

THE ROLE OF ATTACHMENT ON THE RELATIONSHIP BETWEEN TRAUMA AND
SELF-REGULATION AMONG JUSTICE-INVOLVED YOUTH

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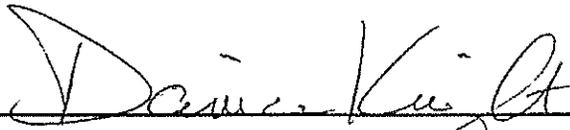
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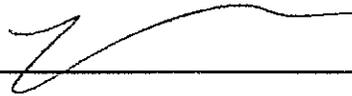
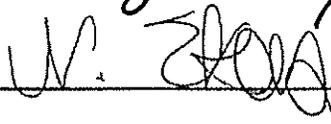
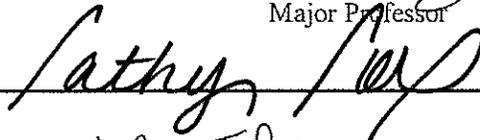
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The Role of Attachment on the Relationship between Trauma and Self-Regulation

Individuals who are exposed to trauma during childhood and/or adolescence, in the form of unwanted physical, emotional, or psychological neglect or harm, (Stowkowy et al., 2020) are susceptible to multiple negative outcomes. These negative outcomes include, but are not limited to, mental illness, sexual risk taking, interpersonal violence, self-directed violence, and problematic alcohol and drug use (Hughes et al., 2017). Additionally, children who experience childhood trauma are less likely to develop core capacities associated with interpersonal relatedness and self-regulation (Cook et al., 2005).

During adolescence, there is an increase in risk-taking behaviors (e.g., driving recklessly, drug and alcohol use, violence, and sexual risk-taking), which typically does not decline until mid-twenties (Steinberg, 2008). This decline is likely due to the development of self-regulatory capacities that occur throughout adolescence and early 20s. Evidence suggests that the development of these capacities is attributed to the maturation of higher-level cognition control, including abstract thinking and deliberative action. These changes in the prefrontal cortex play a key role in self-regulation, and the maturation of neural connections between the limbic system and prefrontal cortex enable better coordination of emotion and cognition (Steinberg, 2008).

Although there is not a consistent definition for self-regulation in the literature, it is generally agreed that self-regulation is one's ability to take in information, weigh choices and consequences, and make adaptive choice(s) to achieve a particular goal (McClelland et al., 2015). Meta-analyses have shown that two critical aspects of self-regulation (i.e., executive function and emotion regulation) are negatively impacted by trauma (Op den Kelder et al., 2018; Villalta et al., 2018). Research also indicates that poor self-regulation in early childhood is associated with depression and anxiety, obesity, alcohol and substance use, unemployment,

aggressiveness, and criminal behavior (Robson et al., 2020). As adolescence is a critical time in the ongoing development of self-regulation and individuals who experience trauma are less likely to develop these capacities, it is important to better understand the relationship between trauma and self-regulation, as well as what environmental factors may influence self-regulation.

Interpersonal relatedness is a potential key factor in the development of self-regulation (Cook et al., 2005). For instance, in the early years of childhood, children are dependent upon external support (e.g., parents) for regulation of behaviors and internal states (Erdmann & Hertel, 2019). Although this dependency changes as the child develops, parents continue to play an important role in influencing positive self-regulation during adolescence (Mason et al., 2016; Morris et al., 2017). Thus, parent-youth relationship quality, particularly the attachment relationship, may be critical in moderating the degree to which trauma impacts self-regulation. This is especially vital to consider as secure attachment is associated with a prevalence of resilience (i.e., a positive adaptation to adversity; see Darling Rasmussen et al., 2019 for a systematic review).

The purpose of the current study is to examine relationships among attachment style, trauma, and self-regulation within a sample of juvenile justice (JJ)-involved youth. Since a high proportion of youth involved in the JJ system report extensive exposure to trauma and challenges with self-regulation, and because poor self-regulation is linked to criminal behavior (Abram et al., 2004; Cruise & Ford, 2011; Ford & Blaustein, 2013; Robson et al., 2020), examining these relationships among JJ-involved youth can inform future research and interventions aimed at improving outcomes for this population.

Self-Regulation

Self-regulation enables one to exercise control over their feelings, thoughts, and behaviors, allowing them to achieve goals, make plans, inhibit unwanted thoughts, control impulses, and regulate social behavior; all of which enable one to live cooperatively and maintain a healthy life (Heatherton & Wagner, 2011; Robson et al., 2020). According to Heatherton and Wagner (2011), individuals who can successfully self-regulate exhibit better mental health, increased job success, improved relationships, a lower risk of engaging in risky sexual behavior, and are less likely to develop problems with alcohol abuse. Humans' capacity for self-regulation is impressive; however, due to a wide variety of circumstances, it is common for people to lose control of their emotions and behaviors. Research has shown that failure to self-regulate is a critical aspect of many mental health and social problems, including addiction, obesity, sexual infidelity, and poor financial problems (Heatherton & Wagner, 2011).

Within various fields of psychology, (e.g., clinical, neuropsychology, cognitive, developmental, personality, and educational) there are differences in how self-regulation is conceptualized and measured, which has generated considerable debate. For the current study, self-regulation is specifically defined as "the ability to flexibly activate, monitor, inhibit, preserve and/or adapt one's behavior, attention, emotions and cognitive strategies in response to directions from internal cues, environmental stimuli and feedback from others, in an attempt to attain personally-relevant goals" (Moilanen, 2007, p. 835). Over time, methodological approaches have incorporated measures from a variety of disciplines, which has led to diminished construct definitional differences and the need to include multiple measures of self-regulation (when possible).

Within the research literature on children and adolescents' self-regulation, there are several key measurement constructs that are especially useful. These include executive function, delay of gratification, self-control, effortful control, engagement, and emotion regulation (McClelland et al., 2015; McClelland et al., 2018). As executive function and emotion regulation encompass several key components necessary for regulation (e.g., inhibitory control, attentional shifting, processing emotions, working memory and cognitive strategies; LeBlanc et al., 2017; Nigg, 2017), this study will consider self-regulation as it pertains specifically to the constructs of executive function and emotion regulation.

Executive Function

Executive Function consists of cognitive processes that elicit action, which allow individuals to engage in goal-oriented behaviors (Meltzer, 2007; Trossman et al., 2020). Although precise definitions vary, there are a few key processes and skills emphasized in the study of executive function. These processes and skills include attentional shifting (or cognitive control and flexibility), inhibitory control, and working memory (Meltzer, 2007; Trossman et al., 2020). Attentional control and flexibility refer to the capacity to willingly focus on a task and shift attention when necessary (Nigg, 2017). Attention is a key facet of executive function, is the basis for other aspects of self-regulation (e.g., inhibitory control, self-monitoring, and strategies for problem solving), and is entwined in emotion regulation such that one cannot effectively regulate their emotions without eliciting attention (Berger et al., 2007; McClelland et al., 2015; McClelland et al., 2018).

Inhibitory control is the ability to inhibit actions based on immediate gratification, which may lead to negative outcomes, while simultaneously activating more adaptive responses, such as showing persistence, waiting for one's turn, and not being impulsive or getting easily

distracted (Nigg, 2017). A facet of executive function closely related to inhibitory control is working memory (Tsubomi & Watanabe, 2017; for review, see Nee et al., 2013), which enables children and adolescents to maintain information in their mind while they work and contemplate various strategies or solutions. These processes of executive function enable individuals to organize, problem-solve, manage time, regulate emotions, and elicit self-restraint and self-motivation.

Emotion Regulation

In addition to executive function and impulse control, self-regulatory function also includes emotion regulation (Mason et al., 2016). Although emotion regulation constitutes a complete area of research unto itself, there are important aspects of emotion regulation that overlap with the study of self-regulation (McClelland et al., 2015; McClelland et al., 2018; Shahab & Taklavi, 2019). Specifically, as intense emotions can disrupt or disorganize several psychological processes, one's ability to regulate their experience and expression of said emotions is considered vital, not only for the basic state of regulation, but also for cognitive processes, behavioral exploration, and for social competence (Diamond & Aspinwall, 2003).

Emotion regulation refers to internal transactional processes that enable an individual to appropriately regulate emotion, either consciously or unconsciously (Bridges et al., 2004; Diamond & Aspinwall, 2003). This may be accomplished through modifying either the emotion-eliciting situation, or one's own experience and expression of positive and negative emotions and the behaviors influenced by these emotional reactions (Bridges et al., 2004; Diamond & Aspinwall, 2003). The development of emotion regulation occurs through bidirectional relationships between the individual and their surrounding context as a function of multiple dynamic processes (McClelland et al., 2015; McClelland et al., 2018). These relationships

account for the interactions between the individual (i.e., genetic and/or neuronal individualities) and the environment in which the individual grows up (i.e., parenting, community, poverty, etc.). Prior research has indicated that infants and children originally rely on interactions with their caregivers to develop strategies to regulate their emotions, which are progressively internalized as they mature (Diamond & Aspinwall, 2003). As the process of regulating one's emotion improves and becomes more automatic, individuals are able to manage increasingly more stressful and complex environments (Calkins, 2010).

