-.44
BRIEF meta-cognitive	.01	.00	.17	2.01	.05	-.16	.15	.13
R^2		.22						

BRIEF = Behavior Rating Inventory of Executive Functioning

CHAPTER IV: DISCUSSION

First, this study examined the extent to which DoS was predicted by global EF skills. As proposed, college students' self-reported levels of overall levels of differentiation of self were successfully predicted by EF. That is, the essential skills needed to build and maintain intimate relationships are closely tied to the higher-order neurocognitive abilities that support the planning and execution of thought and behavior. As previously stated, intimate relationships can be challenging as individuals attempt to work together, problem solve, and resolve conflict under stressful circumstances. These circumstances can trigger powerful "hot" emotions that tax the ability to regulate thought and behavior. Our findings support that individuals with better global EF skills are indeed better able to separate thoughts and feelings, which contribute to a more balanced level of intimacy and autonomy within relationships.

This finding linking DoS and EF is noteworthy as there is limited existing research linking the two constructs. Previous DoS and EF research has been mixed to some extent. Skowron and Dendy (2004) found some evidence to support the connection between effortful control, one component of EF, and DoS. However, Shapiro (2010) reported that the connection between EF and DoS was largely unsupported. It is noteworthy that our study documents support for the DoS and EF connection. Moreover, we extend previous research by utilizing a global measure of EF that was designed to capture a broad range of EF functioning rather than narrow EF skills. Moreover, the current study is based on self-report rather than clinical tasks. This is important in that the limited EF and DoS research has been conducted with clinical cognitive tests. However,

research suggests that self-report ratings of EF assess different levels of EF cognition in comparison to clinical-based measures (e.g., Toplak, West, & Stanovich, 2012).

Second, this study explored whether DoS is better predicted by EF Behavior Regulation (i.e., inhibition) or EF Metacognition (i.e., working memory). As was anticipated, EF Behavior Regulation was found to have a stronger predictive relationship with overall DoS in comparison to EF Metacognition. This is an important finding that suggests that navigating healthy relationship systems it is not just related to overall EF skills. Rather, EF core behavior regulation skills, specifically the ability to inhibit impulses, regulate emotional responses, and shift attention smoothly from one activity to another is closely linked to the ability to constructively balance intimacy and autonomy. In terms of this study, EF behavior regulation is the leading neurocognitive skill related to DoS, or the capacity to operate as a separate person that thinks, feels, and acts in a manner builds togetherness and intimacy. This was not the case for EF Metacognition (i.e., working memory). Though the construct was linked to DoS. It did not compare in predictive strength to EF behavior regulation.

As previously mentioned, Skowron and Dendy's (2004) and Shapiro's (2010) previous research did not look specifically at individual indices of EF. This is the first known study to compare how DoS is predicted by the core dimensions of EF, namely the Behavior Regulation and Metacognitive Indexes, and consider meaningful differences in predicting DoS. The current study's finding that the ability to control impulses, shift attention, and manage emotional responses (i.e., Behavioral Regulation Index) best predicts DoS seems to suggest that the ability to modulate emotional and behavioral

responses plays a more critical role in the development and maintenance of intimate relationships than the ability to systematically problem solve (i.e., metacognitive skills).

The examination of DoS subcomponents (i.e. I-position, emotional reactivity, emotional cutoff, and fusion with others) also followed the same pattern of being highly related to an individual's ability to manage their behavioral and emotional responses. Again, this suggests that behavioral regulation skills are closely related to DoS. This finding was anticipated to some degree, as DoS subcomponents are similar to EF Behavior Regulation indices. For example, DoS emotional reactivity, or the ability to regulate emotion in the face of another's emotionality, is highly similar in concept to EF emotional control, or the ability to regulate emotional responses appropriately. That is, both measures tap how well a person is able to control their emotional and behavioral responses.

In terms of applying these findings clinically, therapeutic approaches to improving relationships skills, or balancing DoS intimacy and autonomy, may want to consider targeting EF behavior regulation skills such as inhibiting, regulating emotions, and shifting attention. By improving these skills individuals may develop a calmer, more rational approach that counters impulsive emotional and behavioral responses that damage relationships. Conversely, when there are conditions present that adversely impact EF functioning (e.g., ADHD, mood disorders, anxiety, etc.) it is important for clinicians to recognize more fully the connection between EF deficits and DoS relational difficulties that can impact relationships and family systems.

