FORMING A THERAPEUTIC RESPONSE TO ADOLESCENT IMPULSIVITY

By

Kira M. Hansen, B.A.

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APPROVED:

Valerie Gifford, Ph.D., Committee Chair
Samantha McMorrow, Ph.D., Committee Member
Mike Daku, M.Ed., Committee Membe
Cindy Fabri, Chair
Graduate Programs, School of Education

Abstract

Utilizing a biopsychosocial perspective, this paper addresses the impact, causes, and treatment of adolescent impulsivity. Specifically, the defining features of impulsivity are identified, and the implications that impulsivity has on adolescent criminal behaviors, treatment participation, and quality of life measures are addressed. As a result of this paper's findings, a therapeutic integration of Dialectical Behavior Therapy and working memory training is proposed in order to meet treatment needs that have gone unaddressed, and this integrated model is presented in the form of a group treatment manual.

Keywords: adolescents, impulsivity, development, biopsychosocial, limbic system, executive functioning, neurochemical, working memory training, dialectical behavior therapy.

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Forming a Therapeutic Response to Adolescent Impulsivity

In examining rates and patterns of juvenile crime in Alaska from 1994-2012 and 2014, overall arrest rates appear to be consistently decreasing. For example, the "Easy Access to FBI Arrest Statistics" report on persons under the age of 18 in Alaska for the period between 1994-2012, demonstrates a steady decline in overall total arrests from 7,399 arrests in 1994 to 3659 arrests in 2011(Puzzanchera & Kang, 2014). Further, in looking to the 2014 Alaska uniform crime report for more current data, it appears that this trend continues, as there were only a total of 1903 arrests of individuals under the age of 18 in 2014 (Department of Public Safety, n.d.).

However, if the reviewer does the math, some interesting elements emerge from these reports and their data. Upon further inspection, while overall arrests continue to fall in the state of Alaska, the relative prevalence (arrests for specific crimes divided by the total number of arrests) of certain crimes appears to be slowly increasing. Specifically, the prevalence of crimes such as drug abuse and liquor law violations seem to be increasing incrementally over each year. Although these crimes increase, the rates for aggravated assault, larceny/theft, other assaults, sex offenses, vandalism, and disorderly conduct seem to hold relatively steady. Notably, of all the criminal statistics, larceny/theft consistently remains the most prevalent crime across all reviewed timeframes, accounting for between 22-26% of all crimes committed for each year (Puzzanchera & Kang, 2014; Department of Public Safety, n.d.).

This information raises numerous considerations. While in the state of Alaska there appears to be a consistent trend of decreasing arrests of juveniles, one is left wondering why the prevalence of some crimes is increasing and why others are holding steady. Upon close examination, a common characteristic of these crimes is that they appear to be motivated at least in part by impulsivity. This paper, therefore, explores the role of impulsivity in the commission

of adolescent crime. To facilitate an exploration of impulsivity, this paper answers the following questions: what is the relationship between impulsivity and adolescent crime; what causes and influences impulsivity in adolescence; and how can impulsivity be addressed by therapeutic interventions? Subsequently, this paper also proposes the incorporation of working memory training into existing treatment modalities to better address impulsivity within treatment.

This literature review examines impulsivity and its relationship to adolescent crime, with a specific focus on the role of mental health, in treating impulsivity in juvenile criminal behavior. Further, this paper explores both current and potential future therapeutic counseling interventions for supporting therapeutic change within the juvenile offender population. As such, an examination of the literature regarding the factors that influence the expression of impulsivity in adolescents, as well as evidenced based interventions and treatments, are explored. The ultimate goal of this paper is to provide a thorough understanding of the needs of this population, methods for meeting these needs, and a curriculum and handbook for using these methods in a group setting.

Literature Review

In the treatment of mental disorders, therapists often seek to understand the origins of a problem, the long-term implications for that problem, and the best ways to address the problem. Often times however, there are multiple underlying factors to behaviors and disorders that work to create and perseverate a problem. Working to address and further decrease adolescent criminal offending is very similar to the process of treating a mental disorder. In order to best address and explore this problem, one must explore its origins, it's long-term implications, and the possible solutions.

Criminality and Mental Health

In their 2005 review of the available literature and research, Odgers, Burnette, Chauhan, Moretti, and Reppucci identified that anywhere between 70-100% of incarcerated youth were eligible for a diagnosis from the Diagnostic and Statistical Manual of Mental Disorders-IV-Text Revision (DSM-IV-TR). Of that percentage, 20% could meet the criteria for diagnosis with a severe mental illness. Therefore, in looking at the aforementioned questions, perhaps the answer to the consistent prevalence and rise in certain crime lies within the expression of mental health symptoms. Further, whereas many mental health professionals often conceptualize impulsivity as an experience separate from other factors, research suggests that the impulsivity might be one of the important mental health factors that impacts the expression and prevalence of juvenile crime (Higgins, Kirchner, Ricketts, & Marcum, 2013). Therefore, moving towards a response to juvenile crime may require a better understanding of the concept of impulsivity and the impact that it has on quality of life, social functioning, and behavioral expression in adolescents.

Defining Impulsivity

Our understanding and conceptualization of impulsivity first began with the introduction of the concept of "will" in the early Judeo-Christian era (Fernandez, & Bravo, 2003). From this point, societal understanding of the concept of internal strength, or lack-there-of, has slowly evolved and changed. As it has shifted over time, the concept of will or will power has also been called self-control (Mukhopadhyay & Johar, 2005; Post, Boyer, & Brett, 2006; Shannon et al., 2011), self-management, effortful control (Post et al., 2006), self-regulation (Bub, Robinson, & Curtis, 2016), and impulsivity. As can be seen, some of these defining terms focus on an internal force (often negative), while others focus on identifying a positive skill that is necessary to deal

with them. Although key terms often vary, the concept of impulsivity can be used to describe a behavior or action that is taken without forethought for the possible consequences or outcomes.

Even thought many individuals understand the concept of impulsivity, few actually understand the origins and causation of impulsivity. In fact, in relation to other fields of study, the study and exploration into the roots of impulsivity is fairly new. As more is learned about impulsivity, a greater understating occurs of its impact on areas such as daily functioning, long-term health, interpersonal relations, and overall quality of life.

Exploring the Impact of Impulsivity

In a review of current literature regarding impulsivity and its far reaching implications, a number of correlations arise in reference to health outcomes, decision making, criminality, relationships, substance use, and treatment outcomes. Research indicates that impulsivity has been linked to negative health outcomes such as overall poor health behaviors (Dawson, Shear, & Strakowski, 2012), sleep disturbances and related problems (Bub et al., 2016; Dawson et al., 2012), increased risk of obesity potentially lasting into adulthood (Bub et al., 2016), and higher rates of unsafe sex practices (aan het Root, Moskowitz, & Young, 2015). Further, studies also indicate higher levels of impulsivity have been related to earlier onsets of alcohol use (aan Het Root et al., 2015; Dawson et al., 2012; Feldstein Ewing, Filbey, Loughran, Chassin, & Piquero, 2015; Khurana et al., 2013; Stautz, Pechey, Couturier, Deary & Marteau, 2016), tobacco use (Stautz et al., 2016), marijuana use (Khurana et al., 2013), and gambling (aan Het Root et al., 2015).

Although the long-term psychological and cognitive consequences of the use of addictive substances and behaviors in adolescents are frequently up for debate amongst researchers, there is little doubt that engaging in these behaviors as a minor can lead to legal trouble. In fact,

impulsivity has been considered one of the "strongest psychological predictors of crime" amongst adolescents (Bechtold, Cavanagh, Shulman, & Cauffman, 2014; Chen & Jacobson, 2013). Adolescent impulsivity related crime is not just limited to the use of drugs and alcohol however, and additional studies indicate that impulsivity has also been linked to violence as well as other anti-social behaviors (Chen & Jacobson, 2013). Further, amongst adult populations, higher levels of impulsivity have been linked to continued risk for interpersonal partner violence (Persampiere, Poole, & Murphy, 2014). Therefore, not only does impulsivity seem to place adolescents at risk for legal offenses, it may also place them at risk for continued legal offenses into adulthood should levels of impulsivity persist.

Given the potential for drug or alcohol use, as well as criminality, it would not be surprising to see many of these individuals end up being placed in one, or many, treatment programs. Unfortunately, research indicates that impulsivity interferes with treatment outcomes and completion rates (Rupp et al., 2016). More specifically, impulsivity was shown to contribute to higher treatment drop out levels, as well as higher rates of substance use relapse (Rupp et al., 2016). Therefore, even when individuals are placed in treatment for the disorders that are influenced by their impulsivity, they are continually hampered by its effects.

Utilizing these findings, the first question of this paper is answered. Impulsivity appears to share a number of relationships with adolescent crime through drugs and alcohol use (aan Het Root et al., 2015; Dawson et al., 2012; Feldstein Ewing et al., 2015; Khurana et al., 2013; Stautz et al., 2016), violence, and anti-social behaviors (Chen & Jacobson, 2013). In fact, this relationship is so great that, as stated above, impulsivity appears to be a primary predictor of adolescent offending (Bechtold et al., 2014; Chen & Jacobson, 2013). With this question

answered, the focus turns towards identifying how impulsivity is expressed and the factors that influences its expression.

Creating a Focus on Impulsivity

Given the amount of impact that impulsivity seems to have on various areas of life functioning, and the potential for this impact to persist into adulthood, it is important for treatment providers to consider treating the experience of impulsivity alongside other mental health disorders. Further, in addition to addressing impulsivity with other disorders, the treatment of impulsivity may provide preventative measures against future criminality. In their study on adolescents and their mother's reports of impulsivity and subsequent delinquency, Bechtold and colleagues (2014) state that many youth involved in the criminal justice systems have committed prior crimes earlier in life, but charges were not pursued. In fact, this seems to be a common practice for some juvenile justice systems. Given this information, there may be a potential to intervene on impulsivity related youth crimes earlier, at the time of dismissal, with the hope of preventing further criminal behavior. Perhaps one of the barriers to early intervention is not just having the appropriate tools and resources, but also knowing what to look for in terms of accurately identified impulsivity. To consider ways to intervene, one must begin by knowing the indicators associated with impulsivity.

The Expression of Impulsivity

Over time, research studying impulsivity has identified a number of ways in which impulsivity and its expression has been described through various models. Descriptions in the research tend to focus on trait and behavioral based impulsivity models. In looking towards both of these models, one can gain a better understanding of which behaviors and aspects may represent an expression of impulsivity.

Impulsivity versus compulsivity. To understand urge based behavior, it is important to begin by identifying what type of behavior is being observed. At first, this task may seem simple, but it quickly becomes more difficult when considering the potential differences between impulsivity and compulsivity. Mostly, this challenge ensues because of the many similarities that these two criteria share. In fact, many researchers have argued that impulsivity and compulsivity exist on a continuum together, with impulsivity on one end and compulsivity on another (Grant & Potenza, 2012). A findning that may support this theory is the fact that a 5-35% comorbidity rate exists between these two types of disorders (Grant & Potenza, 2012).

At first glance, both of these types of disorder share a few key criteria. For example, both impulsivity and compulsivity involve behaviors that affect self-control (Grant & Potenza, 2012). Further, in both disorders, the behavior in question is often aimed at reducing an emotional experience, and there is a significant amount of emotional dysregulation (Grant & Potenza, 2012).

However, the similarities end when looking at the specifics in the expression, functions, and biology of these two different typologies. Impulsive thoughts and behaviors tend to take on a more urge like quality, characterized as an "intense sense of tension," much like a craving for a drug (Grant & Potenza, 2012, p.6). Further, in comparison, impulsive actions mostly result in pleasure, whereas compulsive behavior results in avoiding perceived harm (Grant & Potenza, 2012). For example, impulsively stealing may be motivated by excitement and challenge, while compulsive cleaning may be motivated by the fear of germs.

Further, many differences are found in the core neurobiological foundations of these two types of disorders, demonstrating two different and mostly distinct neurological processes (Grant & Potenza, 2012). These neurological differences, may additionally explain why impulse related

disorders have been shown to be more responsive to pharmacotheraputic interventions than compulsive disorders. Therefore, in summary impulsive behaviors and thoughts can be expected to have an urge like quality, which may help an individual cope with the experience of emotion through avoidance, and in doing so the actions will result in an experience of pleasure. The simplest example of this set of criteria would be related to the use or drugs or alcohol, in which being faced with the emotion of feeling hurt, an individual experiences the urge to use, and using thus results in the pleasure of being high. This experience of impulsivity, however, can be further defined in relation to models of behavioral as well a trait based aspects.

Behavioral aspects of impulsivity. Behavioral models of impulsivity focus on identifying specific behavioral mechanisms or actions that are common amongst the expression of impulsivity (Grant & Potenza, 2012). Amongst the many behavioral indicators, perhaps the most frequently thought of is that of behavioral risk taking (Grant & Potenza, 2012) or rash impulsivity (Farmer, & Golden, 2009). Behavioral risk taking can be defined as the level of willingness an individual has to engage in an action that has known/potential risk or consequence (Derefinko et al., 2014; Grant & Potenza, 2012). For example, this behavioral element has been measured with a simple balloon test in which participants were given points for each pump of air they can place into a balloon, with the understanding that they will be awarded a punishment if the balloon pops (Derefinko et al., 2014). Individuals with higher amounts of behavioral risk taking were more willing to place more pumps of air in the balloon, thus risking punishment in order to gain more possible reward (Derefinko et al., 2014). Behavioral risk taking has also been shown to predict higher amounts of sexual partners or even engaging in sexual relations with "strangers", despite existing knowledge regarding the potential for STDs and other sexual related risks (Derefinko et al., 2014). Essentially within this behavioral element, individuals may be

observed engaging in risky behaviors (legal or otherwise), despite having an existing knowledge of the risks that the behavior carries. From an outside perspective, this willingness to take such risks may be interpreted as not caring or apathy.