Self-Regulation in Youth

Adolescence is a key transition period of development in that there are significant ecological, social, and biological changes that occur (Arain et al., 2013; Steinberg, 2010). As it relates to self-regulation, development and growth in the brain increases the capacity necessary for advanced "adult-like self-regulation" (McClelland et al., 2018). This is primarily due to the gradual maturation of the prefrontal cortex and the development of frontal lobes (Steinberg, 2010), which allows for higher order cognition relevant for regulation, such as metacognition and internalized control (Larson, 2011). Adolescence is also a pivotal time in hormonal changes and navigating changes in social relationships, as well as a time when youth are directing behavior toward life goals. With the onset of puberty, youth experience a variety of physical and hormonal changes that can impact their cognitive functioning and emotional processing through the limbic system (Frere et al., 2020). These factors make self-regulation in adolescence particularly relevant.

Executive function initially emerges in infancy and undergoes continuous refinement into early adulthood, during which time there are associated changes occurring in the core neural networks that support executive function (Trossman et al., 2020). Processes related to impulse

control, planning and emotion regulation, are rooted in early neurobiological development (Mason et al., 2016). During adolescence, the brain evolves in its ability to regulate impulses, organize, and weigh risks and rewards (Arain et al., 2013). According to Kuhn & Franklin (2006) the emergence and strengthening of executive function “is arguably the single most important and consequential intellectual development to occur in the second decade of life” (p. 987). This development and growth of skills allows adolescents to make better choices, interpretations, and decisions about how they should interact with their environment, particularly concerning long-term goals. Identifying deficits in executive function is critical during adolescence, as deficits are associated with a number of psychiatric disorders (including conduct disorder and attention deficit/hyperactivity disorder), physical aggression, and substance use (LeBlanc et al., 2017).

Co-Regulation

As previously discussed, development of self-regulatory capacities in early childhood is highly dependent upon external support (from parents, caregivers, and preschool teachers) to help regulate behavior and internal states (Erdmann & Hertel, 2019; Martinez-Torteya et al., 2014; Bernier et al., 2010). This dependency is known as co-regulation. Through this process the parent or teacher tries to modify the child’s behavior, thoughts, and/or emotions appropriately based on the values and expectations of the environmental context (Erdmann & Hertel, 2019). This enables a child to internalize the experience of co-regulatory strategies, allowing them to become gradually more capable of independently regulating themselves (Erdmann & Hertel, 2019).

Without adequate support and comfort, children struggle to develop sufficient distress regulation strategies (Cooke et al., 2019). This results in key deficits that trigger internalizing

and externalizing behavioral difficulties (Cooke et al., 2019). For example, prior research has indicated that parental stimulation and sensitivity predict early childhood attention and memory performance (Fay-Stammach et al., 2014). Research has also shown that low levels of parental sensitivity and responsiveness are linked with increased emotion reactivity, as well as more fearfulness and negative mood during infancy and early childhood (Martinez-Torteya et al., 2014). Furthermore, one study found that less positive maternal parenting is linked with lower behavioral and emotional regulation, as well as higher physiological reactivity among infants (Martinez-Torteya et al., 2014).

Although research has heavily focused on co-regulation in infants and early childhood, Murray & Rosanbalm (2017) indicated that as children progress into adolescence, caregivers can still play an important role in self-regulation. During adolescence there are several different regulatory skills undergoing development, including managing frustration and stress, integrating emotions and thoughts to achieve goals, increases in complex thinking, as well as comparisons between the self and others. As adolescents are not solely independent from their caregiver during this period, parental figures can play a critical role in healthy development throughout adolescence and into adulthood. To support regulation in adolescence, caregivers can teach self-regulation skills through modeling, create opportunities for the youth to exhibit learned skills, and monitor and/or reinforce youth's progress; thus, providing a responsive and warm relationship as well as a structured environment (Murray & Rosanbalm, 2017).

Overall, research has shown that psychological changes in adolescence impact the development of both executive function and emotion regulation capacities, enabling adult-like regulation. In addition to brain maturation, caregivers and parents play critical roles in the development of self-regulation and can continue to influence regulation during adolescence. As a

result, adolescence may be considered a critical period in the development of self-regulation. Furthermore, as deficits in regulation can lead to negative outcomes such as psychiatric disorders, substance use, and physical aggression (LaBlanc et al. 2017), it is necessary for research to evaluate what factors may negatively influence self-regulation among populations at risk for such behavioral challenges. One factor, well documented within the literature that is associated with deficits in this function, is exposure to trauma.

Trauma

Trauma can occur through a multitude of experiences. Experiencing several traumatic events is a phenomenon known as *complex trauma*. According to Briere and Scott (2015), complex trauma is defined as “exposure to multiple, often prolonged or extended traumas over time, potentially including events such as rape, physical assault, sex trafficking, torture, and combat, and frequently in the context of previous childhood abuse/or neglect” (p. 515-516). Exposure to complex trauma is linked to a variety of psychological outcomes including post-traumatic stress disorder (PTSD) as a consistent response to a given traumatic stressor, dysfunctional behaviors, relational difficulties, and affect dysregulation (Briere & Scott, 2015). Although there are many ways to operationalize and measure trauma, the most common method throughout the literature is the Adverse Childhood Experiences (ACEs) instrument. ACEs document maltreatment in childhood including physical, sexual, emotional, psychological, or verbal abuse, as well as exposure to other household risk factors such as substance abuse, criminality, mental illness, and domestic violence (Hughes et al., 2017). According to the Children’s Bureau of the U.S. Department of Health and Human Services (2022), as of 2020, the rate of adolescent exposure to maltreatment from ages 14 to 17 ranges from 6.3 to 3.6 per 1,000 children, respectively. Research has shown that a greater number of ACEs is associated with

increased risk of negative outcomes, including problematic alcohol and drug use, sexual risk taking, poor self-related health, psychiatric disorders, family problems, and interpersonal violence (Cook et al., 2005; Copeland et al., 2018; Hughes et al., 2017).

Children exposed to complex trauma, or multiple forms of trauma, often are less likely to develop critical capacities for self-regulation (Cook et al., 2005). Specifically, exposure to trauma can have detrimental consequences to a child's biological stress systems and affect brain and cognitive development (Kraaijenvanger et al., 2020; Stowkowy et al., 2020). This is further substantiated by research, which has shown that ACEs negatively impact the development of the prefrontal cortex and are associated with poorer executive function (Lund et al., 2020). Another study found that ACEs have a significant negative correlation with both emotion regulation and executive function (cognitive flexibility; Shahab & Taklavi, 2019). Furthermore, a meta-analysis conducted by Op den Kelder and colleagues (2018), showed that trauma-exposed youth performed worse on working memory and inhibition tasks, and showed lower cognitive flexibility than youth not exposed to trauma. Another meta-analysis documented children and adolescents diagnosed with post-traumatic stress disorder (PTSD), which is highly associated with experiencing multiple forms of trauma (Briere & Scott, 2015), and reported more difficulties in emotion regulation than their counterparts who did not develop PTSD (Villalta et al., 2018). This prior research indicated that ACEs are associated with ineffective self-regulation, which is linked to several health-related outcomes including academic achievement, economic well-being, risk-taking behaviors, substance use, depression, ADHD, and criminal convictions in both adolescents and adults (Flaherty et al., 2013; Heatherton & Wagner, 2011; Robson et al., 2020).

Yet, research has also indicated that effective self-regulation may be a protective factor for youth living in high-risk environments where ACEs are more common. For instance, one study found that youth living in low-income households, who demonstrated higher self-regulation, had better developmental outcomes, including academic achievement, problem behaviors, depression, anxiety, and social competence, compared to counterparts who had diminished self-regulation capacities (Buckner et al., 2009). This study emphasized that skills in self-regulation may enable youth in low-income households to successfully cope with stressful life events (such as those related to ACEs). It also indicated that skills in self-regulation are important factors in supporting youth resiliency (Buckner et al., 2009).

Preliminary research within an adult population suggests that both emotion regulation and executive function mediate the effects of trauma on health-related outcomes (Cloitre et al., 2019; Trossman et al., 2020). For instance, in a community sample of adults (ages 19 to 73), deficits in executive function explained the relationship between adverse childhood experiences and symptoms of psychopathology as well as health risk behaviors (e.g., use of illicit or recreational drugs; Trossman et al., 2020). This study was replicated among a college population of emerging adults, further documenting that executive function is a key component in the relationship between trauma and psychopathology (Trossman et al., 2020). In another study, conducted among adult women, difficulties in emotion regulation (i.e., emotion dysregulation) mediated the relationship between ACEs and three different health outcomes, including PTSD, depression, and physical health (Cloitre et al., 2019). Similarly, within a population of JJ-involved youth, one study found that several facets of emotion dysregulation (e.g., lack of clarity of emotions, difficulty controlling behavior, goal-directed behavior, nonacceptance of emotional

responses, and limited access to strategies) were key components in explaining the association between exposure to trauma and PTSD symptoms (Bennett et al., 2016).

Although most of the prior research on the relationship between trauma and self-regulation has been conducted with adult samples, findings document the role of each in influencing health-related outcomes, with relevance for younger populations of JJ-involved youth (Bennett et al., 2016; Cloitre et al., 2019; Ford & Blaustein, 2013; Trossman et al., 2020). It is important, therefore, to extend this research by examining critical aspects of self-regulation (both emotion regulation and executive function) during the critical developmental period of adolescence and evaluate what other factors may account for its relationship with trauma. One such factor to consider is youth-caregiver attachment.