Limitations

There are some limitations of the current study. First, it can be challenging to establish a cause and effect relationship when using correlational methods. Although it is understood that there is a relationship between DoS and EF, it is unclear if individual DoS is influencing EF or vice versa. Future experimental studies are warranted to better understand the relationship between DoS and EF. Second, DoS and EF are both complex, multi-dimensional constructs that are difficult to operationalize and assess. The current study only investigated four DoS components (i.e. I-position, emotional reactivity, emotional cutoff, and fusion with others) and two core components of EF (i.e., behavior regulation and metacognitive). Though both measures are recognized to broadly assess global characteristics of the constructs, it is possible that there are additional DoS and EF skills not assessed in the current study. Thus, possible construct underrepresentation is a potential limitation. Finally, DoS and EF is difficult to assess given that functioning deficits are hidden until a person is experiencing stress demands. For example, true DoS levels of intra- and interpersonal functioning are typically exposed during stressful or anxious events such as navigating conflict resolution or experiencing social pressure. Likewise, true levels of EF behavior regulation are exposed when there is are strong demands to inhibit prepotent responses. This study did not measure DoS or EF under the conditions that they are most likely to be observable.

Conclusion

Overall self-ratings of global DoS were successfully predicted by EF skills. Additionally, further investigation revealed that when predicting overall DoS, EF

Behavioral Regulation (i.e. inhibition) was a stronger predictor than EF metacognitive Index (i.e., working memory). Additionally, DoS subcomponents (i.e., I-position, Emotional Reactivity, Emotional Cutoff, and Fusion with Others) showed a significant correlation with EF Behavior Regulation. In contrast, there were no significant correlations with any DoS subcomponent and EF Metacognition. These findings suggest that the ability to differentiate thought and feeling, as well as balance intimacy and autonomy in relationships, are more related to inhibitory control skills than systematic problem solving through planning and organizing.

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APPENDICES

APPENDIX A: IRB APPROVAL LETTER

4/20/2015

Investigator(s): Seth J. Marshall
Department: Psychology
Investigator(s) Email: seth.marshall@mtsu.edu

Protocol Title: "Relationships between executive functioning, positive psychology attributes, technology and internet use, sleep behavior, and family system relationships in college students "

Protocol Number: 15-298

Dear Investigator(s),

The MTSU Institutional Review Board, or a representative of the IRB, has reviewed the research proposal identified above. The MTSU IRB or its representative has determined that the study poses minimal risk to participants and qualifies for an expedited review under 45 CFR 46.110 and 21 CFR 56.110, and you have satisfactorily addressed all of the points brought up during the review.

Approval is granted for one (1) year from the date of this letter for 400 (FOUR HUNDRED) participants.

Please note that any unanticipated harms to participants or adverse events must be reported to the Office of Compliance at (615) 494-8918. Any change to the protocol must be submitted to the IRB before implementing this change.

You will need to submit an end-of-project form to the Office of Compliance upon completion of your research located on the IRB website. Complete research means that you have finished collecting and analyzing data. **Should you not finish your research within the one (1) year period, you must submit a Progress Report and request a continuation prior to the expiration date.** Please allow time for review and requested revisions. Failure to submit a Progress Report and request for continuation will automatically result in cancellation of your research study. Therefore, you will not be able to use any data and/or collect any data. Your study expires 4/21/2016.

According to MTSU Policy, a researcher is defined as anyone who works with data or has contact with participants. Anyone meeting this definition needs to be listed on the protocol and needs to complete the required training. **If you add researchers to an approved project, please forward an updated list of researchers to the Office of Compliance before they begin to work on the project.**

All research materials must be retained by the PI or faculty advisor (if the PI is a student) for at least three (3) years after study completion and then destroyed in a manner that maintains confidentiality and anonymity.

Sincerely,

Institutional Review Board
Middle Tennessee State University