However, instead of apathy there is another behavioral system that plays into this process, and it is that of reward dependency or reward seeking (Derefinko et al., 2014; Farmer, & Golden, 2009; Grant & Potenza, 2012). Simply put, this behavioral element represents the behavioral drive for gaining pleasurable experiences (Derefinko et al., 2014). When discussing impulsivity, it is not so much the wanting pleasure that is the problem, as much as it is what a person is willing to give up, bypass, or risk in order to do so. For example, reward seeking has also been positively correlated with (increased) numbers of sexual partners (Derefinko et al., 2014). This behavioral aspect may also express itself in other forms of inter-personal activities through attention seeking behavior (Farmer, & Golden, 2009). However, should the expected social attentional reward or reinforcer not be gained, some individuals may shift their actions to encompass more extreme attention gaining activities, which may include hostility (Farmer, & Golden, 2009). This element may be considered a key defining feature of impulsivity and impulse control disorders, and can be seen as a feature of most impulse related disorders such as substance use, gambling, theft, and shopping (Grant & Potenza, 2012).

In relation to, and possibly as a subset of, reward seeking is the concept of punishment sensitivity. The concept of punishment sensitivity is in many ways the opposite of reward seeking, and it involves the level to which an individual predicts and internalizes the potential effects of a punishment (Cross, Copping, & Campbell, 2011). This process includes how likely an individual believes it is that they will be punished, how they perceive the discomfort of the aversive nature of the punishment, and how much value the individual ascribes to this potential

(Cross et al., 2011). Essentially, punishment sensitivity directly relates to an individual's decision making processes and how likely they are to engage or not engage in an action because of the possible consequences.

There is also an additional element to the expression of reward seeking which is often called reward delay or delay discounting (Farmer, & Golden, 2009; Grant & Potenza, 2012). Delay discounting is the process of choosing smaller short-term rewards over larger long-term rewards (Grant & Potenza, 2012), or larger delayed consequences over shorter immediate consequences (Farmer, & Golden, 2009). For example, the short-term pleasure of using drugs--but going to jail-- might be chosen over the long-term gain and benefit of finishing probation. As mentioned above, from an outside perspective, delay discounting may appear as a lack of interest or care; when in reality, this factor may have more to do with a cognitive ability to ascribe equal or greater value to the most advantageous outcome (e.g. greater long-term gain over smaller short-term consequence).

In some ways, delay discounting may also seem closely related to the element of non-planning (Grant & Potenza, 2012) or lack of future orientation (Pan & Vazsonyi, 2011). Future orientation refers to a person's expectation and actions regarding the future, to include elements such as planning and goal setting (Pan & Vazsonyi, 2011). Individuals with deficits in this area may appear unmotivated or as if they have no direction for their future. However, instead of a lack of concern, individuals may lack the ability to orient themselves to the future and create plans for attaining progress.

Another behavioral aspect of impulsivity is that of experiential avoidance (Farmer, & Golden, 2009; Grant & Potenza, 2012). The term experiential avoidance refers to an individual's unwillingness to stay in contact with, or be present in, uncomfortable feelings, events, or

physical sensations, as well as the actions they take in order to modify the frequency, intensity, or duration of these experiences (Farmer, & Golden, 2009). For example, drinking alcohol to decrease feelings of social anxiety. When referring to the expression of impulsivity, the actions chosen to avoid negative states are most often pleasurable and may include activities such as drugs, alcohol, gambling, stealing, and sex (Grant & Potenza, 2012). In fact, this pleasure related avoidance is a core feature that often serves to delineate impulsivity from compulsivity (Grant & Potenza, 2012). However, it should be noted that there are exceptions to this general rule, and although many individuals engage in specific actions to avoid negative states, some may also engage in disassociation and detachment instead (Farmer, & Golden, 2009).

A final behavioral expression of impulsivity is that of poor inhibitory control or disinhibition (Farmer, & Golden, 2009). Inhibitory control is a function of the brain/neurological system that helps to stop a behavior or action (Farmer, & Golden, 2009). In relation to impulsivity, inhibitory control most frequently relates to a person's ability to prevent or stop an action that will knowingly result in a punishment (Farmer, & Golden, 2009). Unlike the aforementioned behavioral risk taking, individuals are not engaging in this behavior for the potential of greater reward. Instead, individuals demonstrate this characteristic when they are unable to stop themselves from engaging in an action.

Through these collective aspects, the functions and influences of impulsivity begin to emerge. With regard to these aspects, it appears that one of the key influences behind impulsivity is the process of seeking out rewards and pleasure while avoiding pain and discomfort. Further, through this process, it also appears impulsivity impedes the individual's ability to engage in planning and long-term, goal oriented behaviors and cognitions.

It should be noted that the above behavioral expressions represent a study of multiple impulse related disorders. Therefore, not every individual will express all areas of these behavioral criteria. In order to better measure and rate an individual's impulsivity in different areas researchers often turn to trait based measures of impulsivity (Grant & Potenza, 2012).

Trait impulsivity. Trait impulsivity represents a set of identified, defined, and measured characteristic of impulsivity. Using these characteristic, researchers are able to place individuals on a continuum of impulsivity in relation to its consequences, ranging from low --suggesting little to no consequence-- to high --suggesting potentially debilitating consequences-- (Grant & Potenza, 2012). Within this area, there are a number of impulsive traits that have been identified throughout the literature. By exploring these traits, professionals can gain further understanding of the ways in which impulsivity may be expressed in different individuals.

The most commonly cited trait based impulsivity model is based off of the five factor personality model, and is known as the UPPS model (Derefinko et al., 2014; Grant & Potenza, 2012; Schmidt, Gay, & Van der Linden, 2008; Sperry, Lynam, Walsh, Horton, & Kwapil, 2016). UPPS represents the four primary factors of impulsivity including; urgency, (lack of) premeditation, (lack of) perseverance, and sensation seeking (Derefinko et al., 2014; Grant & Potenza, 2012; Schmidt et al., 2008; Sperry et al., 2016). Similar to the aspect of experiential avoidance, the characteristic of urgency represents the tendency for an individual to react in a rash, regrettable, or impulsive fashion when experiencing intense emotion (Derefinko et al., 2014; Grant & Potenza, 2012; Schmidt et al., 2008; Sperry et al., 2016). However, unlike experiential avoidance, the characteristic of urgency is often split into two different categories, positive urgency and negative urgency (Derefinko et al., 2014; Schmidt et al., 2008; Sperry et al., 2016). Negative urgency is the response to negative affect states such as anger, guilt, and shame;

whereas positive urgency is the response to positive affect states such as joy and excitement (Derefinko et al., 2014; Schmidt et al., 2008; Sperry et al., 2016). Despite the fact that positive urgency is mentioned and studied by some, it is far less prevalent than its negative counterpart (Sperry et al., 2016). In their 2008 study on insomnia and impulsivity, authors found that the trait of negative urgency was linked to frequency of disturbing thoughts or visions while falling asleep, as well as unpleasant dreams or nightmares during sleep (Schmidt et al., 2008). Further, in their discussion of these finding, Schmidt and Colleagues (2008) posit that this occurrence may be linked to an individual's limited ability to engage in avoidant behaviors/tactics during the pre-sleep and sleep time.

The next factor, lack of premeditation, represents the characteristic of engaging in an act before thinking of the possible consequences or negative outcomes (Derefinko et al., 2014; Grant & Potenza, 2012; Schmidt et al., 2008; Sperry et al., 2016). This characteristic represents both the element of behavioral risk taking as well as poor inhibition control. For many, this factor is considered the stereotypical hallmark of impulsivity.

The third factor, lack of perseverance, introduces a behavioral concept that has not yet been presented. Lack of perseverance represents the failure to remain focused or follow through on difficult or boring tasks or when faced with distraction, thus resulting in unfinished tasks, late deadlines, and numerous other related stressors (Derefinko et al., 2014; Grant & Potenza, 2012; Schmidt et al., 2008; Sperry et al., 2016). This trait was also linked to the process of insomnia (Schmidt et al., 2008). In their study, Schmidt and Colleagues (2008) demonstrated that lack of perseverance was linked with insomnia by way of worries and stressors relating to day-time activity and the consequences of inadequate sleep. These elements included problems caused by fatigue in various aspects of life such as work and in social relationships (Schmidt et al., 2008).

Unlike negative urgency, which impacts sleep through an inability to avoid negative affect, lack of perseveration appears to negatively impacted sleep through what appears to be anxious ruminations (Schmidt et al., 2008).

The fourth and final element, sensation seeking, represents the need or search for excitement and pleasure or novel experiences (Derefinko et al., 2014; Grant & Potenza, 2012; Schmidt et al., 2008; Sperry et al., 2016). In looking at the aforementioned behavioral aspects, this trait mostly encompasses the reward seeking behaviors of impulsivity, but it also touches on elements of behavioral risk taking as well. Along with lack of premeditation, sensation seeking is perhaps also another stereotypical hallmark of impulsivity. In their study on impulsivity and risky sexual behaviors, authors found sensation seeking to be positively linked to an increased numbers of sexual partners as well as sex with strangers, suggesting that the trait of sensations seeking in itself is a unique predictor for engaging in risky sexual behavior (Derefinko et al., 2014).

Through this trait based assessment of impulsivity, additional characteristics and influences begin to appear. Although the behavioral model of impulsivity highlights the role of the reward system and deficits in long-term goal related cognition and behaviors, specific trait based factors have been identified as negatively impacting one's ability to sustain attention and focus. Through these models, a picture emerges with regard to influences that impulsivity has on the behaviors and cognitions of adolescents.

In looking at these behavioral characteristics and traits, it should be noted that not all impulsivity presents in the same fashion, due to the influences of a wide variety of factors converging to illicit this experience. When utilizing these characteristics, professionals should assume that most individuals will not meet all of the above criteria in the same manner.

Therefore, clinical judgement is paramount in differentiating and understanding the expression of impulsivity and the influences of different factors on its expression.

Gender and impulsivity. One of the factors that should be consider is that of gender. Overall, studies indicate that impulsivity is more frequently noted or identified in males than females (Chapple & Johnson, 2007; Colder & Stice, 1998; Cross et al., 2011; Erez, Pilver, & Potenza, 2014). The reasoning and theory behind this difference, however, remains a topic of debate and is addressed later in this paper.

In addition to this "gender gap," the literature also indicates that the expression of impulsivity is subtly different between males and females. For example, within their meta-analysis of gender and impulsivity, Cross and colleagues (2011) identify that in comparison to male counterparts, female participants demonstrated similar outcomes in all areas of impulsivity except for punishment and reward sensitivity, risk taking, and sensation seeking. Female participants demonstrated a lower willingness to engage in risk taking and sensation seeking behavior, and higher sensitivity to the potential consequences of the proposed risks compared to males, demonstrating higher levels of punishment sensitivity in females (Cross et al., 2011). Cross and Colleagues (2011) posit that these differences are the result of natural evolutionary difference, in which the male mammal of a species is more prone to risk taking activities compared to females.

Adding to this theory, other researchers indicate that males are more likely to engage in external displays of impulsivity through acts of aggression, disobedience, and delinquency (Chapple & Johnson, 2007; Colder & Stice, 1998; Jiménez-Barbero, Ruiz-Hernández, Llor-Esteban, & Waschgler, 2016). Research ties much of this behavior to the expression of anger and a potential lack of alternative emotional problem solving or coping skills, as well as social

modeling (Colder & Stice, 1998; Jiménez-Barbero, 2016). Further, in looking specifically at individual impulse control disorders, males have been shown to demonstrate more prevalence of diagnosis, than females, in the areas of pathological gambling, pyromania, problematic Internet use, intermittent explosive disorder (Grant & Potenza, 2012), as well as in measures of sexual impulsivity (Erez et al., 2014).

Although female individuals can possess the same traits of impulsivity, researchers indicate that impulsivity is expressed in a less aggressive manner than males (Colder & Stice, 1998). Further, when anger and aggression are expressed as a part of female impulsivity, they frequently have a different underlying cause and reward (Jiménez-Barbero et al., 2016). Within their expression of impulsivity, females have been shown to engage in higher levels of theft and/or kleptomania, trichotillomania (hair pulling), and compulsive shopping than their male counterparts (Grant & Potenza, 2012). Further, research also indicates that female individuals are more likely to have co-occurring mental health symptoms and diagnosis when they engage in impulsive activities (Erez et al., 2014; Grant & Potenza, 2012).

From these findings, it appears that gender and gender related factors may influence the expression of impulsivity. Therefore, when identifying the causes and influences of adolescent impulsivity, gender may be viewed as a potential predictor. When considering the role of gender in the expression of impulsivity, individuals should consider outcomes such as the propensity to engage in behavioral risk taking, aggression, and the role of mental health symptomology for female adolescents.

Understanding the various expressions of impulsivity is an important consideration during assessment and treatment of presenting problems. Familiarity with symptom presentation allows clinicians to thoroughly and accurately assess and treat impulsivity. However, in the

treatment of adolescents it is equally important to be able to differentiate between developmental and age appropriate behavior and behaviors that are atypical.