Attachment

First conceptualized by Bowlby (1969), attachment is a profound and enduring emotional bond, connecting one person to another (Ainsworth et al., 1978). An attachment figure is a trusted companion who provides comfort and support when a child encounters a potentially fear-arousing situation. Beginning in infancy and continuing throughout adulthood, attachment relationships withstand space and time, continuing to endure even if the attachment figure is absent for a time. In attachment theory, it is understood that every individual has a fear of being abandoned or separated from his or her attachment figure (Ainsworth et al., 1978). “Separation” is not just physical absence of an attachment figure but may also occur when the caregiver is perceived as inaccessible and/or unresponsive. This emotional separation elicits distress, and the anticipation of this possible occurrence arouses anxiety (Ainsworth et al., 1978). Over time, a child who has consistently experienced an appropriate response to their distress signals and

communication will expect the figure to continue to be accessible and responsive in the future. Bowlby (1969) referred to this cognitive aspect of attachment as a mental working model.

Prior research on attachment has established three primary and distinct patterns of attachment (Ainsworth et al., 1978; Waters et al., 2015). These patterns are classified as secure, insecure-avoidant, and insecure-anxious (Ainsworth et al., 1978; Feddern Donbaek & Elkit, 2014). Although these patterns of attachment were first observed in infants, further research on attachment patterns has shown that they persist through childhood into adulthood (Ainsworth et al., 1978; Belsky, 2002; Waters et al., 2015), and are associated with different caregiving environments as well as outcomes throughout one's life (Ainsworth et al., 1978; Belsky, 2002; Corcoran & McNulty, 2018; Waters et al., 2015).

Insecure attachment styles are associated with depression, anxiety, post-traumatic disorder, obsessive-compulsive disorder, eating disorders, suicidality, and personality disorders (Corcoran & McNulty, 2018). Furthermore, research has found that in adults, both anxious and avoidant attachment are associated with negative health outcomes, and that difficulties in emotion regulation mediate the relationship between anxious attachment and these outcomes (Lewczuk et al., 2018). Although not yet replicated with adolescents, these associations indicate the importance of gaining a better understanding of the relationship between attachment and emotion regulation, as it pertains to adolescents with higher mental health concerns, such as JJ-involved youth.

Attachment and Self-Regulation in Adolescence

As previously discussed, a key contributor to the development of self-regulation is co-regulation. This form of regulation is fostered by the parent-child attachment relationship. Parenting that involves non-supportive parent-child relationships, that undermine a child's ability

to self-regulate, can have significant and detrimental effects on a child's self-regulation (McClellan et al., 2018). For instance, a 3-year longitudinal study indicated that harsher parenting at age 12 was associated with lower self-regulation later during adolescence (Brody & Ge, 2001). However, a parent-child relationship that involves an emotionally positive parent-child relationship within the context of a predictable and organized home environment (elements of secure attachment), enables the development of competencies within self-regulation (Baumrind, 1991; Brody & Ge 2001; Moilanen et al., 2018; Morris et al., 2007; Sroufe, 1997).

Prior research documenting attachment as a crucial factor in the development of self-regulation (Padykula & Conklin, 2009; Kinniburgh et al., 2005) has historically focused on the dyadic relationship as it relates to infants and young children. However, according to Attachment Theory (Feddern Donbaek & Elkit, 2014; Bowlby, 1969, 1973, 1980), attachment behavior toward caregivers transforms immensely during adolescence (Bowlby, 1988). Efforts to maintain exploratory systems and attachment in adolescence manifest through the facilitation of autonomy and increases in negotiations with parents, while still attempting to preserve the relationship among adolescent and parent (Feddern Donbaek & Elkit, 2014). Furthermore, adolescents are vulnerable to insecurity, as the transitional period of adolescence results in increased conflict (Feddern Donbaek & Elkit, 2014). Parenting that includes supporting autonomy and setting boundaries (components of secure attachment) facilitates stronger self-regulation than parenting that focuses on compliance and control (Bernier et al., 2010; Lengua et al., 2007). Therefore, creating a "well-organized adolescent-parental relationship" is essential during this period (Feddern Donbaek & Elkit, 2014). Given the role of attachment in the development of self-regulation, it is important to evaluate the degree to which attachment relationships experienced by JJ-involved youth are related to self-regulation.

Trauma, Attachment and Self-Regulation

In addition to its influence on self-regulation, trauma can also impact the development of attachment relationships between caregiver and child (Cook et al., 2005), which can further hinder one's ability to develop adaptive regulation strategies. For example, research indicated that children who experienced maltreatment are more susceptible to developing insecure/disorganized attachments with their primary caregiver, which can lead to these individuals responding more adversely to stress and being more vulnerable to pathological breakdowns (Cicchetti & Doyle, 2016; Cook et al., 2005). Mental health problems emerging both from insecure attachments and childhood adversity may contribute to difficulties later in adult relationships, such as the attachment in romantic relationships and with partners, which places the individual at even further risk for psychological problems (Cooke et al., 2005).

As previously discussed, self-regulation is dependent upon external factors, such as the interaction between youth and caregiver. However, depending on the bidirectional relationship between the contextual factors and the individual, this interaction can be beneficial or harmful to development (Gayman et al., 2017). With regards to self-regulation, the caregiver's relationship with the adolescent and trauma experienced by the youth can both impact how self-regulation develops. For instance, research has shown that children ages 6 to 12 that are exposed to neglect, physical and/or sexual abuse, early onset maltreatment and multiple forms of maltreatment, exhibit greater difficulties in emotion regulation (Kim & Cicchetti, 2010). Yet, trauma and the parent-child relationship are not always mutually exclusive. Within households where maltreatment, neglect, or abuse occurs, parents are less likely to provide scaffolding and support when their child is upset, which is a vital way children learn constructive strategies to regulate their emotional states.

Adolescents in the Juvenile Justice System

Among youth involved in the JJ system, there are high rates of trauma, psychiatric, substance, anxiety, affective, and behavioral disorders, as well as sexually transmitted diseases (Ford & Blaustein, 2013; Sanders et al., 2018; Tolou-Shams et al., 2019). Research on this population indicated that approximately 60% have substance use disorders, 70% are diagnosed with psychiatric disorders, 92.5% have experienced at least one form of psychological trauma, and over 56.8% were exposed to trauma 6 or more times (Abram et al., 2004; Baglivio et al., 2014; Ford & Blaustein, 2013; Ford et al., 2008; Sanders et al., 2018). Additionally, it is estimated that roughly 67% to 90% of detained and adjudicated youth meet the criteria for at least one psychiatric mental health disorder, and almost 50% meet the criteria for two or more comorbid disorders (Ford & Blaustein, 2013).

Higher rates of trauma among this population increase their susceptibility to poor self-regulation and negative health outcomes (Ford & Blaustein, 2013). According to Ford and Blaustein (2013), adolescents in JJ residential facilities that experience traumatic stressors, often over an extensive amount of time in primary relationships, are likely to have neurological alterations that make them prone to excessive and blunt emotional reactions, impulsive, rigid, and disorganized coping and thinking styles. This experience of psychological trauma has a fundamental impact on the youth's regulatory processes that interfere with their ability to effectively manage emotions, body sensations, behavior, and interpersonal relationships. As a result, these youth are at an increased risk for impulsive or violent behaviors, substance use, high-risk activities, and are vulnerable to negative social influences (Finkelhor et al., 2007; Ford & Blaustein, 2013; Ford et al., 2010). These factors increase the likelihood of committing a

crime in young adulthood and substantially increase the risk of later involvement in criminal justice system as an adult (Copeland et al., 2007).

Current Study

As previously discussed, prior research indicated that self-regulation plays a vital role in one's mental and physical well-being (Heatherton & Wagner, 2011; Robson et al., 2020). Effective self-regulation enables one to better achieve goals and function as a member of society. Based on prior research, higher rates of trauma can negatively impact self-regulation (Cook et al., 2005; Lund et al., 2020; Op den Kelder et al., 2018; Shahab & Taklavi, 2019; Villalta et al., 2018). As self-regulation affects individuals throughout their life, and is shown to mediate the effects of trauma on negative physical and mental outcomes (Cloitre et al., 2019; Trossman et al., 2020), it is important to understand what factors may impact or influence the relationship between trauma and self-regulation.

Attachment is a critical factor in the development of self-regulation and is impacted by trauma (Padykula & Conklin, 2009; Kinniburgh et al., 2005). Research indicated there is a negative relationship between childhood trauma and attachment, such that individuals who experienced maltreatment are more likely to develop insecure attachments (Cicchetti & Doyle, 2016; Cook et al., 2005). This development of an insecure attachment can lead to the child being more vulnerable to breakdowns in psychopathology and respond adversely to stress (Cicchetti & Doyle, 2016; Cook et al., 2005). As it pertains to self-regulation, a substantial amount of research has illustrated the importance of attachment and co-regulation in infants in early childhood, as well as adulthood (Cooke et al., 2019; Corcoran & McNulty, 2018; Fay-Stammbach et al., 2014; Lewczuk et al., 2018; Martinez-Torteya et al., 2014), yet a dearth of information exists for adolescents.

As caregivers can still play a pivotal role in the development of self-regulation in adolescence, it is important to consider whether attachment influences the relationship between youth trauma and self-regulation. This is especially critical for individuals who are detained in the JJ system and will be released back into their previous environments with their families. The current study examines how trauma is associated with self-regulation and whether attachment influences the degree to which trauma is associated with these self-regulation factors.

The current study expands the current body of research by addressing how both trauma and attachment work to influence self-regulation in adolescents, in the specific population of JJ-youth. Furthermore, as minimal research has examined what factors may contribute to the association between trauma and self-regulation, this pilot study will expand research to examine how specific attachment styles are moderators of trauma and self-regulation. Aim one examines how childhood trauma is associated with a youth's ability to self-regulate. As prior research concerning these relationships has historically focused on younger children, this study examines not only how these relationships operate in adolescence, but specifically how trauma is related to two forms of self-regulation (i.e., deficits in executive function and emotion dysregulation). This is accomplished through the research question: Does childhood trauma experienced by the youth have a negative impact on the youth's ability to self-regulate? Hypothesis 1 states:

- (1) Youth ACEs will be positively associated with self-regulation (i.e., deficits in executive function and emotion dysregulation) in that as youth ACEs increase, youth's difficulties in self-regulation will also increase.

Aim two examines the relationship between attachment style and youth self-regulation. Because JJ-involved youth are more likely to experience trauma, and trauma is associated with greater dysfunction in relationships, it is expected that JJ youth will largely report insecure

attachment styles (i.e., anxious attachment and avoidant attachment). Furthermore, attachment styles may moderate the relationship between trauma and self-regulation (see Figure 1).

Hypotheses 2 and 3 state:

- (2) JJ-involved youth will have a greater likelihood of scoring high on anxious or avoidant attachment style.
- (3) Insecure attachment style will be a significant moderator of the relationship between trauma and self-regulation (i.e., deficits in executive function and emotion dysregulation), in that the relationship between trauma and self-regulation will be stronger for youth with insecure attachment styles.
 - a. The relationship between trauma and emotion dysregulation will be stronger for youth with anxious attachment.
 - b. The relationship between trauma and deficits in executive function will be stronger for youth with avoidant attachment

Information gained from these analyses have the potential to inform the development of interventions that target self-regulation in juvenile justice youth and highlight the value of integrating attachment into future interventions.

Methods

The data utilized in the current study was collected as a part of an ongoing 5-year longitudinal study entitled, “Preventing opioid use among justice-involved youth as they transition to adulthood: Leveraging Safe Adults (LeSA).” The project is funded by the National Institute on Drug Abuse (NIDA; Grant 1UG3DA050250 and 1UH3DA050250) and registered with ClinicalTrials.gov (NCT04678960). The purpose of the LeSA project is to assess the effectiveness of an intervention in preventing opioid and substance use among youth after release

from residential JJ facilities (Knight et al., 2021). The intervention used in the LeSA project is the Trust-Based Relational Intervention[®] (TBRI) developed by the Karyn Purvis Institute of Child Development (KPICD) at Texas Christian University (TCU). Through TBRI, the LeSA project aims to leverage family systems by providing instrumental and emotional guidance, role modeling, and support (Knight et al., 2021).

The LeSA project is designed to simultaneously test the effectiveness of TBRI in preventing opioid use among JJ-involved youth and to gain insights into obstacles at the facility level that need to be overcome for TBRI to be implemented and sustained as a part of re-entry protocols. The effectiveness portion of the trial includes a comparison between youth enrolled in the standard re-entry practice (SRP; Stage 1 – SRP) and those enrolled in SRP plus TBRI (Stage 2 – SRP + TBRI). Stage 1 – SRP consists of nine sites (two more sites were added after the start of recruitment), with study activities including both youth and caregiver assessments over 18 months. Although procedures can differ for each facility, SRP typically includes schooling, mental and behavioral services, group and/or individual counseling, anger management, and substance use treatment. SRP programs may differ in whether they incorporate the youth's family, as well as whether all individuals receive substance use treatment, or just those who have a prior history of substance use. The length of SRP varies by facility ranging from 8 months to 12 months (Knight et al., 2021). Stage 2 – SRP + TBRI encompasses the same nine sites and procedures in Phase 1, but it also includes both the youth and caregiver receiving the TBRI intervention, which consists of 9 youth trainings and 9 caregiver trainings, as well 4 nurture groups with both caregivers and youths attending. The nine sites included in the LeSA project are all secure residential facilities in both a Southwestern state and a Midwestern state that are designed to address emotional and behavioral needs of youth involved in the JJ system. All sites

included in the study have medium security protocols, provide educational, behavioral and medical health services (Knight et al., 2021).

Participants

Participants for the current study were drawn from the Stage 1 – SRP. The target sample for this study was at least 60 dyads (i.e., 60 youths and 60 caregivers) from nine facilities. Youth participants were referred to the project based on them (i) being disposed to probation and receiving care in a secure JJ-involved facility at the time of their recruitment, (ii) having no indication of active suicide risk, and (iii) having identified one caregiver that is willing to participate in the study through working with JJ-involved staff (Knight et al., 2021). The LeSA project aims for high diversity and expects the ethnic and sex distribution to reflect the population of the youth in sites.

Participants in this pilot study ($N=45$) consisted of 36 male youth and 9 female youth, of which 46.7% identified as ethnically Hispanic. The demographic race of the JJ-youth population varied with reportedly 33.3% white, 31.0% other, 21.4% black, 11.9% more than one race, and 2.4% American Indian/Alaska Native. It should be noted that individuals who selected “other” stated that they were referring to their race as either Hispanic or Mexican. See Table 1 for full summary of demographics.

Table 1*Frequency of Sample Demographics*

Demographic	Male		Female		Total	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Age						
14	3	100.0	0	0.0	3	6.0
15	6	85.7	1	14.3	7	14.0
16	9	75.0	3	25.0	12	24.0
17	17	81.0	4	19.0	21	42.0
18	1	100.0	0	0.0	1	2.0
Total Age reported	36	81.8	8	18.2	44	100.0
Ethnicity						
Hispanic or Latino	19	90.4	2	9.5	21	46.7
Not Hispanic or Latino	17	70.1	7	29.2	24	53.3
Total Ethnicity reported	36	80.0	9	20.0	45	100.0
Race						
White	9	64.3	5	35.7	14	33.3
Black	9	100.0	0	0.0	9	21.4
American Indian/Alaska Native	0	0.0	1	100.0	1	2.4
More than one race	3	60.0	2	40.0	5	11.9
Other	12	92.3	1	7.7	13	31.0
Total Race reported	33	78.6	9	21.4	42	100
Education						
8 th grade or less	8	88.9	1	11.1	9	20.0
9 th grade	14	87.5	2	12.5	16	35.6
10 th grade	5	71.4	2	28.6	7	15.6
11 th grade	5	83.3	1	16.7	6	13.3
12 th grade	1	50.0	1	50.0	2	4.4
GED	3	60.0	2	40.0	5	11.1
Total Education reported	36	80.0	9	20.0	45	100.0

Note. GED stands for General Educational Development

Procedures

Recruitment of families for participation in the LeSA project is facilitated by the sites. Families are identified as those who's youth are expected to be released from the facility into a caregiver's or guardian's supervision and will begin their probation approximately 3-months

after they are recruited. These families are connected to the LeSA research assistants (RAs) via brochures and email (Knight et al., 2021). Safe Adults (i.e., caregiver) and youth for Stage 1 – SRP are recruited and consented two to three months prior to the youth being discharged (Knight et al., 2021). Caregivers are asked to consent to their participation in the study as well as granting permission for the youth’s participation. The youth assent for participation is also obtained prior to research activities being conducted. If the youth turn 18 during the study, they will be asked to provide written consent. Each recruited youth and safe adult individually complete the baseline assessment at recruitment and complete additional assessments through follow-up interviews conducted at 3, 6, 12, and 18 months. All data for the five assessments is collected via Qualtrics. For the current study, only the baseline assessment of youth was included in analyses.

Consenting and assessments are facilitated by RAs via secure virtual platforms (e.g., Microsoft Teams, Zoom) with response information being entered into Qualtrics throughout the protocol interview (Knight et al., 2021). Caregivers and youth are individually compensated for their participation in the study with each receiving \$25 per completed assessment. Spanish-speaking families are accommodated in all research activities by ensuring all brochures, assent and consent forms, and assessments are available in both English and Spanish. All youth participants in the current sample speak English as their primary language. The research protocol for the LeSA project is approved by the TCU Institutional Review Board (IRB), as well as local juvenile boards and research review committees, when applicable.

Measures

In addition to the measures discussed below, information on general demographics (e.g., age, sex, race/ethnicity, education) for both the youth and caregiver was also collected. Additionally, as the population for this study consists of adolescents in JJ systems, data from the

youths JJ facility records will be collected (e.g., recidivism, treatment utilization, current offense, number of offense); however, youth records were not available at the time data collection for the current study occurred.

Trauma

For this study, early experiences of trauma were assessed using the 10-item Adverse Childhood Experiences Questionnaire (ACE-Q; Felitti et al., 1998). This is a self-report questionnaire that is designed to measure exposure to psychological, physical, or sexual abuse and household dysfunction due to substance abuse, mental illness, violence, or criminal behavior (Felitti et al., 1998). For each of the 10 questions, 1 point is scored for an answer of yes and 0 is scored for an answer of no, with the final scores ranging from 0 to 10. As the participant's score increases, so does the individual's risk of negative mental and physical health outcomes (Treat et al., 2019). This questionnaire was used to assess the youth's current trauma experienced. Although the threshold for ACEs in the literature is typically dichotomized to individuals with four or more (Hughes et al., 2017). The sum of ACEs events reported by youth was used in the current study.