Development and impulsivity

In exploring the developmental expression of impulsivity, a number of influencing factors must be considered such as neurology, biology, gender, and social environment. These factors will be explored in more detail further in this paper; however, the factors that emerge the most with regard to research and child and adolescent developmental processes are those of biological and neurological development. Although Erikson and other theorists often establish the formation of impulse control as emerging around the age of 2, neurologically the early skills and building blocks of impulse control begin to emerge between 6 and 12 months as children begin to learn to repeat behaviors that are positively reinforced (Grant & Potenza, 2012). Though this developmental age may seem premature for the skill of impulse control, these skills indicate the beginning of effortful control, which includes an entire group of self-regulation skills that help to suppress one or many stimuli in order to achieve a desired goal (Grant & Potenza, 2012). In fact, effortful control continues to improve all the way up until 33 months (Grant & Potenza, 2012).

As children continue to grow through the ages of 3 until 7, significant amounts of development continue to occur with regard to other forms of inhibitory control (Grant & Potenza, 2012). This time period is considered a key timeframe for the development of important neurocircuitry (Grant & Potenza, 2012). Further, while children move into the ages between 8 through 12, processing speed skills continue to improve, the ability to strategize emerges, and more importantly, working memory begins to emerge (Grant & Potenza, 2012). Working memory has been shown to be a key factor in the process of impulse control and includes a

variety of skills that relate to the ability to hold onto specific information, while simultaneously blocking and resisting outside influences (Grant & Potenza, 2012).

In addition to developing working memory and the ability to strategize, another very important process happens during this time period as well. It is in the middle of this time span, at age 10, that researchers identify the emergence of two important processes (Grant & Potenza, 2012). At this age, the skill of impulse control begins to grow on a steady linear path continuing until the age of 25 or 30 (Grant & Potenza, 2012; Shulman, Harden, Chein, & Steinberg, 2015). Simultaneously, the process of sensation seeking increases until it peaks in late teenage years, and then finally begins a decline (Grant & Potenza, 2012; Shulman et al., 2015).

In looking at the development of impulse control, a few key features emerge within the research. With regard to gender, research indicates whereas male and female impulse control growth begins at the same time, females appear to progress along this process faster than their male counterparts (Shulman et al., 2015). Further, studies also indicate male levels of sensation seeking appear to be higher while levels of impulse control are lower when compared to those of female participants (Shulman et al., 2015).

Although impulse control is working to steadily increase, sensation seeking is also increasing and peaks between the ages 16 and 17 for females and 18 and 19 for males (Shulman et al., 2015). Research indicates once this process peeks for females, it begins to decline quickly, unlike males in which once levels peak, they slowly decline into early adulthood (Shulman et al., 2015). Some researchers theorize that this difference in male and female progression may be influenced by puberty maturation timelines, given females tend to mature sooner in this area than males (Shulman et al., 2015).

In considering all of this information, it becomes apparent that males seem to be subject to a much longer period of decreased impulse control and high levels of sensation seeking. Therefore, it is not surprising that research indicates that males have a longer period of "vulnerability," or high sensation seeking in relation to levels of existing impulse control (Shulman et al., 2015). For males, this window happens between the ages of 12 and 25, while for females it falls between the ages of 12 and 15 (Shulman et al., 2015).

In looking to explain these differences, research has identified a few indicators that lie within the progression of neurocognitive development. These differences are located within key systems of the brain, such as the frontal lobe and subcortical regions that control emotion and motivation (Grant & Potenza, 2012; Leshem, 2016). It appears that areas controlling emotional processing and motivation/rewards mature before the frontal lobe of the brain, which is responsible for the processing, planning, and inhibition of actions (Grant & Potenza, 2012; Leshem, 2016). Therefore, this gap results in adolescents having strong emotional and reward seeking systems, but limited structures to help them think through the consequences of their emotion or reward motivated actions. Further, the structure of the frontal lobe, which acts to counterbalance this process, does not finish completely developing until well into the age of 26 or later (Grant & Potenza, 2012).

From these findings, key information on the causation of impulsivity emerges. Through this exploration on development, the role of neurocognitive structures enters into the picture. Further, these findings make the enormous influence of these structures, the time period of their development, and the influence of biological sex on the entire process abundantly clear.

Utilizing this information, it also becomes apparent that the presence of impulsivity or lack of impulse control is a by-product of natural development. However, what this does not

explain is the fact that every preteen and teen is not a juvenile delinquent. Since not every teen bout of impulsivity leads to criminality, and impulsivity appears to be a natural process in adolescence, the focus turns to the difference between functional and dysfunctional forms and expressions of impulsivity.

Functional and Dysfunctional Impulsivity

The purpose of impulsivity. Given the fact that the development of impulse control is a natural part of development, it begins to appear that parts of impulsivity may in fact have a natural role in human functioning from an evolutionary stand point. In fact, many researchers suggest this, expressing the view that at the core of the concept of impulsivity is an ability to react to situations in a quick manner without the drawn-out process of logical processing (Zadravec, Bucik, & Sočan, 2005). With regard to the basic instinct of survival, this ability allows individuals to react quickly in life saving situations (Zadravec et al., 2005). For example, swerving out of the way of a car to avoid an accident.

Further, developmental researchers also suggest that the experience of impulsivity may, in fact, help to aid in the process of creating independence and partner attraction, as well as biological role fulfillment. As mentioned above, the height of sensation seeking (a characteristic of impulsivity) for teenage girls is between the ages of 16 and 17 (Cross et al., 2011). Researchers suggest that this level of sensation seeking may encourage adolescent girls to leave their family unit and explore other social circles outside of the home, thus supporting the biological imperative of finding a partner for reproduction (Cross et al., 2011). Additionally, it has also been noted by numerous sources that, as a whole, adolescent males are more impulsive, aggressive, and sensation seeking than their female counterparts (Cross et al., 2011; Vigil-Colet, Morales-Vives, & Tous, 2008). Likewise, for males, the behavior of risk-taking and aggression

has also been linked to core mate selection and attraction behaviors (Cross et al., 2011). With all of this in mind it appears that impulsivity may have both productive and harmful attributes, and that not all impulsivity can be categorized as risky or bad. In fact, researcher Scott Dickman recognized just this fact, which influenced his research into functional and dysfunctional impulsivity.

Functional impulsivity. Dickman uses the concept of functional impulsivity to describe rapid, but often inaccurate, responses during situations in which it is to an individual advantage (Dickman, 1990). For example, rapidly answering the remaining questions of a timed quiz in the last minute that is remaining instead of leaving the unanswered questions blank. Research has shown in these settings that individuals with high levels of functional impulsivity are more likely to obtain a better overall score than those with low functional impulsivity, who would leave the task unfinished (Dickman, 1990). However, the key factor to the functionality of this type of impulsivity is that it is only utilized in situations in which rapid response is both warranted and advantageous (Smillie & Jackson, 2006; Zadravec et al., 2005). Therefore, measurement scales of functional impulsivity include questions regarding fast responses to problem solving in social situations and cognitive problems, such as thinking quickly, and taking advantage of time sensitive opportunities (Zadravec et al., 2005). In studies regarding functional impulsivity and dysfunctional impulsivity, functional impulsivity has been shown to be uniquely related to personality characteristics such as extraversion (Adan, Natale, Caci, & Prat, 2010; Smillie & Jackson., 2006), ventersomeness or adventurousness (Adan et al., 2010; Claes, Vertommen, & Braspenning, 2000; Cosi, Morales-Vives, Canals, Lorenzo-Seva, & Vigil-Colet, 2008; Zadravec et al., 2005), and enthusiasm (Zadravec et al., 2005).

Dysfunctional impulsivity. In comparison, dysfunctional impulsivity is defined as a rapid, error prone, responding to situations in which it is not advantageous to do so (Dickman, 1990). For example, racing though an untimed test when there is unlimited time given in order to contemplate and provide answers. In fact, it has been theorized that individuals experiencing dysfunctional impulsivity may be unable to inhibit their behavior long enough in certain situations in order to use slower, more methodical and accurate methods (Dickman, 1990). In support of this theory, research indicates that dysfunctional impulsivity has been linked to decreases in performance on tests of neurocognitive inhibition skills called stop/go tasks (Vigil-Colet et al., 2008).

Research indicates that dysfunctional impulsivity is in line with the characteristics of trait impulsivity (Smillie & Jackson., 2006), and it has been linked to personality traits of psychoticism (Adan et al., 2010; Smillie & Jackson, 2006). Additionally, dysfunctional impulsivity has also been identified as a vulnerability for substance use, pathological gambling, aggression and antisocial behaviors (Adan et al., 2010). Further, research has indicated dysfunctional impulsivity is correlated with both physical and verbal expressions of anger, and adolescents demonstrate higher levels, than adults, on measures of both dysfunctional impulsivity and aggression (Vigil-Colet et al., 2008). Research also notes that when aggression is used, adolescents are more susceptible to utilizing physical forms of aggression in comparison to adults. Notably, these physical approaches to aggression change and evolve into other more controlled forms of aggression as they progress into adulthood (Vigil-Colet et al., 2008). Also noteworthy is the finding that adolescents with dysfunctional impulsivity were also shown to have a lower tendency to avoid punishment (Vigil-Colet et al., 2008). Therefore, adolescents with dysfunctional impulsivity are more likely to engage in aggressive and risky behavior, and

they are less likely to be motivated by the potential for punishment in comparison to adults with dysfunctional impulsivity.

In reviewing functional and dysfunctional impulsivity, it becomes apparent that functional impulsivity represents a healthy reactivity in appropriate situations, while dysfunctional impulsivity embodies deficits in inhibition that contribute to negative outcomes and life difficulties. Additionally, dysfunctional impulsivity represents our common understanding of the concepts of impulsivity and is in line with trait based measurements of impulsivity. It also becomes apparent that dysfunctional impulsivity places adolescents at future risk of engaging in behaviors that can very likely lead to criminal involvement and other negative quality of life outcomes. Therefore, it is dysfunctional impulsivity that must be addressed in order to intervene in juvenile crime. However, when seeking to find a solution, it is important to understand what has been tried, what has worked and what has not, and the multiple factors that come together in order to influence and create impulsivity. In exploring a means for intervening in this process, we must first take a step back and look at where this all began through a historical examination of impulsivity and its treatment.

Historical Viewpoints and Approaches to Impulsivity

As mentioned above, in looking back in history, the concept of "will" as a force that impacts decisions and behaviors did not actually emerge until the Judeo-Christian era (Fernandez, & Bravo, 2003). However, despite its early beginnings, the scientific study of will did not begin until the 1800's, at which time individuals began to posit theories on the origins of will based action and mental health problems (Fernandez, & Bravo, 2003). At this time, general consensus seemed to be that will was a moral based force, and failures of will were a result of insanity or immorality (Fernandez, & Bravo, 2003). Around 1816, the first "classification of the

disorders of will" were published, classifying and including behaviors such as impulsive stealing, suicidal ideation, "irresistible aversion or antipathy toward one's own children," and more (Fernandez, & Bravo, 2003).

As the 20th century dawned, the role of brain and mental functioning gained popularity in understanding impulsivity or will based action (Fernandez, & Bravo, 2003). At this time, the role of impulsivity also began to enter into consideration with regard to child and adolescent development (Post et al., 2006). During this period, there appears to be strong influences from psychoanalysis and behaviorism, with regard to the formation, purpose, and correction of impulsive actions (Post et al., 2006). Beliefs regarding impulsivity largely centered around the idea that "the individual was regulated internally by drives and externally by the reward contingencies of the environment" (Post et al., 2006, p.7).

In the 1950's, theoretical focus began to shift towards early cognitive therapy, and it highlighted the external factors that influenced impulsivity (Post et al., 2006). However, as the field moved through the 1970's, humanistic perspectives also took root (Post et al., 2006). As evidence of impulsivity's progression into the world of mental health, it appeared as a consideration and characteristic of personality to be assessed during diagnosis in the publication of the DSM III (Fernandez, & Bravo, 2003).

Following the 1970's and moving into the 1990's, a considerable increase occurred in the publication and study of topics such as "self-regulation" (Post et al., 2006). With this upsurge of interest, came a focus on goal related behaviors, and a shift towards looking at how the individual themselves was involved in the regulation of behaviors and activities began (Post et al., 2006). It was also around this period that a continued expansion of the mental health profession's view towards impulsivity through the publication of the DSM IV began, resulting in

the appearance of impulse control disorders as a classification of their own (Fernandez & Bravo, 2003).

It is not until the late 1900's however, that neurobiology enters into the picture with the study of impulsivity (Fernandez & Bravo, 2003). With this exploration, research begins to look at the mechanisms of brain functioning and its influence and control on impulsivity, as well as their relationship with neurochemical elements such as serotonin and dopamine (Fernandez & Bravo, 2003). This study has progressed and researchers continue to explore these areas today, as well as the genetic and heritable elements of impulsivity. However, despite this progression into neurobiology, cognitive behavioral perspectives of interventions continue to remain prevalent (Post et al., 2006).

Current Perspectives and Theory

Perhaps the most effective way to conceptualize all of the various factors that have been considered over the years is through the biopsychosocial model (Tansey, 2010). Utilizing this model allows individuals to incorporate multiple factors into understanding the formation and expression of impulsivity. This versatility integrates the most recent findings by acknowledging how biological, psychological, and social factors can act independently, as well as in conjunction, to influence the expression and consequences of impulsivity.

Biological considerations.