Self-Regulation

Self-regulation of youth was operationally defined as executive function and emotion regulation. To capture these constructs, the youth's difficulties/deficits in these areas of self-regulation were measured. Executive function was assessed using the Barkley Deficits in Executive Functioning Scale – Children and Adolescent's - Short Form (BDEFS; Barkley, 2012; Collado-Valero et al., 2021). This is a 20-item parent-report scale for children and adolescents between the ages of 6 and 18 (Barkley, 2012; Collado-Valero et al., 2021). The BDEFS encompasses five different executive function domains to evaluate information on deficits in

executive function (Collado-Valero et al., 2021). These domains include Time Self-Management (i.e., “Procrastinates or puts off doing things until the last minute”), Solving and Self-Organization (i.e., “Has trouble explaining his/her ideas as well or as quickly as others”), Inhibition and Self-Restraint (i.e., “Makes impulsive comments”), Self-Motivation (i.e., “Does not put much effort into his/her chores, schoolwork, or other assignments”) and Emotion Regulation (“Has trouble calming him/herself down once he/she is emotionally upset”); Barkley, 2012). Response options for the items are based on a 4-point Likert scale (i.e., 1 = *never*, 2 = *sometimes*, 3 = *often*, and 4 = *very often*) to assess the frequency of behavioral alterations occurrence (Barkley, 2012). An overall score for executive function using the BDEFS is calculated by summing the scores of all 20-items (Barkley, 2012), with higher scoring indicating greater deficits in executive function. Consistent with prior literature, internal reliability for all scales ranged from $\alpha = .81 - .90$ in this study.

Emotion dysregulation of the youth was assessed using the state version of Difficulties in Emotion Regulation Scale (S-DERS; Gratz & Roemer, 2004; Lavender et al., 2017). As this scale is measuring difficulties in regulating emotions, it was considered a measure of emotion dysregulation rather than emotion regulation. The original trait version of the Difficulties in Emotion Regulation Scale (DERS) is a 36-item self-report scale for youth ages 11 through 17, as well as adults (Neuman et al., 2010; Gratz & Roemer, 2004). Originally developed and designed for the purpose of providing a comprehensive assessment of clinically relevant emotion regulation difficulties, the scale is structured across several domains of emotion regulation (Gratz & Roemer, 2004; Neuman et al., 2010). Utilizing the original DERS, the S-DERS was pared down to 21-items; it was developed to capture the salience of momentary difficulties in regulating emotion (Lavender et al., 2017). Similar to the original DERS, the subscales of S-

DERS assessing the difficulties include the following domains: Nonacceptance (i.e., “I feel ashamed of myself for feeling this way”), Modulate (i.e., “I am having difficulty controlling my behaviors”), Awareness (i.e., I am acknowledging my emotions”), and Clarity (i.e., “I am confused about how I feel”; Lavender et al., 2017). Response options for the DERS are based on a 5-point Likert scale (1 = *not at all*, 2 = *sometimes*, 3 = *about half the time*, 4 = *most of the time*, and 5 = *completely*). Scores for each domain are calculated by summing the individual items within each subscale, and the overall total score for S-DERS is calculated by summing all 21-items (Lavender et al., 2017), with higher scores indicating greater difficulties in regulating emotions (i.e., emotion dysregulation). Cronbach’s alpha for the total scale was $\alpha = .86$, demonstrating good internal consistency (Lavender et al., 2017). All four subscales also demonstrated adequate to excellent internal consistency (i.e., Awareness $\alpha = .76$; Clarity $\alpha = .85$; Modulate $\alpha = .87$; and Nonacceptance $\alpha = .91$).

Attachment

In order to assess the attachment style, the current study utilized the Experiences in Close Relationships-Relationship Structures scale (ECR; Feddern Donbaek & Elklit, 2014; Fraley et al., 2011). This scale was designed to assess structures of attachment in multiple relationships, such as with the mother, father, or romantic partner, using the same set of items for each relationship assessed (Feddern Donbaek & Elklit, 2014; Fraley et al., 2011). The ECR is a self-report 9-item questionnaire that assesses underlying attachment through two insecure attachment dimensions: avoidance (i.e., “It helps to turn to this person in times of need”) and anxiety (i.e., “I often worry that this person doesn’t really care for me”). Valid for use with 15- to 18-year-olds, as well as with adults, this scale assesses these dimensions of attachment across the participant’s relationship with their mother, father, and romantic partner, as well as with relationships in

general (Feddern Donbaek & Elklit, 2014; Fraley et al., 2011). Response options for the ECR are based on a 7-point Likert scale (1 = *strongly disagree* to 7 = *strongly agree*). Scores for the avoidance dominion (ECR-Avoidant) are calculated by averaging items 1 through 6, after reverse coding items 1 through 4, and scores for the anxious dominion (ECR-Anxious) are calculated by averaging items 7 through 9 (Fraley et al., 2011) with higher scores indicating greater anxious or avoidant attachment. Both anxious ($\alpha > .87$) and avoidance ($\alpha > .78$) subscale domains demonstrated good internal consistency. As a proxy for generally attachment style, the current study utilized the youth's reported attachment style for the Safe Adult they will be living with after they are released from the JJ-facility, as this adult may be a biological parent, adoptive parent, grandparent, or other guardian in the youth's life.

Analytic Plan

Analytical procedures were conducted in the following sequence: (1) preliminary descriptive analyses, including testing assumptions for regression; (2) correlational analyses exploring preliminary relationships and identifying potential covariates; (3) regression analyses examining relationships between trauma and self-regulation; (4) descriptive analysis of the sample reported attachment styles; and (5) moderation analyses examining the role of insecure attachment styles in relationships between trauma and self-regulation.

All statistical analyses for the proposed study were conducted using SPSS version 26. Prior to conducting analyses, descriptive statistics were generated on the data to assess assumptions related to analyses and to determine whether any outliers should be removed from the data. Assumptions based on residuals were tested prior to primary analyses included multicollinearity, independence, homoscedasticity, and normality (Cook, 1977; Durbin &

Watson, 1950; Shapiro & Wilk, 1965; Stevens 2002). If assumptions were not met, transformations were then be performed on the data.

Means, standard deviations and Pearson coefficients were calculated for the key study variables. Correlations were examined between demographics (i.e., age, sex, race, number of offenses, and recidivism) and key variables including trauma, self-regulation (i.e., deficits in executive function, emotion dysregulation), and attachment. Demographic variables that were significantly related to key variables at $p < .05$ were considered as covariates in the analyses discussed below.

To address hypothesis 1, two simple linear regression analyses were conducted separately to establish the relationship between trauma and self-regulation. Specifically, these examined the relationship between ACEs and deficits in executive function, and ACEs and emotion dysregulation. Hypothesis 2 was addressed graphically by including both the anxious attachment style variable and the avoidant attachment style variable in a scatter plot. This illustrates the distribution of the sample within each of the insecure attachment styles. To address hypothesis 3, the PROCESS macro model in SPSS (Hayes, 2022; Model 3) was used to test whether attachment style moderates the relationship between youth trauma and self-regulation.

Moderation considers how a construct, such as attachment style, influences the degree to which the independent variable (i.e., trauma, in this case) is associated with the dependent variable (i.e., self-regulation). Thus, moderation analyses enable researchers to better understand underlying factors that strengthen or weaken the relationship between the independent and dependent variable. Continuous variables including ACEs and attachment dimensions were mean centered using the Hayes (2022) PROCESS model, which allowed for variables to represent relatively high, median, and low levels in analytic models. Additionally, using PROCESS the

conditioning values for the 3-way interaction were set to minus 1 standard deviation (-1SD), mean, and plus 1 standard deviation (+SD).

Based on correlational significance, determined in preliminary analyses, hypothesis 3 was addressed through conducting two 3-way moderated regression models examining the influence of attachment styles (i.e., anxious, avoidant, and secure) and ACEs on the two dependent self-regulation outcomes (see Figures 1 and 2). As depicted in Figure 1, this model considers how the interaction between youth ACEs, anxious attachment, and avoidant attachment predicts deficits in executive function. In conducting the model in Figure 1, three 2-way interactions (i.e., ACEs*Anxious, ACEs*Avoidant, and Anxious*Avoidant) are also generated to evaluate how each 2-way interaction might predict deficits in executive function. Similar to Figure 1, Figure 2 generates the same analyses, but results are based on emotion dysregulation as the dependent outcome. In addition to analyzing the 3-way interactions, hypothesis 3a and 3b were addressed by examining the 2-way interactions within the two models, which evaluated how the two insecure attachment styles separately influenced the different outcomes of self-regulation. Moderation was determined based on *p* values of less than .05 and bootstrap re-samples on the data with 5,000 re-iterations at 95% confidence intervals (Hayes, 2022).

Figure 1

Moderation Model for Deficits in Executive Function

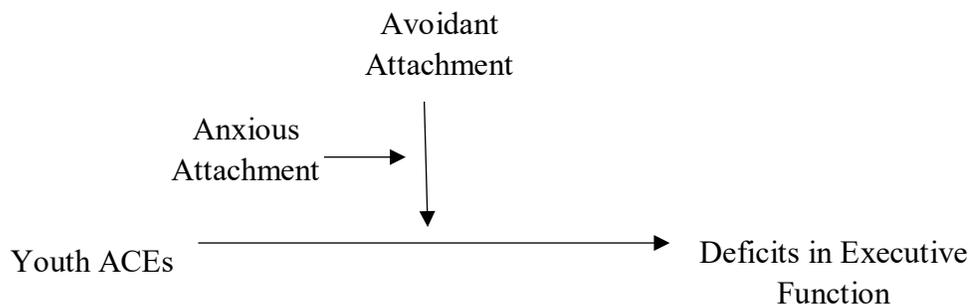
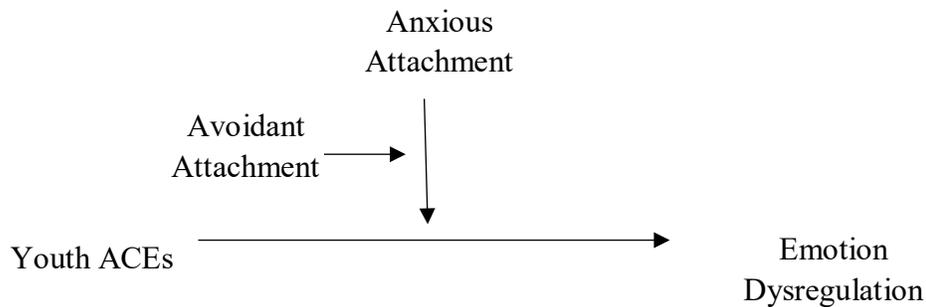


Figure 2*Moderation Model for Emotion Dysregulation***Results****Descriptive Statistics and Correlational Analyses**

All assumptions of regression were tested prior to conducting any analyses on the data. No outliers were identified or removed from the data. All regression assumptions were met (i.e., independence, collinearity, homoscedasticity, and normality) and residual values confirmed normality using Shapiro-Wilk, $p > .05$ (Shapiro & Wilk, 1965). Therefore, data were not transformed in any way. See Tables 2 and 3 for descriptive statistics on demographics that were considered as potential covariates (Table 1) and key variables (Table 2).

Table 2*Descriptive Statistics of Potential Covariates*

Variable	<i>n</i>	<i>M</i>	<i>SD</i>	Minimum	Maximum
Age	44	16.23	0.99	14.00	18.00
Gender	45	1.20	0.41	1.00	2.00
Race	42	5.43	1.35	1.00	7.00

Note. For frequencies descriptive statistics of potential covariates see Table 1

Table 3*Descriptive Statistics of Key Variables*

Variable	<i>n</i>	<i>M</i>	<i>SD</i>	Minimum	Maximum
ACEs	45	3.38	2.69	0.00	10.00
BDEFS	43	49.72	13.16	20.00	75.00
S-DERS	41	41.88	12.17	27.00	92.00
ECR-Avoidant	42	3.27	1.50	1.00	7.00
ECR-Anxious	42	2.37	1.61	1.00	7.00

Note. ACEs – Adverse Childhood Experiences; DEF – Deficits in Executive Function; BDEFS - Barkley Deficits in Executive Functioning Scale – Children and Adolescent’s - Short Form; S-DERS - Difficulties in Emotion Regulation Scale; ECR-Avoidant refers to the Avoidant attachment scale of the Experiences in Close Relationships-Relationship Structures scale; ECR-Anxious refers to the Anxious attachment scale of the Experiences in Close Relationships-Relationship Structures scale

Correlations between all variables considered in this study are presented in Table 4. Correlational analyses indicated a significant relationship between trauma and emotion dysregulation ($r = .522, p < .001$), as well as trauma and anxious attachment ($r = .494, p = .001$). There was also a significant correlation between anxious attachment and emotion dysregulation ($r = .509, p = .001$). However, there was no significant correlation between trauma and deficits in executive function ($r = -.058, p = .728$), nor between trauma and avoidant attachment ($r = .013, p = .937$). Analyses also identified a significant relationship between trauma and gender ($r = .305, p = .042$). However, due to the small sample size, gender was not included as a covariate in the analyses discussed below.

Table 4*Correlations*

Variable	ACEs	BDEFS	S-DERS	ECR-Avoidant	ECR-Anxious	Age	Gender	Race
ACEs	1	-.058	.522**	.013	.494**	-.017	.305*	-.003
BDEFS		1	-.110	-.204	-.188	.180	-.132	.012
S-DERS			1	.280	.509**	.019	-.044	.034
ECR-Avoidant				1	.632**	.221	-.109	-.014
ECR-Anxious					1	.157	.083	-.065
Age						1	.072	-.065
Gender							1	-.168
Race								1

Note. ** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed). Data for youth recidivism and number of offenses were not available at the time analyses were conducted.

Relationship between the Trauma and Self-Regulation

A simple linear regression was used to examine the relationship between emotion dysregulation and adverse childhood experiences (i.e., trauma). Results showed that trauma was significantly associated with emotion dysregulation, $b = 2.32$ ($SE = .61$), $t = 3.82$, $p < .001$, $R^2 = .27$. This model partially supported hypothesis one in that an increase in reported trauma indicated an increase in emotion dysregulation. For every additional ACE reported, emotion dysregulation increased by 2.32. As the correlation between trauma and deficits in executive function was non-significant, regression models were not conducted for this outcome.

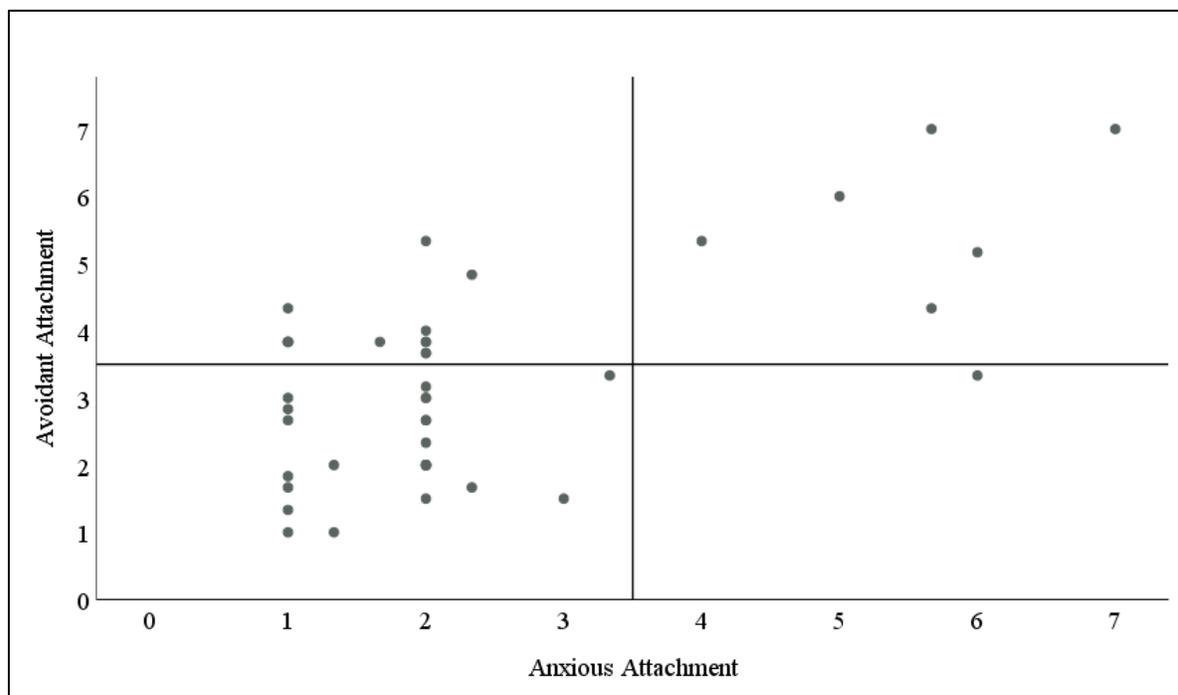
Distribution of Attachment Styles

As seen in Table 3, means for insecure avoidant attachment and insecure anxious attachment were both less than 3.5 (range = 2.37 to 3.27), which suggests that most of the sample

for this study did not fall solely within one insecure attachment style. This is corroborated by the scatterplot seen in Figure 3. Based on descriptive analyses, of the 42 participants with ECR scores: 12 scored above 3.5 on ECR-Avoidant only, 1 scored above 3.5 on ECR-Anxious only, and 6 score above 3.5 on both ECR-Avoidant and ECR-Anxious. The remaining 23 participants scored less than 3.5 on both ECR-Avoidant and ECR-Anxious. This indicates that 19 of the 42 participants would fall within an insecure attachment style. Thus, descriptive analyses indicate that while 45.2% of youth displayed some anxious and/or avoidant tendencies, the majority of participants (54.7%) did not report insecure attachment styles.

Figure 3

Scatter Plot of Attachment Styles



Attachment as Moderator

A 3-way moderated regression analysis ($N=40$) examined whether tendencies toward anxious attachment (centered) and avoidant attachment (centered) differentially affected the relationship between trauma (centered) and emotion dysregulation. Analyses utilizing Hayes

(2022) PROCESS Model 3 revealed a marginal 3-way interaction [$b = -.53$ ($SE = .28$), $t = -1.87$, $p = .071$ (95% CI -1.10, .05, See Figure 4)].