Neurological systems. Within the process of neurological and cognitive functioning, executive functioning is responsible for inhibiting thoughts or actions, controlling and focusing attention, planning, decision making, organization, regulating emotion, and much more (Bickel, Jarmolowicz, Mueller, Gatchalian, & McClure, 2012; Grant & Potenza, 2012; Stautz et al., 2016). Much of the literature regarding impulsivity demonstrates a strong connection to

executive functioning (Arán-Filippetti & Richaud de Minzi, 2012; Bickelet al., 2012; Brooks, 2016; Dawson et al., 2012; Feldstein Ewing et al., 2015; Fino et al., 2014; Grant & Potenza, 2012; Perampiere et al., 2014; Romer, Betancourt, Brodsky, Giannetta, Yang, & Hurt, 2011; Shannon et al., 2011; Stautz et al., 2016). Research indicates that impulsivity has been linked to decreased functioning in various measures of executive functioning and response inhibition (Fino et al., 2014). Further, research identifies that the impulsive elements of acting without thinking and poor behavioral control are predictors of decreased executive functioning (Fino et al., 2014).

In looking deeper, research links impulsivity to deficits in specific function of executive functioning, such as working memory (Bickel et al., 2012; Brooks, 2016; Fino et al., 2014; Grant & Potenza, 2012; Khurana et al., 2013). Within the process of executive functioning, working memory is responsible for holding and manipulating information, while simultaneously blocking outside information and stimulation (Grant & Potenza, 2012). Working memory more specifically relates to cognitive functions such as attention, task switching, goal setting and achievement (Baddeley, 2007). Research exploring risk factors for adolescent alcohol use indicates that deficits in working memory are linked to greater risk for adolescent substance use (Khurana et al., 2013). Further, research also indicates that impulsive elements, such as acting without thinking and delay discounting, are negatively associated with working memory (Khurana et al., 2013), suggesting that these areas of impulsivity may be linked to deficits in working memory. In contrast, research also finds that the element of sensation seeking is positively associated with working memory (Fino et al., 2014; Khurana et al., 2013), indicating that sensation seeking by itself may not be a risk factor for deficits in working memory functioning.

In adolescents, deficits in areas of executive functioning and working memory make sense as they are controlled and housed in the prefrontal cortex of the brain (Bickel et al., 2012; Brooks, 2016; Fino et al., 2014; Leshem, 2016; Tansey, 2010), which has a long maturation process, and it does not completely stop maturing until the mid-twenties (Fino et al., 2014; Lesham & Glisichsohn, 2012). Therefore, it is easy to assume that impulsivity is a direct result of deficits in immature or undeveloped executive functioning. However, this assumption does not account for the fact that impulses and reward/pleasure seeking thoughts and actions have been directly tied to the limbic system of the brain (Bickel et al., 2012; Fino et al., 2014). This additional fact indicates that there are in fact two separate neurological systems at play, the lower brain's limbic system and the frontal brains executive functioning system. However, what this does not explain is why, if executive functioning is separate from the impulsive limbic system, it has so many connections with the expression of impulsivity.

In response to this, researchers have recently suggested that the executive functioning and the limbic systems are in fact meant to work in unison and balance one another. The frontal executive system is meant to intercept and inhibit the impulsive nature of the limbic system (Bickel et al., 2012; Brooks, 2016; Cleanthous & Christodoulou, 2009; Grant & Potenza, 2012). To explain in more detail, the limbic system creates reward/pleasure related impulses, which are biologically and evolutionarily imperative; however, since pure impulse is not always healthy, the executive functioning system intercedes in order to help evaluate the safety and wisdom of the impulse (Bickel et al., 2012; Brooks, 2016; Cleanthous & Christodoulou, 2009; Grant & Potenza, 2012). For example, the limbic system creates the urge eat a large piece of cake, but the executive functioning system may intercede because that large piece of cake is the equivalent of one whole days caloric need and will be bad for overall health.

If this relationship between systems is working properly, impulses that are harmful or disadvantageous will be inhibited. However, should for some reason either one of these systems be thrown out of balance, this process would no longer work properly. Researchers posit that the expression of harmful or risky impulsivity is the result of the limbic system overpowering the executive functioning system as a result of weakness or deficits in the executive functioning system, or hyperactivity in the limbic system (Bickel et al., 2012; Grant & Potenza, 2012; Shannon et al., 2011). Therefore, in further exploring the biopsychosocial factors that impact the expression of impulsivity, emphasis must be placed on the elements impacting the development, functioning, and fortitude of executive functioning and the limbic system.

Neurochemicals. One such element is that of neurochemical functioning and levels. A key element in the limbic system is dopamine, which helps to initiate a response to reward stimuli (Grant & Potenza, 2012). Therefore, if an individual were to produce too much dopamine, this system could become hyperactive, thus resulting in impulsivity and aggression (Fitzgerald, 2011; Grant & Potenza, 2012). Likewise, studies indicate that increased levels of norepinephrine have also been linked to increased levels of impulsivity (Fitzgerald, 2011; Grant & Potenza, 2012). Increased levels of norepinephrine have also been linked to other experiences regarding lack of inhibition, specifically the experience of mania (Grant & Potenza, 2012). Both dopamine and norepinephrine belong to a class of neurochemical called catecholamines, which are related to the activation of the central nervous system and stress response (Grant & Potenza, 2012). Further, human and animal studies indicate that chemically decreasing levels of both dopamine and norepinephrine through blocking agents, have resulted in decreases in impulsivity and aggression (Fitzgerald, 2011; Grant & Potenza, 2012).

Although increased levels of these neurochemicals have been identified in some areas, decreased levels of serotonin have also been linked to the expression of impulsivity and aggression (Fitzgerald, 2011; Grant & Potenza, 2012). The neurochemical serotonin is also associated with the functions of the central nervous systems, and it is commonly associated with the process of mood regulation (Grant & Potenza, 2012). Likewise, medical studies indicate that chemically increasing serotonin levels has shown decreases in impulsivity and aggression (Fitzgerald, 2011; Grant & Potenza, 2012). Further, it should also be noted that both serotonin and norepinephrine have been linked to functioning of working memory and learning (Fitzgerald, 2011).

Additionally, neurochemical changes in elements such as acetylcholine, glutamate, GABA, vasopressin, oxytocin, opioids, and testosterone are shown to be linked to the expression of impulsivity and aggression (Grant & Potenza, 2012). However, while these links have been demonstrated, little information exists to explain why these differences occur in some individuals but not others. Perhaps one of the best explanations may be the role of genetics.

Genetics. In studies regarding the expression and formation of impulsivity, researchers indicate that 40-45% of impulsivity expressed within an individual is the result of genetics (Grant & Potenza, 2012; Niv, Tuvblad, Raine, Wang, & Baker, 2012). Researchers indicate that the remaining 55-60% of impulsivity is influenced by environmental factors, such as peer group (Niv et al., 2012). Exploration into the genetic components that influence the expression of impulsivity yields findings that these elements are influenced largely by the genes that relate to the production, reception, and processing of neurochemicals (Grant & Potenza, 2012). Researchers indicate that there are five specific systems that have been shown to relate to impulsivity when altered due to genetic expression (Grant & Potenza, 2012).

One of these systems is responsible for the production of serotonin. As discussed above, research has indicated that decreased serotonin levels have been correlated with the increased expression of impulsivity (Fitzgerald, 2011; Grant & Potenza, 2012). In individuals who are genetically impacted by changes to this system, deficits actually occur at multiple points to include production, reception, and metabolism (Grant & Potenza, 2012). Serotonin is the product of tryptophan, which has been converted by an enzyme into serotonin (Grant & Potenza, 2012). For some, genetic changes decrease the functioning of this enzyme (Grant & Potenza, 2012). Changes in this specific gene structure have been associated with increased rates of alcoholism, as well as heroine addiction (Grant & Potenza, 2012).

Once serotonin is produced, it is stored until it is necessary for one of its many purposes, such as mood regulation (Grant & Potenza, 2012). Once there is a need for this chemical, serotonin is released to be picked up by serotonin receptor sites that trigger specific functions within the brain (Grant & Potenza, 2012). However, genetic research indicates that for some there are changes to this system of serotonin production and reception (Grant & Potenza, 2012). The reception of neurochemicals is key in their ability to function and trigger their necessary responses. Therefore, it is not surprising that genetic changes that negatively impact the reception of serotonin have been linked to conduct disorder, substance abuse, depression, and suicide (Grant & Potenza, 2012).

However, the function of a neurochemical does not end with reception. After a neurochemical has been received by its specific receptor, it must be removed. The brain does this in a number of different ways. With serotonin this is achieved by an enzyme breakdown (Grant & Potenza, 2012). Researchers show that for some individuals, genetic expression in this system causes an overproduction of this enzyme, resulting in an accelerated break down of serotonin

which does not give it enough time at the receptor site (Grant & Potenza, 2012). In correlation to this genetic alteration, research has shown increased levels of hyperactivity/impulsivity, inattention, and substance abuse (Grant & Potenza, 2012).

Likewise, studies show the changes in the dopamine system are also influenced by genetic differences. However, changes in the dopamine system are reflected in augmentations to three different receptors in the opioid system, to including Mu, Kappa, and Nociception/orhanin FQ opioid receptors (Grant & Potenza, 2012). The Mu-opioid receptor system functions on an individual's sensitivity to reward (Grant & Potenza, 2012). This system controls the amount of pleasure or reward a person receives when they engage in an action (Grant & Potenza, 2012). Understandably, impulsivity has been linked to an over functioning of this system caused by a change in genetic expression (Grant & Potenza, 2012). Genetic changes effecting the mu-opioid receptors have been linked to increased rates of addiction to alcohol and heroine (Grant & Potenza, 2012).

Similar to the mu-opioid system, the kappa opioid system works to modulate how rewards are felt in the brain through the modulation of dopamine release (Grant & Potenza, 2012). The role of this system is to avoid over activation of the reward system, which protects against negative outcomes such as the creation of addictive habits (Grant & Potenza, 2012). However, for some individuals, there is a genetic change to this system which prevents it from modulating properly (Grant & Potenza, 2012). As a result, this system is not able to regulate the release of dopamine the way it is intended, potentially leading to an over-release (Grant & Potenza, 2012). Researchers have linked this genetic change to an overall higher occurrence of addictive behaviors (Grant & Potenza, 2012).

Although, the kappa system works to modulate dopamine, the nociception/orphanin FQ receptor system specifically works to inhibit the release of dopamine (Grant & Potenza, 2012). Some theorize that this inhibition might also be accompanied by a release of GABA, a neurochemical that works to inhibit signals and systems within the brain (Grant & Potenza, 2012). Further, this system inhibits the rewarding properties and influences of drugs (Grant & Potenza, 2012). However, impulsivity has been linked to changes in this system caused by genetic augmentations, leading to an impairment of these processes (Grant & Potenza, 2012). In addition, genetic changes in this system have been linked to vulnerability to opiate addiction (Grant & Potenza, 2012).

These genetic changes, directly tie into neurochemical imbalances that have been evidenced by researchers in both serotonin and dopamine. However, these are not the only genetic changes that have been found that influence impulsivity. Additional differences have been found to influence the melanocortin receptors, which to act to regulate stress response through the release of cortisol (Grant & Potenza, 2012). Further, expression of impulsivity is connected to genetic changes in this system, influencing its ability to properly respond to stress and stressors (Grant & Potenza, 2012).

As can be noticed above, much of the research regarding impulsivity and genetics seems to be directly tied to the development of drug or alcohol addiction. Largely, this correlation is a reflection of the changes in the reward system that leads to both impulsivity and susceptibility to addictive behaviors. In relation to this process, research has also identified genetic changes in the cannabinoid system (Grant & Potenza, 2012). One of the many functions of the cannabinoid system is to mediate the brain's response to external or exogenous chemicals, which relates to the how rewards are received from drug use (Grant & Potenza, 2012). For some individuals with

impulsivity, researchers discovered genetic differences leading to impairments of this system, causing an increased susceptibility to drug rewards (Grant & Potenza, 2012).

Likewise, research has also identified genetic vulnerabilities in the glutamate system (Grant & Potenza, 2012). Glutamate works to transmit signals within the brain (Grant & Potenza, 2012). However, genetic changes in this system have been found to relate to heroin addiction as well as the rewards gained from drug use in general (Grant & Potenza, 2012).

In considering this information, it appears that genetics have the potential to play a significant role in the expression of impulsivity, as genetics can directly impact neurochemicals and neurological systems that relate to the regulation of rewards in the brain. Therefore, individuals with genetic changes to these systems would be more susceptible to rewarding behaviors in general, which may result in the reward system overriding the executive functioning system. However, it is important to remember that these genetic changes may not be present in all individuals with impulsivity, and genetics is just one of many vulnerabilities.

Changes to the frontal lobe. Another factor that can lead to vulnerability to impulsivity would be any event or factor that causes damage to the frontal lobe and/or the executive functioning system. One of the most common causes of this damage is traumatic brain injury (TBI). A traumatic brain injury is considered to be any head injury, normally to the frontal lobe section of the brain, resulting in loss of consciousness or loss or memory, and ongoing cognitive or social impairment (Vaughn, Salas-Wright, DeLisi, & Perron, 2014). Traumatic impact to the frontal lobe section of the brain often results in brain injury or tissue death in this area, which due to the location, impacts processes of executive functioning. In fact, research comparing trait based criteria of impulsivity and TBI found that individuals with TBI exhibited increased expression of urgency, as well as lack of premeditation and perseverance, three core features of

trait impulsivity (Rochat, Beni, Annoni, Vuadens, & Van der Linden, 2013). Further, researchers confirmed these changes were consistent with the executive impairments seen in impulsivity (Rochat et al., 2013). Additionally, research indicates that about one third of all juvenile offenders qualify for a diagnosis of TBI, in comparison to the 12% of the general population of adolescents that would qualify (Vaughn et al., 2014).

Physical injury is not the only way in which the executive functioning system can become impaired. Another way in which this system becomes impaired is through drug and alcohol use (Whelan et al., 2012). Studies indicate that executive functioning deficits are present in some adolescents prior to beginning their substance use (Khurana et al., 2013). In fact, this preexisting deficit may, as discussed above, place youth at higher risk for engaging in substance use (Khurana et al., 2013). Unfortunately, while a certain level of deficit to executive functioning is pre-existing, over a period of consistent use additional damage to this system occurs (Bickel et al., 2012; Khurana et al., 2013). Research indicates that there are mild to severe cognitive deficits noted in 50-80% of individuals with an alcohol use disorder (Bickel et al., 2012). Undeniably, this research makes one wonder which comes first, executive functioning deficits or substance use; a question still under investigation.

Despite the numerous questions that remain, it is clear that there are a few key biological factors that influence the expression of impulsivity. These factors center firmly on the relationship between the executive functioning and the impulsive limbic systems. The balance between these two systems is key, and if either of these systems is disrupted in the right manner, impulsivity ensues. Biological changes to these systems appears to be largely influenced by changes in neurochemical levels, or damage to the frontal lobe and the executive functioning system.

Additionally, these findings further emphasize the pivotal role that neurocognitive structures play in the causation and influences of impulsivity. Further, these findings serve as a means for answering one of the key questions of this paper, the causes and influences of impulsivity. Despite the pivotal role that these factors play in explaining the expression of impulsivity, there are also a number of psychological considerations that impact this process as well.

Psychological considerations. Biological factors, are not the only element that can influence the occurrence and expression of impulsivity. In fact, there appears to be a link between biological factors and psychological expression, with regard to impulsivity. A productive way to illuminate this connection is through an exploration of the relationship between psychiatric disorders and impulsivity.

Psychiatric disorders. There are a multitude of mental health disorders which have demonstrated a relationship to impulsivity. Studies seems to most frequently focus on Attention Deficit Hyperactive Disorder (ADHD) (Bickel et al., 2012; Dawson et al., 2012; Grant & Potenza, 2012; Moeller, Barratt, Dougherty, Schmitz, & Swann, 2001). However, disorder such as Borderline Personality Disorder (BPD), Substance Use Disorder (SUD), Traumatic Brain Injury (TBI), Antisocial Personality Disorder (ASPD) (Grant & Potenza, 2012; Moeller et al., 2001), Bipolar Disorder (BD), Conduct Disorder (CD) (Moeller et al., 2001), Schizophrenia (Grant & Potenza, 2012; Tansey, 2010), depression, social anxiety (Erez et al., 2014), Autism and PTSD (Niv et al., 2012) are also discussed in the research with regard to impulsivity. Further, research indicates that this relationship between specific mental health disorders and impulsivity, may be the result of a variety of factors such as a byproduct of the primary cause of

the psychiatric disorder, genetic changes/vulnerabilities, or a combination of genetic predisposition and environmental factors (Grant & Potenza, 2012).

Take substance use for example. Research indicates there exists a strong relationship between the expression of impulsivity and the diagnosis of a Substance Use Disorder (SUD) (Grant & Potenza, 2012). In further exploring this relationship, a bidirectional relationship between substance use and impulsivity appears (Grant & Potenza, 2012). This means that impulsivity places individuals at higher risk for substance use, while substance use places individuals at a higher risk for impulsivity. Regardless of the origins of this relationship, SUDs appear to be directly related to both changes in neurotransmitter functioning as well as frontal lobe executive functioning deficits (Grant & Potenza, 2012). Most notable however, is that due to its strong relationship with impulsivity, researchers often use the presence of an SUD to measure the relationship that other psychiatric disorders may have with the expression of impulsivity (Grant & Potenza, 2012; Moeller et al., 2001).

Likewise, ADHD is commonly the diagnosis most individuals think of when they discuss impulsivity in adolescents. In fact, unlike many other psychiatric disorders, impulsivity is a specific subtype/qualifier for ADHD (Grant & Potenza, 2012; Moeller et al., 2001). Notably, the hyperactive/impulsive type of ADHD has been associated with higher rates of Oppositional Defiant Disorder and Conduct Disorder, two disorders equally known for their impulsivity (Grant & Potenza, 2012; Moeller et al., 2001). Further, studies link ADHD and SUDs (Grant & Potenza, 2012; Moeller et al., 2001). In exploring the roots of this disorder, researchers have pinpointed a relationship between ADHD and the dopamine system (Grant & Potenza, 2012; Moeller et al., 2001). These findings are congruent with the evidence demonstrating the connection between dopaminergic processes and impulsivity (Grant & Potenza, 2012).

More surprisingly, is the demonstrated relationship between impulsivity and personality disorders such as BPD and ASPD (Grant & Potenza, 2012; Moeller et al., 2001). In a study of the diagnostic predictors of BPD, researchers found that impulsivity was the number one predictor of diagnosis (Moeller et al., 2001). These findings, in fact, reflect that impulsivity is the most evidenced characteristic feature of BPD (Grant & Potenza, 2012; Moeller et al., 2001). Additionally, studies indicate that there is a 38.2% comorbidity rate between BPD and SUDs (Grant & Potenza, 2012). Further, those with both SUDs and BPD have been shown to have higher rates of impulsivity, than those with BPD and no SUD (Moeller et al., 2001). Unfortunately, research also indicates that within those with BPD and higher rates of impulsivity, there is also a higher rate of suicidality (Grant & Potenza, 2012; Moeller et al., 2001). In exploring the causal factors for BPD, research has theorized that it is the result of a genetic predisposition for lower levels of serotonin in combination with environmental influences (Grant & Potenza, 2012).

Within the diagnosis of ASPD, impulsive aggression is one of three subtypes that have been identified by researchers (Moeller et al., 2001) Researchers estimated that 20% of all those diagnosed with ASPD were identified as being predominantly impulsively aggressive, while 57% of those diagnosed were a mix between impulsive and calculated aggression (Moeller et al., 2001). These findings suggest that there is a population of individuals impacted by impulsivity within the diagnosis of ASPD. Notably, 40.5 % of all those diagnosed with ASPD have been show to also have co-occurring SUD (Grant & Potenza, 2012). In exploring the causal factors for ASPD, researchers have identified two primary sources, changes in the serotonin system and frontal lobe damage/TBI (Moeller et al., 2001).

It is important to note the commonality of causal factors in the above findings. Of the diagnoses that were explored, all appeared to share a link with impulsivity and changes to the neurochemical systems. These findings suggest that neurochemical deficits or imbalances which influence dysfunctional impulsivity may be a factor in some psychiatric diagnoses. For example, the byproduct of changes to the serotonin system may lead to both ASPD and impulsivity. Another factor that is often demonstrated within these identified psychiatric diagnoses is difficulty in regulating emotion.

Emotion regulation. Emotion regulation is the ability to monitor and evaluate emotions, and to modify reactions to them in order to engage in goal directed behavior (Ahmed, Bittencourt-Hewitt, & Sebastian, 2015). With regard to the ability to regulate emotion, the question is not necessarily if a person regulates their emotions, as much as how they regulate their emotions. When faced with emotional stimuli, an individual's emotional regulation processes identify or select an approach for coping with the ensuing feeling. Within these responses, individuals can develop both healthy and unhealthy tendencies. For example, in response to anger, an individual may choose compromise while another may turn to physical violence.

These responses or coping mechanisms, both healthy and unhealthy, are categorized in terms of internalizing or externalizing responses (Berking & Whitley, 2014). Internalizing responses are coping responses that are directed inward, for example social withdrawal, depression, or anxiety (Berking & Whitley, 2014). In contrast, externalizing responses are those coping mechanisms that are directed to external sources, such as aggression, anger, or other behavior problems (Berking & Whitley, 2014). Further, research indicates that the coping

mechanisms an individual utilizes to address negative emotions may directly relate to the development of depression and depressive symptoms (Berking & Whitley, 2014).

Outside of the relationship that emotion processing has on depression, emerging research suggests that levels of impulsivity have also been linked to decreased functioning in emotional regulation (Schreiber, Grant, & Odlaug, 2012). These findings are further supported by research that identifies difficulty regulating emotion in disorders with a known connection to impulsivity such as SUDs (Berking & Whitley, 2014; Schreiber et al., 2012), BPD (Berking & Whitley, 2014; Grant & Potenza, 2012), and ADHD (Berking & Whitley, 2014; Mitchell, Robertson, Anastopolous, Nelson-Gray, & Kollins, 2012). In looking further into this relationship, researchers have identified that emotional regulation directly relates to measures of negative and positive urgency, one of the core trait based measures of impulsivity (Farmer & Golden, 2009; Ceschi, Billieux, Hearn, Fürst & Vander Linden, 2014; Sperry et al., 2016). These findings are not surprising, as the definition of urgency is the impulsive reaction to either positive or negative affect (Farmer & Golden, 2009; Sperry et al., 2016).

Studies indicate that a large majority of the processes regarding emotional regulation, rest in both the limbic and the prefrontal executive functioning systems (Ceschi et al., 2014; Mitchell et al., 2012; Schreiber et al., 2012). It appears that emotion and emotional impulses are generated by the limbic system, and the functions of the prefrontal executive functioning system work to balance out these impulses with problem solving approaches and coping skills (Ceschi et al., 2014; Mitchell et al., 2012; Schreiber et al., 2012). This is the same system that manages impulsivity. Therefore, much like the expression of impulsivity, when this system becomes imbalanced and the limbic system dominates or over-rides executive function, and emotional regulation declines (Schreiber et al., 2012).

Also, as is the case with impulsivity, the maturation process naturally has a significant role in the development and functioning of these emotional regulation systems (Ahmed et al., 2015). In fact, Ahmed and colleagues (2015) state, ". . . during the time lag in functional maturity between prefrontal and limbic regions, adolescents are less effective at regulation of their own emotions . . ." (p. 13). In other words, delayed maturation of the prefrontal cortex can result in a gap in an adolescent's ability to intervene upon and effectively manage emotional impulses.

In addition to developmental issues, traumatic experiences introduce another mitigating factor. Studies indicate that the experience of trauma can actually increase the expression of impulsivity (Ceschi et al., 2014). Unfortunately, these studies also point out that due to this increase in impulsivity, individuals increase their involvement in risky behaviors, thus increasing their chances of being re-exposed to trauma or traumatic experiences (Ceschi et al., 2014). In exploring this relationship further, researchers indicate that trauma is directly related to trait based impulsivity measures of urgency and lack of perseveration (Ceschi et al., 2014).

In this context, it appears that measures and expressions of urgency actually work to interfere with a person's ability to engage in or develop positive emotional coping skills (Ceschi et al., 2014). On the other hand, research suggests a lack of perseveration may positively relate to coping effectively with trauma. This can occur because a lack of perseveration inhibits an individual's to ability to remain-focused on the traumatic event, which actually works as a protective factor (Ceschi et al., 2014). However, a deeper relationship between trauma and impulsivity is supported by researchers and warrants further investigation.

Psychological trauma. Research conducted on substance abusing individuals who are incarcerated notably indicates an increased prevalence of early childhood trauma in the form of

neglect and psychological maltreatment amongst this population (Cuomo, Sarchiapone, Giannantonio, Mancini, & Roy, 2008). In addition, studies on adolescents diagnosed with ASPD have identified a specific subset within this population with high rates of callous-unemotionality, anxiety, trauma, and PTSD symptoms (Kahn et al., 2013). This subset differs from their counterparts in the fact that others, not in this subset, only displayed high rates of callous-unemotionality (Kahn et al., 2013). The most interesting aspect regarding this subtype of individuals with trauma, is that they also demonstrate significantly higher rates of impulsivity (Kahn et al., 2013). By way of explaining this difference in expression, research points to a history of trauma and abuse (Kahn et al., 2013). It should also be noted that of the adolescents studied, 52% of them qualified for this subtype (Kahn et al., 2013). Taken together, these findings indicate that there may be a relationship between psychological trauma and the experience of impulsivity.

Further information regarding this possibility can be found in the research regarding adolescent disassociation and the impact of trauma and stress on the developing brain. When trauma, abuse, or neglect occurs, the body's stress system is activated (Diseth, 2005). In response to the activating events, the chemical cortisol is released (Diseth, 2005). In this process, cortisol is released with the intention to protect the body from stress responses by dampening the impact of this process and toning down the brain's fear response (Diseth, 2005). Short term, cortisol acts as a beneficial substance. However, long-term exposure to cortisol, as a result of consistent environmental stressors, begins to have negative impacts on the brain and body, especially that of a young developing one (Diseth, 2005).

In response to prolonged exposure to cortisol a few processes occur, one of which is the down-regulation, or decreased release, of cortisol (Diseth, 2005). This decrease occurs as a part

of the body's efforts to sustain balance and equilibrium (Diseth, 2005). Unfortunately, it also comes at a cost. With the body releasing less cortisol, the individual now has a dysfunctional fear response system, resulting in a variety of symptoms including feelings of passive fear (Diseth, 2005). One of the problems that can occur as a result of this change is an acclimation to fear, thus leading a child to not responds to feelings of fear in a healthy survival focused manner (Diseth, 2005).

Another process that occurs as a result of this down regulation is the release of high levels of dopamine and noradrenaline (Diseth, 2005). Notably, this is where the first potential connection to the biology of impulsivity is made, as high levels of dopamine secretion have also been linked to the expression of impulsivity (Grant & Potenza, 2012). As such, research indicates that the cortisol induced change to this system results in hyperarousal, feelings of anxiety, irritability, a sensitivity to stress, and a pattern of symptoms that are very similar to ADHD (Diseth, 2005).