Relying on Figure 4 for illustrative purposes, each line represents an interaction of the three independent variables (i.e., trauma, anxious, and avoidant) on the dependent variable emotion dysregulation. These lines explain the 3-way interaction between trauma, anxious attachment and avoidant attachment at low (-SD) and high (+SD) levels of each variable. For example, line (1) High Anxious High Avoidant shows the directionality and relationship between low rates of trauma (-1SD) and high rates of trauma (+SD) on emotion dysregulation when participants reported high scores in ECR-Anxious (+SD) and high scores in ECR-Avoidant (+SD).

Although the 3-way moderated regression was only marginal in significance, further examination of simple slope tests were conducted to test all hypotheses. Simple slope analyses indicated at high levels of ECR-Anxious there was a significant positive relationship between trauma and emotion dysregulation (higher levels of trauma associated with greater dysfunction) when ECR-Avoidant was high (+1SD; $b = 3.54$ [$SE = 1.33$], $t = 2.66$, $p = .012$; See Figure 4 line [1] High Anxious, High Avoidant), average (mean; $b = 4.75$ [$SE = 1.42$], $t = 3.35$, $p = .002$), or low (-1SD; $b = 5.96$ [$SE = 2.00$], $t = 2.97$, $p = .006$; See Figure 4 line [2] High Anxious, Low Avoidant). Additionally, there was also a significant effect of trauma on emotion dysregulation at an average level (mean) of ECR-Anxious when ECR-Avoidant levels were average ($b = 2.75$ [$SE = 1.06$], $t = 2.58$, $p = .015$) or low ($b = 2.65$ [$SE = 1.05$], $t = 2.51$, $p = .017$).

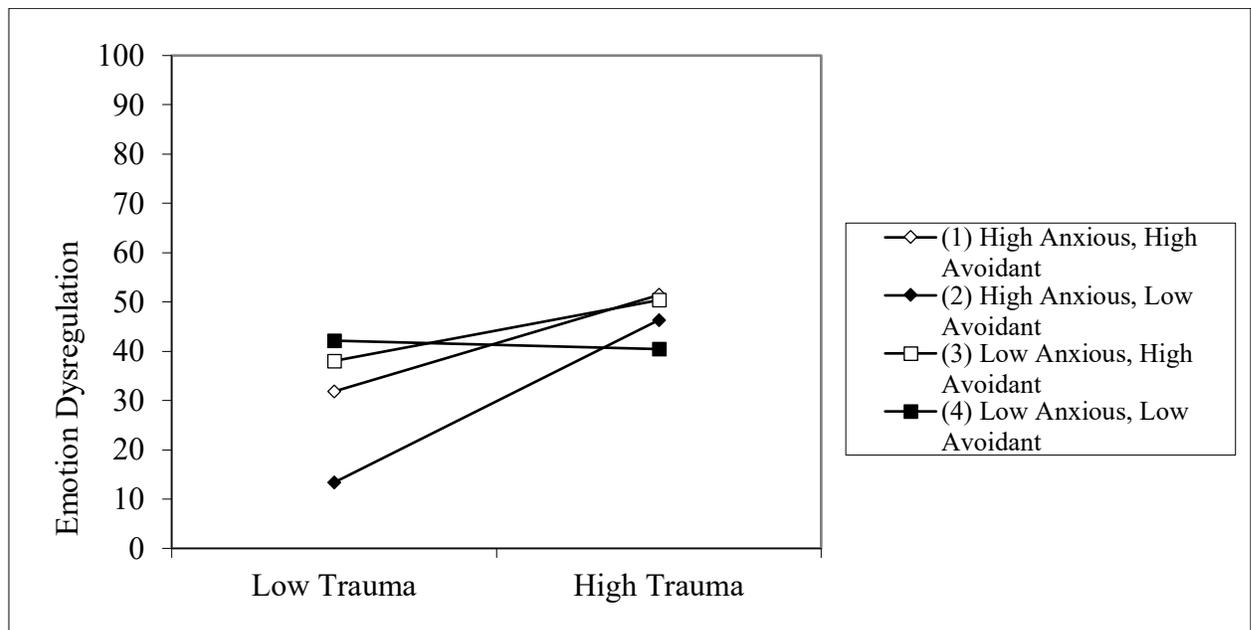
However, there was no significant effect when ECR-Anxious was at an average level (mean) and ECR-Avoidant was at high levels ($b = 2.85$ [$SE = 1.89$], $t = 1.50$, $p = .1425$). There was also no significant effect of trauma on emotion dysregulation at low levels of ECR-Anxious

when ECR-Avoidant was high ($b = 2.23$ [$SE = 2.58$], $t = .87$, $p = .393$; See Figure 4 line (3) Low Anxious, High Avoidant), average (mean; $b = .96$ [$SE = 1.36$], $t = .70$, $p = .486$), or low ($b = -.31$ [$SE = 1.34$], $t = -.23$, $p = .819$; See Figure 4 line (4) Low Anxious, Low Avoidant).

Overall, simple slope analyses of the 3-way moderated regression indicated that when individuals scored high on ECR-Anxious there was a significant effect of trauma on emotion dysregulation regardless of whether the individual also scored high, average, or low on ECR-Avoidant. There was also a significant effect at average levels of ECR-Anxious unless ECR-Avoidant levels were high. Additionally, as scores on ECR-Anxious decreased below the mean there was no significant effect of trauma on emotion dysregulation. Thus, results indicate that when individuals scoring high or average on ECR-Anxious experience high rates of trauma these individuals will likely have greater difficulty in regulating their emotions than individuals who score low on ECR-Anxious.

Figure 4

3-way Moderated Regression



Results of the 3-way moderated regression also indicated a significant 2-way interaction between trauma and anxious attachment, $b = 1.24$ ($SE = .59$), $t = 2.11$, $p = .043$. Furthermore, results of the 2-way interaction revealed that at low levels of ECR-Avoidant there was a significant effect of the interaction between ECR-Anxious and trauma on emotion dysregulation, $F(1, 32) = 5.66$, $p = .023$. However, the interaction did not have a significant effect when ECR-Avoidant levels were high, $F(1, 32) = .56$, $p = .458$. Overall, results of the 3-way moderated regression support Hypothesis 3a. In that anxious attachment is a significant moderator of the relationship between trauma and emotion dysregulation.

Discussion

Challenges with self-regulation are particularly problematic among high-risk populations such as JJ-involved youth. For youth in general, an inability to self-regulate is associated with several mental health and social problems, including sexual infidelity, poor financial problems, obesity, and addiction (Heatherton & Wagner, 2011). Among JJ-involved youth, these are further complicated by histories of (trauma, and the caregiver-youth relationships). Regulatory capacities in early childhood are largely dependent upon external support (from caregivers, parents, and teachers) to help adjust behavior and internal states (Erdmann & Hertel, 2019; Martinez-Torteya et al., 2014; Bernier et al., 2010), and for youth that experience sensitive and responsive parenting (consistent with fostering secure attachment), these healthy relationships help to develop strong self-regulation (Bernier et al., 2010; Lengua et al., 2007), better mental health, improved relationships, and fewer problems with alcohol abuse (Heatherton & Wagner, 2011). But for youth with histories of trauma and insecure attachment, there is greater risk of dysregulation, which lead to adversely responding to stress, vulnerability to pathological problems, risk of substance abuse, and difficulties in romantic relationships (Cicchetti & Doyle,

2016; Cook et al., 2005; Flaherty et al., 2013; Heatherton & Wagner, 2011; LaBlanc et al. 2017; Robson et al., 2020).

This exploratory study evaluated whether attachment interacts with trauma to influence self-regulation, as measured by emotion dysregulation and deficits in executive function. Findings supported the hypothesized relationship between trauma and emotion dysregulation (hypothesis 1), indicating that trauma was significant and positively associated with emotion dysregulation. Hypothesis two focused on the likelihood of this sample exhibiting high anxious and/or avoidant attachment styles. Descriptive analyses of the sample did not support hypothesis 2, as less than half (46.2%) of the sample reported scores above 3.5 (i.e., the mean of the response options) on either ECR-Anxious or ECR-Avoidant. Additionally, within this portion of the sample, there was not clear categorization into either anxious or avoidant attachment. Rather scores ranged largely from only avoidant to both avoidant and anxious scores, with only one respondent solely reporting higher anxious scores.

Hypothesis 3a explored the potential 3-way interaction between trauma, anxious attachment, and avoidant attachment, proposing that the significance of this interaction on emotion dysregulation would be driven by higher anxious attachment. Results indicated only marginal significance on the 3-way interaction among the independent variables, which suggests that significance may be found with a larger sample size. Significance within the 3-way interaction would show that attachment style, whether secure or insecure, influenced the degree to which one is able to regulate their emotions as exposure to trauma increase. There was, however, a significant 2-way interaction, which suggested that trauma's association with emotion dysregulation was influenced by anxious attachment. Such that JJ-youth with anxious attachment have greater difficulties in regulating emotions as exposure to trauma increases.

Furthermore, there was no significant 2-way interaction between avoidant attachment and trauma on emotion dysregulation. This showed that for JJ-youth with avoidant attachment there was no difference in their ability to regulate their emotions as exposure to trauma increased. Thus, results supported hypothesis 3a.