Unfortunately, as a result of this constant exposure to stress and cortisol, the brain also begins to experience destruction and deficits in growth to specific areas of neurocognitive functioning as a result of neurotoxicity (Diseth, 2005). This impact causes reduction in specific brain centers, such as the hippocampus, prefrontal cortex, amygdala, and corpus colosseum (Diseth, 2005). In looking further, three of these four areas appear to have a direct relationship to the expression of impulsivity.

Within the brain's system, the amygdala controls much of the impulse oriented limbic system (Grant & Potenza, 2012). Changes in this system, as well as prolonged exposure to stress, cause the amygdala to become hyperactive and overstimulated, resulting in a tendency for this system to create more, or stronger, impulse cues than are necessary (Diseth, 2005). Changes

in this system due to cortisol toxicity have been shown to impact behavioral control including, hyperarousal, aggression, impulsivity, and increased sexual activity (Diseth, 2005). Further, delays in maturation are also demonstrated in the prefrontal cortex as a result of an overuse of the stress system and cortisol (Diseth, 2005). As discussed above, the prefrontal cortex houses the executive functioning system that exists to balance out the impulse driven limbic system (Grant & Potenza, 2012).

These findings indicate that a consistent exposure to threat and stress, such as prolonged abuse, neglect, fear, and trauma, create changes to both key systems of impulsivity, the limbic and the executive functioning systems. The changes that occur from this process cause the limbic system to become overactive, while also impeding the development of executive functioning thus leading to a weakening of this system. When taken together, these two processes create an imbalance in the intended checks and balances of the impulse control systems, manifesting in the expression of impulsivity.

One more system that also becomes impacted is the corpus colosseum (Diseth, 2005). Within the brains functions, the corpus colosseum exists to mediate and connect the left and right hemispheres of the brain (Diseth, 2005). Changes in the functioning of this system caused by chronic exposure to stress can lead to the lateralization of this system, meaning that the brain may become more dominant on one side or the other (Diseth, 2005). It is further important to note that the right hemisphere of the brain relates to nonverbal emotional communication and emotional arousal, and as such it is largely connected to the amygdala and the impulse system (Diseth, 2005). Therefore, brain lateralization in the right hemisphere can lead to an increase in emotion based tendency and a decrease in problem solving, thus potentially resulting in emotional reactivity (Diseth, 2005).

These findings suggest the experience of trauma and stress can have a significant impact on the development of the young brain, and subsequently influence the expression of impulsivity. However, as a way to try to avoid this damage, research also indicates that healthy attachment during early development works to mitigate and dampen the impact that distress has on the stress system, thus protecting the brain (Diseth, 2005). Therefore, attachment styles may in fact become one of many indicators and predictors of stress and trauma.

Attachment. The concept of attachment identifies that a child's early interactions and experiences with a caregiver pave the way for how the child learns to interact with others and regulate emotions throughout life (Sholtens, Rydell, Bohlin, & Thorell, 2014; Webster, Hackett, & Joubert, 2009). If children's interactions with their caregivers are consistent, reliable, sensitive, and responsive, a secure attachment is formed (Sholtens et al., 2014; Webster et al., 2009). A secure attachment allows a child to explore the environment with the assurety of minimal risk and someone available for comfort when needed (Sholtens et al., 2014; Webster et al., 2009).

Unfortunately, when caregivers do not provide these elements, an insecure attachment is formed (Sholtens et al., 2014; Webster et al., 2009). From this point a few attachment styles can occur for the child. If a caregiver is less than sensitive or attentive to a child's needs an insecure avoidant or insecure ambivalent attachment style might be developed (Sholtens et al., 2014). Within both of these attachment styles the child does not form a bond or reliance on the caregiver, but does create strategies for handling stress and anxiety (Sholtens et al., 2014). However, if the child does not create strategies of handling stress and anxiety, and does not attain a sensitive attentive caregiver, a disorganized attachment style is likely to occur (Sholtens et al., 2014). In a disorganized attachment style, coping strategies are often not formed because the

caregiver or parental figures are perceived as frightened or frightening (Sholtens et al., 2014). Research indicates that of the types of insecure attachment, disorganized attachment is strongly linked to psychopathology and psychiatric diagnosis (Sholtens et al., 2014).

However, within the process of insecure attachment another concept can occur as well. In an effort to avoid the negative and vulnerable feelings of insecure attachment, it is theorized that some youth deactivate or block out their awareness of this process (Webster et al., 2009). As a result, youth have unresolved feelings and concepts regarding attachments that they keep outside of their awareness (Webster et al., 2009). This is known as unresolved attachment (Webster et al., 2009). This process allows youth to be able to maintain the façade of being well adjusted, while also allowing them to not have to experience the conflicting and threatening feelings they experience as a result of insecure attachment (Webster et al., 2009).

Research reveals that children with ADHD and a disorganized form of attachment demonstrate significantly higher levels of ADHD symptomology than those with other styles of attachment (Sholtens et al., 2014). Studies also indicate that children with disorganized attachment are more likely to display externalizing behaviors, such as conduct related problems (Sholtens et al., 2014). Additionally, maltreated adolescents with an unresolved attachment style, were identified to have deficits in the functioning of working memory (a subsidy of executive functioning), attention, and cognitive functioning (Webster et al., 2009). It should be noted that both elements of attention and working memory deficits have been linked to the expression of impulsivity. These findings expand upon the research regarding impulsivity and psychological trauma, suggesting that unresolved and disorganized attachment styles may further place adolescents at risk for the expression of impulsivity.

Within the elements that occur as a part of psychological influences to impulsivity, a few key themes emerge. While the expression of these experiences is psychological, a large underlying factor is neurocognitive development and cognitive functioning based. In fact, a majority of these factors directly tie back to the processes of executive functioning and the limbic system, as well as their related neurochemical systems.

Through these factors, an answer to the second research question posed in this research paper surfaces. Once again, the findings in this section reaffirm the strong influence that neurocognitive factors play in the causation of impulsivity. Additionally, in answering the question regarding the causes and influences effecting impulsivity, this section specifically points to the role of factors such as trauma and attachment. Notably, these factors give way to exploring the impact of social and environmental factors and their impact on impulsivity.

Social considerations. Some research indicates that social factors may actually be able to predict adolescent delinquency resulting from impulsivity (Chen & Jacobson, 2013). In reviewing these factors, the primary themes that become apparent are those of social control and monitoring, the impact of the environment on healthy development, and exposure to risk factors or negative influences. These influences and factors are present in neighborhood qualities, family characteristics and discipline styles, peer groups and environmental exposures, and gender socialization.

Neighborhood qualities and influence. Research indicates that neighborhood context (Amorim Neto & True, 2011) and poverty (Chapple & Johnson, 2007) may directly correlate with impulsivity. Research notes that teens with higher levels of impulsivity appear to live in neighborhoods with residents of lower socioeconomic status (LSES) (Amorim Neto & True, 2011). This relationship may be explained by the influence of socio-economic status on the

development and family structure, levels of social control, and neighborhood efficacy (Vogel & Barton, 2013).

With so much of the research on impulsivity pointing towards to role of neurological development and executive functioning, it is important to first look at how socioeconomic status can impact this process. Research indicates that children from LSES environment demonstrate decreased levels of executive functioning (Arán-Filippetti & Richaud de Minzi, 2012). Further, they have surmised that the delay in development of this system may tie directly to conditions that result from having less financial resources which impacts the level of nurturing a child receives (Arán-Filippetti & Richaud de Minzi, 2012). Specifically, researchers have identified elements such as a decreased availability of cognitive stimulating material or toys, poor housing conditions, crowding, and excessive noise, as leading to high levels of stress and instability (Arán-Filippetti & Richaud de Minzi, 2012). Although not specifically identified, it could be argued that such ensuing levels of stress may impact the stress system thus leading to an excessive level of cortisol release. As such, increased levels of stress from environmental factors may produce a toxic effect on the brain and body's stress system. Should a high level of stress and cortisol release be maintained, this prolonged exposure may lead to structural changes in the brain, impacting the brain in a manner similar to that discussed in this paper's section on trauma.

Another factor that has been shown to be pivotal in the expression of impulsivity in neighborhood settings is the lack of available informal social controls (Amorim Neto, & True, 2011; Neumann, Barker, Koot, & Maughan, 2010; Vogel & Barton, 2013). Informal social controls represent informal neighborhood elements that help to monitor and report issues (Zimmerman, 2010). Neighbors reporting to a parent when a child is sneaking out, or when a child is suspected of a minor crime are two examples. It is easy to see how this element of

neighborhood communication may tie into reward and punishment sensitivity, as well as delay discounting within the experience of impulsivity. If an adolescent knows that there is a low to minimal chance of a neighbor contacting a parent or authority figure, it would be expected that the adolescent would be more inclined to engage in the behavior. In other words, the motivation to not engage in delinquent behavior is decreased since chances of getting caught are minimal.

Another factor influencing impulsivity is that of neighborhood collective efficacy (Vogel & Barton, 2013; Zimmerman, 2010). The concept of neighborhood collective efficacy is used to describe the level to which members of a neighborhood, as a whole, believe they can impact the behaviors of others and the events that occur around them (Vogel & Barton, 2013; Zimmerman, 2010). Therefore, a neighborhood with low collective efficacy would not believe that much could be done about delinquency and crime. Consequently, they can be led to believe there is no reason to report the delinquent behavior to authority figures, like parents or police. Likewise, parents in such an environment may also be led to believe that there is nothing that can be done to change disruptive or criminal behaviors and fail to try. Research indicates that the effect of impulsivity is stronger in neighborhoods with low levels of collective efficacy compared to neighborhoods with higher collective efficacy (Vogel & Barton, 2013; Zimmerman, 2010). Additionally, research indicates that authoritative parenting styles are enhanced when the family resides in a neighborhood with high levels of collective efficacy (Vogel & Barton, 2013).

It should also be noted that some research has reported the effect of impulsivity on delinquency is only statistically significant in areas of high socioeconomic status and low levels of criminogenic behaviors (Amorim Neto, & True, 2011). With regards to these findings, authors indicate that these results are in fact the result of statistical dilution. Levels of crime in low socioeconomic areas are so high that the role of impulsivity in this process does not end up being

significant because it is diluted out by all of the non-impulsive related crimes (Amorim Neto, & True, 2011). It only becomes apparent in an environment with high levels of social control and a strong social push to not engage in criminal behavior that impulsivity is a major statistical predictor of delinquency (Amorim Neto, & True, 2011). This finding holds true even though overall levels of impulsivity are higher amongst LSES compared to high SES (Amorim Neto, & True, 2011).

These findings suggest that in LSES neighborhoods, multiple factors contribute to delinquency, only one of which is impulsivity. However, within higher SES settings that control other factors, impulsivity is a major predictor of delinquency. This information does not dismiss the role of impulsivity in LSES settings; instead, it indicates that there are numerous other factors that must be considered when addressing impulsivity. One such factor that should be considered in all socioeconomic settings is that of family connectivity and interactions.

Family elements. Additional research suggests that for some adolescents, family structure and interactions are just as influential as neighborhood elements. Some of the factors that have been identified in the research include parental supervision and monitoring (Chen & Jacobson, 2013; Menting, Van Lier, Koot, Pardini, & Loeber, 2016; Neumann et al., 2010), single-parent households (Neumann et al., 2010; Zimmerman, 2010), family warmth (Chen & Jacobson, 2013), maternal attachment (Arán-Filippetti & Richaud de Minzi, 2012; Chapple, & Johnson, 2007), and parenting styles (Jiménez-Barbero et al., 2016; Menting et al., 2016). Research indicates that parental monitoring and supervision of adolescents is perhaps one of the most influential factors in mitigating delinquency (Chen & Jacobson, 2013; Menting et al., 2016; Neumann et al., 2010). This element includes not only parental monitoring of adolescents but also factors such as knowledge of the actions and whereabouts of adolescents (Chen & Jacobson,

2013; Neumann et al., 2010). With regard to this factor, research indicates that impulsivity negatively correlates with parental monitoring (Neumann et al., 2010). Therefore, as monitoring increases, the expression of impulsivity decreases. Given the importance of parental supervision, it is understandable how a child in a single-parent household may have increased likelihood of engaging in delinquency when impulsivity is present, as such a situation may limit a parent's time and resources for monitoring.

In addition to monitoring, another factor to consider is family warmth and attachment. The element of family warmth reflects the level to which an adolescent feels they are understood by their family (Chen & Jacobson, 2013), and it may arguably be considered an expression of attachment and connectedness with family members. As such, both family warmth and maternal attachment have been shown to share a relationship with mitigating delinquency (Arán-Filippetti & Richaud de Minzi, 2012; Chapple, & Johnson, 2007; Chen & Jacobson, 2013). Notably both attachment and family warmth help to develop a bond between youth and their parental figures, which may act as a motivator to avoid delinquent behaviors (Chen & Jacobson, 2013). However, a pivotal factor in this process is the parenting style that is adopted.

Parenting style appears to influence behavioral outcomes of impulsivity, mostly when impulsivity is low to medium in its intensity (Menting et al., 2016). Further, specific parenting styles that have been identified as having a negative impact include overly authoritarian or inconsistent (Jiménez-Barbero et al., 2016; Menting et al., 2016). It is important to note at this time that there are conflicting definitions of authoritarian styles of parenting, and the definition in the research that has been identified as having negative outcomes is when an authoritarian style is achieved through coercion and harshness (Jiménez-Barbero et al., 2016). As a result of this style of parenting, research indicates that children and adolescents may demonstrate poorer

cognitive reasoning, and increased expressions of aggression (Jiménez-Barbero et al., 2016). Research indicates that male adolescents demonstrate higher levels of using violence as a problem-solving method when they received an authoritarian style of parenting from their maternal figure (Jiménez-Barbero et al., 2016). It should be further noted that while male adolescents rebelled against the maternal authoritarian style, they also appeared to do well with a paternal style that was both educational and authoritative (Jiménez-Barbero et al., 2016). The fact that the research reviewed did not address cultural and ethnic differences in parenting styles and adolescent behavioral outcomes should be considered in relation to this information.

In working to understand these findings, authors point to the relationship that coercive styles of parenting can share with a general level of increased family violence (Jiménez-Barbero et al., 2016), thus indicating that such a parenting style may, in fact, reflect overall levels of family violence and aggression. However, another explanation may be found in the difficult nature of dealing with some childhood impulsive behaviors. For example, in their study on how parents cope with children experiencing ADHD, researchers found that mothers of children with hyperactive/impulsive type ADHD were more likely to engage in physical punishment or abuse as well as inconsistent discipline (Teixeira, Marino, & Carreiro, 2015). Unfortunately, these approaches were also found to result in increased problematic behaviors such as aggression and opposition (Teixeira et al., 2015). These findings suggest that outside of a general family pattern of violence, parents may adopt a more forceful authoritarian style of parenting in the face of difficult behaviors due to not knowing how to approach these behaviors to affect positive change.

Likewise, inconsistent parental styles can also result from family discord as well as insufficient parenting knowledge. Inconsistent parenting can present in a number of ways with

the main theme being that the messages received from one parent, or from both parents, lack consistency and predictability (Jiménez-Barbero et al., 2016). For example, an adolescent may receive an authoritative style from their maternal figure only to receive a contradictory permissive messages from their paternal figure (Jiménez-Barbero et al., 2016). Such a style can lead to adolescents being unable to learn the difference between truly right and wrong behavior, since parental messages are constantly shifting or at odds (Jiménez-Barbero et al., 2016). As such, deficits in empathetic abilities may occur, leading to a tendency to minimize the negative effects of violent of criminal behaviors (Jiménez-Barbero et al., 2016). In such a situation, adolescents with impulsivity may find it difficult to develop internally based family connected motivators for not engaging in delinquent or impulsive behaviors.

Peer and environmental influences. Outside of family influences, adolescents can also be highly impacted by their chosen peer group. Research indicates that affiliation with delinquent peers increases the probability of arrest in adolescents with low to medium levels of impulsivity, but did not appear to influence youth with high levels of impulsivity (Menting et al., 2016). Further, there is a strong relationship between exposure to community violence and problem behaviors and perpetration of delinquency (Low & Espelage, 2014). However, the explanation for such an impact may not be as simple as exposure. In fact, research into development and the adolescent brain indicates that due to natural delays in the development of executive functioning, adolescents are less able to regulate their emotions leading them to be more susceptible to peer influences when making decisions (Ahmed et al., 2015). This information indicates that adolescents may naturally and biologically be more influenced by peers. These findings suggest there may also be a biological basis for peer susceptibility.

Socialization. One last consideration is that of gender socialization. When looking specifically at the way that impulsivity is expressed, specifically expressions of aggressive impulsivity, researchers have suggested that gender norms and socialization may, in fact, play a significant role in the shaping of impulsive behaviors (Chapple & Johnson, 2007; Jiménez-Barbero et al., 2016). Research indicates that male children frequently receive less familial constraints and regulations than female children. As such, male children may be more prone to expressions of impulsivity (Chapple & Johnson, 2007). Additionally, male and female children often receive different social messages regarding the use and expression of aggression (Chapple & Johnson, 2007). Accordingly, research indicates that male children appear to use violence and aggression as a means of building self-esteem, while female children use it as a way to deal with problems with social relations (Jiménez-Barbero et al., 2016). It could also be argued that gender socialization influences internal motivation for behavior through social values on permissible or excusable behaviors.

The above identified social factors present new considerations for the expression of impulsivity. Although aspects of these processes relate to executive functioning and brain development, a large majority of them introduce the concept of motivation into this equation. The factors presented in this section speak to various processes and experiences that create or discourage motivation in adolescents to avoid harmful or risky behaviors. One of the primary factors identified appears to be social and familial judgment, pleasing, or attachment. Therefore, as factors change to decreases these attachments or processes, the likelihood of engaging in impulsive behavior increases. Notably, within this section peers, family, and neighbors were the primary source of detriment to motivation, however arguably these are not the only sources that may impact this process.

When considering the question posed regarding the causes and influences of impulsivity in adolescents, the literature suggests there are arguably numerous factors with a few essential elements emerging. First and foremost, a neurocognitive imbalance between the limbic and executive functioning systems is an essential influencer. In relation to this process, factors such as adolescent development, biological sex, and trauma and abuse emerge as factors that can further negatively impact this process. Another influencer that emerged is the impact of imbalanced neurochemicals with influencing factors such as genetics and mental health disorders. Lastly, a final influencer that emerged is the importance of motivation to avoid engagement in impulsive or reckless actions, which is affected by factors such as parental involvement, neighborhood awareness and efficacy, and peer groups. With this question answered, the focus now turns to exploring how impulsivity can be addressed through therapeutic interventions. As a part of this processes, it is important to explore commonly held beliefs about impulsivity, and the influences of these beliefs on the treatment of impulsive behaviors.

Public Perception and Lay Theories of Impulsivity and Self-control

Despite the progression that has occurred in the scientific field into the biological and neurological basis for impulsive behaviors, public perception of impulsivity still appears to remain grounded in will power. In fact, studies into individual perceptions of self-control and the ability to change highlight that many individuals continue to see the ability to change, or resist something negative, as a matter of internal fortitude or will (Freeman, Shmueli, & Muraven, 2013; Mukhopadhyay & Johar, 2005).

Further, studies also indicate that there are two general beliefs regarding the formation and execution of self-control. One belief states that self-control is a fixed resource of which some

have more than others (Freeman et al., 2013; Mukhopadhyay & Johar, 2005). The second belief contradicts this statement and identifies that self-control is actually a flexible and unlimited resources that can be changed and increased should a person wish (Freeman et al., 2013; Mukhopadhyay & Johar, 2005). In looking at the impact that these two beliefs have on public perception, research finds that individuals with fixed beliefs of self-control judge failures in self-control more harshly (Freeman et al., 2013). In fact, these negative judgments can frequently lead to acts of discrimination and shaming, and they are often detrimental to individuals experiencing difficulties with self-control.

Although these beliefs appear to represent general public perception on the experience of impulsivity, they also very likely represent the beliefs of many individuals who provide services to adolescent individuals. Given the key findings that emerged from this literature review, it is also likely that these perspectives have been conveyed to the adolescents who experience impulsivity as well. Utilizing these findings, it appears that addressing beliefs about impulsivity and correcting misperceptions of will power, may be necessary to support the provision of therapeutic interventions.

Treatment Needs

From these two considerations, biopsychosocial factors and public perceptions, concepts of treatment needs begin to emerge. From the biopsychosocial model, it is apparent that there are three main factors at work with regard to the expression of impulsivity, the imbalance of the executive functioning and limbic systems, neurochemicals, and motivation. However, motivation is not simply wanting not to hard enough. Motivation in this sense is specific internal and external sources of accountability and control that work to balance the reward/punishment system.

Further, public perception of impulsivity and self-control, suggests that treatment needs to include education on the factors that create and influence impulsivity for clients, family members, and treatment providers. Both treatment services and staff training must work to challenge commonly held beliefs regarding impulsivity. To persist in will powered based thinking and beliefs only fuel feelings of inevitability, powerlessness, failure, and judgment.

Current Treatment Approaches

Targeting neurochemicals. Due to the relationship between neurochemicals and impulsivity, one of the current treatment approaches is the use of psychotropic medications. Within this approach, the goal is normally to increase serotonin or decrease dopamine to help rebalance the limbic and executive functioning systems. Much of the research in this area has been conducted on adult populations, and the applicability of each medication to an adolescent population may vary. Although the medications bellow show applicability to the treatment of impulsivity, none of the listed medications are marketed specifically for impulse regulation (Grant, Odlaug, & Suck Won, 2007). Nevertheless, each medication has been shown to be effective for treating impulsivity (Grant et al., 2007).

Antidepressants. Within the research on impulsivity and psychopharmaceutical, the class of drugs that appears to get the most attention is that of antidepressants. One of the most commonly studied forms of antidepressants is selective serotonin reuptake inhibitors (SSRIs) (Amorim Neto & True, 2011; Carter & Olshan-Perlmutter, 2015; Grant & Chamberlain, 2015; Grant et al., 2007; Grant & Potenza, 2012) Research indicates that there are a number of reasons why SSRIs have been specifically chosen to treat impulsivity, one of which is their ability to specifically work on serotonin, a primary neurochemical indicator in impulsivity (Grant & Potenza, 2012). Two medications commonly studied and prescribed are Fluoxetine (Prozac)

(Carter & Olshan-Perlmutter, 2015; Grant & Potenza, 2012; Grant et al., 2007) and Sertraline (Zoloft) (Grant & Potenza, 2012; Grant et al., 2007).

In addition to their effect on serotonin, SSRIs are prescribed over other antidepressants due to their relative safety (Grant & Potenza, 2012). Researchers recognize that impulsivity frequently accompanies other mental health diagnoses with a prevalence of suicidality (Grant & Potenza, 2012). Therefore, researchers note that even if taken in large amounts, SSRIs remain relatively nonlethal (Grant & Potenza, 2012). In addition, another positive factor is that this family of antidepressants is tolerated well by patients, and in comparison to other available medications, there are fairly few negative side effects (Grant & Potenza, 2012). Overall, research indicates that SSRIs have received mixed reviews as to their efficacy in impacting impulsivity. One of the greatest challenges is the fact that each impulse control disorder functions differently. Therefore, what works for one individual does not always work for others. Available findings indicate that SSRIs have shown some efficacy in the treatment of compulsive buying (Grant et al., 2007), impulsive aggression, and intermittent explosive disorder (Grant & Potenza, 2012; Grant & Chamberlain, 2015).

Another classification of antidepressant used to treat impulsivity is selective norepinephrine reuptake inhibitors (SNRIs) (Grant & Chamberlain, 2015). In comparison, SNRIs work to create a change in neural chemistry by blocking the reuptake of norepinephrine, thus making more available for use by the neural system. Unlike SSRIs, SNRIs are indicated less frequently in the treatment of impulsivity, and they are mostly utilized in the treatment of ADHD (Grant & Chamberlain, 2015). However, promising results have been seen for the use of this medication for individuals with binge eating disorder (Grant & Chamberlain, 2015).

Antiepileptic and anticonvulsants. Another commonly prescribed family of drugs is antiepileptics or anticonvulsants (Amorim Neto & True, 2011; Carter & Olshan-Perlmutter, 2015; Grant & Potenza, 2012). This family of medications is traditionally marketed as anti-seizure medication; however, they have shown an application to impulse control disorders in their ability to work on GABA and other neurochemicals that decrease activity in the limbic system (Grant & Potenza, 2012). Specifically, the medications that have been indicated include Valproic acid, Carbamazepine, Tiagabine, Divalproex (Grant & Potenza, 2012), Lamotrigine (Carter & Olshan-Perlmutter, 2015; Grant & Potenza, 2012), Dilantin, and Depakote (Carter & Olshan-Perlmutter, 2015). These medications have been used to address impulsive aggression, as well as BPD and ASPD (Carter & Olshan-Perlmutter, 2015). Whereas these medications have a demonstrated efficacy, they can also come with significant risks to the client (Grant & Potenza, 2012). Many of the listed medications have aversive side effects, as well as the potential for lethal reactions (Grant & Potenza, 2012). For this reason, the pros, cons, and alternatives to these medications must be thoroughly weighed out prior to prescription.

Typical and atypical antipsychotics. Due to their ability to impact serotonin and/or dopamine, both typical and atypical antipsychotics have also been used to treatment impulse related symptomology (Amorim Neto & True, 2011; Carter & Olshan-Perlmutter, 2015; Grant & Chamberlain, 2015; Grant & Potenza, 2012). Although the older typical antipsychotics are less popular, research does indicate the use of medications such as Haloperidol and Flupentixol (Grant & Potenza, 2012), due to their ability to decrease levels of dopamine. However, these substances are often poorly received by clients due to their adverse side effects, and adherence to this type of medication is low (Grant & Potenza, 2012).

In comparison, the use of atypical antipsychotics has seen much more success with regard to impulsivity. Drugs that have been used within this category include Risperidone and Olanzapine (Carter & Olshan-Perlmutter, 2015; Grant & Potenza, 2012). In contrast to typical antipsychotics, atypical antipsychotics work to modify both dopamine and serotonin (Grant & Potenza, 2012). Further, studies on the drug Risperidone, indicate that it can be an effective option for adolescent impulsive aggressions when combined with another mood stabilizer (Carter & Olshan-Perlmutter, 2015). Other studies implicate these medications for use with conduct disorder, as well as potential uses with trichotillomania (Grant & Chamberlain, 2015).

Lithium. Much like typical antipsychotics, lithium is a mood stabilizing medication that has been utilized in the treatment of mood disorders for many years. Some studies indicate that there may be some application of lithium to impulsivity (Amorim Neto & True, 2011; Carter & Olshan-Perlmutter, 2015; Grant et al., 2007; Grant & Chamberlain, 2015). Further, research into the use of lithium to decrease impulsive aggression has demonstrated the ability to significantly decrease symptomology within medium security prisoners (Carter & Olshan-Perlmutter, 2015). Other studies indicate that lithium may be effective in the treatment of conduct disorder, and there are mixed reviews regarding its efficacy towards gambling disorders (Grant & Chamberlain, 2015). It appears that lithium is most effective for treating symptoms of impulsive aggression.