Findings within the current study are consistent with prior research, as there was a correlational tie between anxious attachment and emotion dysregulation (Kim & Cicchetti, 2010), and exposure to trauma was positively associated with emotion dysregulation within JJ-involved youth (Ford & Blaustein, 2013). Results expand the current body of literature by addressing the role of attachment style on the association between trauma and emotion dysregulation. By examining two different outcomes of self-regulation (i.e., executive function and emotion dysregulation), this study provides evidence for identifying how different attachment styles impact these two outcomes. Specifically, this study showed that when combined with exposure to trauma, anxious attachment is linked to higher rates of emotion dysregulation, whereas there was no significant influence of avoidant attachment. By gaining a better understanding of the role different attachment styles have on self-regulation, this study offers preliminary support for informing the selection and/or creation of interventions that target improving self-regulation (particularly emotion dysregulation) among the JJ-youth population.

While executive function is an important component of self-regulation, correlations between trauma and deficits in executive function were non-significant. There was also no correlation between trauma and avoidant attachment or between avoidant attachment and executive function deficits. Therefore, further examination of trauma as a predictor of executive function (part two of hypothesis 1) was not feasible, nor was examining avoidant attachment as a moderator of trauma and executive function (hypothesis 3b).

Although it is not clear as to why there was no significant correlations among these variables, there are a few factors that may explain this occurrence. The BDEFS measure used to assess executive function was completed by the caregiver and was the only parent-report used in analyses. All other variables were self-reported by the youth. Thus, the results of BDEFS may be more indicative of the caregiver's perception of the youth and their own attachment styles rather than an accurate reflection of the youth's executive function abilities. Caregivers are only able to rate the youth based on their own experiences, which does not include an overall understanding of the youth's behaviors across all settings and interactions. This may be substantiated by prior research, which found an association between trauma and executive function in an adult sample when using the self-report version of BDEF (Trossman et al., 2020). Furthermore, as caregivers in the LeSA project included biological, adoptive, and foster parents, as well as grandparents, some caregivers may not have spent a great deal of time with the youth prior to the youth's incarceration. Therefore, LeSA caregivers may not have a precise perception of the youth's executive function abilities. This potential limitation will need to be considered in future studies that utilize the LeSA data to look at change over time; changes from baseline to follow-up may not be a true reflection of change over time in executive function abilities, but rather may be attributable to the LeSA caregiver spending more time with the youth after discharge from the facility.

Additionally, the lack of correlation between avoidant attachment and self-regulation variables (i.e., deficits in executive function and emotion dysregulation) may also be attributed to youth resiliency in learning to adapt and develop self-regulation skills independent of caregiver support. Avoidant attachment is typically generated through a consistent absence in accessibility to the attachment figure. Thus, many individuals that development this form of insecure

attachment may learn to rely on themselves and their perceptions of others rather than rely on their attachment figure to meet their needs and help them develop skills in self-regulation. Furthermore, avoidant attachment may also result in individuals exhibiting some numbness in expressing emotions and interpreting them. Thus, the S-DERS may be more sensitive to emotion volatility rather than this form of numb regulation.

Limitations

Although the results of this study are promising, there are several limitations that should be considered. The most notable limitation is the sample size. For this pilot there were 42 participants, and of those, only 7 scored above 3.5 on ECR-Anxious. As significant results relate to this construct, results should be interpreted with caution. Furthermore, the marginal 3-way interaction was negative, which may be a result of the small sample size, as all significant simple slot analyses were positive. Thus, to determine the true relationships at play within the population of JJ-involved youth, a larger sample size is needed to confirm the accuracy of the results found in this study. Another limitation to consider is the sample demographics. As this study only includes adolescents in the JJ system (most of whom were male), the results may not be generalizable to adolescents outside these settings or to females in the system. This study also only incorporates secure residential facilities from two states in the US. Consequently, results should be interpreted with caution when generalizing to adolescents in other JJ facilities. Lastly, the current study does not address change over time, thus causality cannot be determined.

Future Directions

Results of this pilot study expand research to consider how different attachment styles impact specific forms of regulation (specifically emotion dysregulation). These findings inform future research to consider targeting attachment style as a way influence positive change in

emotion dysregulation. Thus, future studies should consider change over time in attachment and explore how regulation of youth changes in response to attachment. Future studies considering the relationship between trauma, attachment and self-regulation should focus on obtaining a larger sample to test the hypotheses in the current study. Increasing the sample size would improve the power associated with the study, which enhances the probability of accurately rejecting null hypotheses (Cohen, 1992). An increased sample size may be acquired by expanding the data collection period, increasing incentives, and expanding to other U.S. states. Another option would be to partner with state departments which oversee several different facilities, such as state Juvenile Justice Department. By increasing power, future research can also consider how controlling for gender may influence the associations among these four variables.

Additionally, it would also be beneficial to consider other/multiple ways of assessing executive function abilities, such as youth self-report measures on executive function. By including a youth self-report measure, future analyses may be more consistent in conveying overall executive function abilities, since youth are more aware of their overall abilities across situations and interactions. Although not as heavily used in the literature, there are a few self-report measures that have been adapted in recent years, including the Amsterdam Executive Function Inventory (AEFI; Van der Elst et al., 2012) and Dynamic Occupation Assessment of Executive Function (DOAEF; Chubarov et al., 2015; Nyongesa et al., 2019). However, most measures of executive function used in research are task-based, which can be time consuming in order to capture the different elements of executive function (Nyongesa et al., 2019). One of the most widely used, and costly, measures of executive function is the Behavioral Rating Inventory of Executive Function (BRIEF; Gioia et al., 2000; Guy et al., 2004; Nyongesa et al., 2019),

which has shown to be valid across a number of settings (Nyongesa et al., 2019). If able, future research should consider using both the parent-report BRIEF assessment as well as a self-report measure when possible. Future analyses should also consider additional variables that will corroborating the results of executive function such as GPA, incident reports, and behavioral variables they may help show an accurate depiction of the youth skills in executive function for the sample. Capturing this real time data can be done by gaining parent consent for release of academic records and entering into data sharing agreements with facilities to measure incident reports. By including at least two methods of assessing executive function in adolescence, future studies will be able to better determine the validity of executive function scores.

Another area future studies could explore is incorporating a measure of the rate in which the youth are exposed to certain forms of trauma, such that participants could indicated the number of times an ACE occurred. As prior research has focused on the number of ACEs predicting poor self-regulation (Lund et al., 2020; Shahab & Taklavi, 2019), adding the number of times an ACE occurred may enable future studies to assess whether exposure mediates (number of times) the relationship between trauma and self-regulation. Especially as increased exposure is likely to have a negative association with self-regulation. Lastly as previously discussed, this study does not determine causality. Thus, future studies should also look at change over time to verify whether trauma causes difficulties in self-regulation, and to evaluate whether a change in attachment style from insecure anxious to secure may decrease the degree to which trauma influences self-regulation.

Conclusion

This study provides preliminary evidence that anxious attachment plays an important role in moderating the effect of trauma on emotion dysregulation. Based on the study results,

interventions that target improving emotion dysregulation should consider incorporating aspects of care that focus on improving attachment relationships, especially for individuals with anxious attachment styles. This may include identifying an adult caregiver for the youth that is able to invest in providing a secure attachment for that youth, as well as working with current parents and caregivers to increase their own awareness, connection, and effective self-regulation (Purvis et al., 2013; Purvis et al., 2015). Interventions that are able to increase secure attachment between youth and an adult caregiver will likely promote decreased emotion dysregulation, as the child can learn to regulate from the intervention and from improved regulation within the caregiver. By addressing emotion dysregulation, better behavioral outcomes among youth are more likely (i.e., improved mental health, decrease in substance and alcohol abuse, decrease in aggression, and risky sexual behavior).

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VITA

Lillyan Taylor Shelley was born May 21, 1992, in Abilene, Texas. She is the daughter of Thomas Joseph Taylor and Stephanye Sayles Taylor. A 2010 graduate from Jim Ned High School, Tuscola, Texas, Lillyan received a Bachelor of Business Administration degree from Texas Christian University, Fort Worth, Texas, in 2014. After working in the financial sector for several years, she decided to attend the University of Houston, acquiring pre-requisites in psychology, to pursue a doctoral degree in this field. In the Summer of 2020, Lillyan enrolled in graduate study at Texas Christian University, working with Dr. Danica Knight to research adolescent development and the effectiveness of the Trust Based Relational Intervention (TBRI).

ABSTRACT

THE ROLE OF ATTACHMENT ON THE RELATIONSHIP BETWEEN TRAUMA AND SELF-REGULATION AMONG JUSTICE-INVOLVED YOUTH

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This pilot study examined whether aspects of the youth-caregiver attachment relationship influenced the degree to which trauma is associated with self-regulation within the vulnerable population of juvenile-justice involved youth. Data utilized in the current study was from an ongoing 5-year longitudinal project. Correlation, simple linear regression, and moderated regression analyses were used to address relationships among the four factors. Results indicated a significant positive association between trauma and emotion dysregulation, and that anxious attachment moderated this relationship. No relationship was found between trauma and executive function, or between insecure attachment styles and executive function. Results of this study provide preliminary evidence of how attachment influences the association between trauma and emotion dysregulation. As the findings from this study indicate attachment as potential underlying mechanisms of self-regulation, these results are informative for interventions targeting positive change in self-regulation within the population of justice involved youth.