Glutamatergic agents. Within the process of neurological transmission and communication, the chemical glutamate is responsible for the transmission of signals between nerve cells. Glutamatergic medication, therefore, works to decrease the activity of glutamate in the brain, slowing down these signals and activity (Grant et al., 2007; Grant & Chamberlain, 2015). In this processes, changes also occur to the dopamine and serotonin receptors (Grant et

al., 2007; Grant & Chamberlain, 2015). Glutamatergic medications indicated for use with impulsivity include N-acetylcysteine (NAQ) (Grant et al., 2007), Memantine, and Topiramate (Grant & Chamberlain, 2015). Within theses studies, outcomes indicate that the use of these medications may help with gambling urges (Grant et al., 2007), alcohol use, kleptomania, and compulsive buying (Grant & Chamberlain, 2015).

Opioid antagonists. Opioid antagonist medications work at the opioid receptor site to block the activation of these areas (Grant & Potenza, 2012). This type of medication is traditionally used in the treatment of opioid addiction, as the administration of this medication prevents opioid substances for having an effect on the user and works to curb cravings for these substances (Grant & Potenza, 2012). However, recent research also indicates that this form of medication is also effective for addressing cravings for alcohol since blocking the opioid receptor site also decreases the release of dopamine and decreases the reward that is received by the brain from alcohol (Grant & Chamberlain, 2015). For this same reason, recent studies also indicate the use of oral Naltrexone for other impulse-related disorders (Grant et al., 2007; Grant & Chamberlain, 2015; Grant & Potenza, 2012). Research indicates the use of this medication has shown decreases in gambling urges and behaviors (Grant et al., 2007; Grant & Chamberlain, 2015). Additional studies indicate that there may also be implications for this medication in trichotillomania (Grant et al., 2007) as well as kleptomania (Grant & Chamberlain, 2015).

Stimulant medications. Research indicates that stimulant medications possess a unique relationship with impulsivity that results from ADHD (Amorim Neto & True, 2011). There are a number of commonly used stimulant ADHD medications; however, those listed within the research include Methylphenidate, Dextroamphetamine, and Pemoline (Amorim Neto & True, 2011). While stimulant medications have long demonstrated their efficacy in treating some

ADHD symptomology, this class of medication has also been shown to worsen other impulse control disorders (Grant & Chamberlain, 2015).

From these findings, a partial answer to the third research question posed in this paper emerges. In an effort to address neurochemical imbalances and behavioral symptomology of impulsivity, it appears that the use of medication does have some demonstrated efficacy. However, due to the many documented side effects, and the fact that medication only helps to address one factor of impulsivity, the use of medication alone is not enough to treat impulsivity. Additionally, it should be noted that medication is not appropriate or effective for all individuals, and psychopharmacological intervention should be considered one of many options.

Behavioral approaches.

Cognitive behavior therapy (CBT). As a result of the research that occurred in the 1980's and 1990's, a number of studies emerged exploring behavioral, cognitive, and cognitive behavior therapy (CBT) approaches to impulsivity (Amorim Neto & True, 2011; Baer & Nietzal, 1991; Farmer & Golden, 2009; Piquero, Jennings, & Farrington, 2010). This early research appears to continue to significantly influence the literature and treatment today, as many of the current articles reviewed largely cited studies from the late 80's and early 90's. However, reviews of these studies identify a number of complicating factors.

The most complicating factor is the lack of a common definition of impulsivity (Baer & Nietzal, 1991; Farmer & Golden, 2009). This factor has led to non-uniform study populations, thus making it difficult to compare measures of change (Farmer & Golden, 2009). Another complicating factor that arises is the wide variety of cognitive, behavioral, and cognitive behavioral approaches that have been utilized (Baer & Nietzal, 1991; Farmer & Golden, 2009). Due to this variety, and the limited amount of research that appears to be available, it is difficult

to identify the mechanism that helps to support actual change for impulsivity specifically (Farmer & Golden, 2009).

Mixed reviews appear regarding the utilization of these behavioral, cognitive, and cognitive behavioral techniques. Although more recent studies outwardly state that CBT is the most empirically validated treatment for impulsivity (Garrett & Giddings, 2014), an earlier study conducted by Baer & Nietzal (1991) identified that these interventions were associated with improvements in impulsivity that were one third to three fourth standard deviations greater than the untreated group. One third to three fourths of a difference is a significant variance in outcomes, and no research seems to be easily available between this 1991 article and the 2014 article to identify what changes in approach have been made to increased positive outcomes. However, another potential explanation for these mixed reviews is a lack of specificity regarding approach. There are multiple treatment interventions that utilize a CBT perspective, and each of them is identified by the title they have been given instead of the theory that underlies them (CBT).

Social and interpersonal skills training. One example of a specific CBT approach that has occasionally been applied to treating impulsivity is that of social and interpersonal skills training (Grant & Potenza, 2012; Moeller et al., 2011; Stouwe, Asscher, Hoeve, Laan, & Stams, 2016). Although approaches to this process vary, most focus on creating change in social skills by addressing topics such as social interactions, pro-social behavior, and cognitive skills (Stouwe et al., 2016). Further, these skills are taught through the utilization of techniques such as positive reinforcement, coaching, and role-playing (Stouwe et al., 2016).

Unfortunately, much like other CBT research, studies regarding the efficacy of this approach appear to be rare. However, existing research indicats that interventions may be

effective in decreasing participants' impulsivity, increasing their ability to take the perspective of others, and bolstering their engagement in critical reasoning (Stouwe et al., 2016). Researchers indicate that outcomes from this study are small but still relevant (Stouwe et al., 2016).

Dialectical behavior therapy (DBT). One approach that combines both CBT and social skills training is that of DBT. DBT is a derivation of CBT that emphasizes the importance of self-acceptance and validation, as well as skills training in the process of reshaping dysfunctional behaviors (Macpherson, Cheavens, & Fristad, 2012; Shelton, Kesten, Zhang, & Trestman, 2011). Due to its ability to address these factors and create demonstrable change, many endeavors have been made to adapt DBT for various populations including adolescents with various forms of emotional dysregulation and impulsivity. Research indicates that DBT has been applied to adolescent populations with oppositional defiant disorder (ODD), trichotillomania (Macpherson et al., 2012), substance use disorders (Rathus & Miller, 2015), and eating disorders (Macpherson et al., 2012; Rathus & Miller, 2015).

Studies regarding the application of DBT to adolescents and adult populations demonstrate decreases in aggression, overall disciplinary problems in correctional centers (Macpherson et al., 2012; Shelton et al., 2011), impulsivity (Jamilian, Malekirad, Farhadi, Habibi, & Zamani, 2014), suicidal behaviors, non-suicidal self-injury, depression, and hopelessness, as well as increases in general functioning (Macpherson et al., 2012). In looking further at these results, it appears that although DBT originated as a treatment for BPD, it may be globalized to address many disorders of emotional dysregulation (Jamilian et al., 2014; Macpherson et al., 2012; Rathus & Miller, 2015; Shelton et al., 2011).

It is for these reasons that DBT appears to be the most effective available behavioral approach for addressing the behavioral expression of impulsivity. The combination of DBT and

the use of psychopharmaceuticals partially answers the research question guiding this paper pertaining to the identification of interventions that can be employed to address impulsivity. Therefore, the DBT model and its application to adolescent populations will be explored later in this paper with regard to its use in treatment interventions. However, as previously stated, these approaches only partially answer this questions, as not all of the identified areas of identified treatment need can be met by these approaches.

Addressing Remaining Treatment Needs

While psychopharmaceuticals work to address the neurochemical aspects of impulsivity, DBT interventions work to addresses the behavioral aspects that result from impulsivity. Additionally, it may be argued that in addressing these behavioral processes, DBT targets the motivational factors that influence the expression of impulsivity, as changes in behavior require and effect changes in motivation and cognition. However, whereas these interventions work to impact neurochemical functioning and motivation, no interventions appear to address the primary cause of impulsivity, the imbalance of the limbic and executive functioning systems. As such, there appears to be a significant gap in the current treatment of impulsivity.

Working memory training. In response to this gap, one proposed solution is that of working memory training (Arán-Filippetti & Richaud de Minzi, 2012; Brooks, 2016; Khurana et al., 2013; Menting et al., 2016; Romer et al., 2011). Working memory training involves engaging in tasks that exercise the functions of the working memory system-- such as information recall, planning, and problem-solving-- with the goal of strengthening this system (Kermani, Mohammadi, Yadegari, Sadeghi, & Haghighi, 2016; Melby-Lervåg & Hulme, 2013). Although this approach has been suggested by numerous researchers in reference to impulsivity, little to no research exists indicating implementation of the suggestion. However, a significant amount of

research can be found on the application and outcomes of working memory training in relation to adolescent ADHD and other developmental disorders.

In a review of the available research, eight studies indicated that working memory training resulted in improvements and favorable outcomes. Mores specifically, the improvements noted included increased functioning of working memory (Dunning, Holmes, & Gathercole, 2013; Klingberg, Forssberg, & Westerberg, 2002; Mezzacappa & Buckner; 2010; St. Clair-Thompson & Holmes, 2008), increased cognitive functioning (Klingberg et al., 2005), and improvements in delay discounting cognitions (Bickel, Yi, Landes, Hill & Baxter, 2011). However, in addition to these improvements, research outcomes also demonstrated improvements in hyperactive/impulsive ADHD symptomology (Kermani et al., 2016; Klingberg et al., 2005; Klingberg et al., 2002; Mezzacappa, & Buckner, 2010; Roording-Ragetlie, Klip, Buitelaar, & Slaats-Willemse, 2016; St. Clair-Thompson, & Holmes, 2008). Additionally, it should be noted that these improvements were found to surpass the improvements that can be achieved through the use of stimulant ADHD medications (St. Clair-Thompson, & Holmes, 2008). These findings suggest that working memory training not only improved deficits in working memory/executive functioning, but in doing so, it also helped to deceases the behavioral symptomology of these deficits, such as impulsivity.

It should also be noted that the application and efficacy of working memory training was not supported by all articles reviewed. In a meta-analysis of working memory training in adolescents with ADHD, Melby-Lervåg and Hulme (2013) reported that they did not find enough substantial outcomes to support the application of this intervention. However, there are a number of factors that may explain the lack of supportable findings. One such factor is that of the research populations that are used in some studies. Research has found that working memory

training only shows significant and sustainable improvements in individuals with pre-existing working memory deficits (Melby-Lervåg & Hulme, 2013; Roording-Ragetlie et al., 2016; St. Clair-Thompson & Holmes, 2008). Therefore, studies conducted on populations not specifically containing adolescents with working memory deficits yielded no sustainable improvements.

Another factor that appears to impact outcomes is the type and delivery of training that adolescents received. Trainings that occur via computerized software with little counselor interaction may be less effective than those delivered through different means or with greater interaction (Minear et al., 2016; Wass, Scerif, & Johnson, 2012). Additionally, training programs that have shorter training durations appear to be less effective than those that are longer and more intensive (Klingberg et al., 2002).

In addition to the modality of the training program, a factor that may further explain unsubstantiated outcomes is that of motivation. Studies indicate that the level of participant motivation may have a significant impact on the outcomes of working memory training (Bickel et al., 2011; Kermani et al., 2016; Holmes et al., 2009; Minear et al., 2016; Wass et al., 2012). Further, elements that appeared to impact participant motivation included the use of monetary reinforces (Bickel et al., 2011), the therapist/client relationship (Kermani et al., 2016), and the level of therapist support and interaction given to participants (Holmes et al., 2009).

Taken as a whole, evidence supporting changes in working memory and executive functioning as well as behavioral improvements, suggests that working memory training may be an effective intervention for addressing impulsivity. As such, working memory training may, in fact, work to fill the gap that currently exists in the treatment of impulsivity. It is proposed that working memory training can be integrated with other behavioral and pharmaceutical treatments, as necessary, to address adolescent impulsivity in a manner that best meets all of the identified

treatment needs. Therefore, it is argued that the integration of DBT, psychopharmaceuticals, and working memory training answers the third research question of this paper by identifying a series of interventions that can be utilized to address all of the identified treatment needs for impulsivity.

Theoretical Orientation and Description of the Application

Theoretical orientation

Dialectical behavior therapy. DBT was originally created in order to address BPD and patterns of self-harming behaviors and suicidality (Rathus & Miller, 2015). As such, DBT includes elements that address emotional, interpersonal, behavioral, cognitive, and self-dysregulation (Rathus & Miller, 2015). DBT aims to create change through the process of learning new self-regulatory skill (Macpherson et al., 2012; Rathus & Miller, 2015).

In this process, therapists work from a hierarchical standpoint which consists of four treatment stages (Macpherson et al., 2012; Miller, Rathus, & Linehan, 2007). The first stage of this process focuses on safety and behavior regulation, during which therapists address and teach skills for stabilization and behavioral control (Miller et al., 2007). As clients become more functional, as evidenced by a decrease, or lack, of self-harming behaviors, they move into the second stage of treatment (Miller et al., 2007). In the second stage, the goal is to address symptoms of emotional distress, which is achieved through emotional regulation and acceptance skills (Miller et al., 2007). The overall goal of this stage is for clients to be able to experience "regular" happiness and unhappiness in a manner that does not exhibit emotional extremes (Miller et al., 2007). As clients move past the second stage and into the third, the focus becomes addressing symptoms of ongoing disorders and "ordinary problems of living (Miller et al., 2007). In this process, therapists focus on helping clients increase self-respect and achieve personal

goals (Miller et al., 2007). The forth and final stage of this process focuses on meaning making through the process of resolving feelings of "incompleteness" (Miller et al., 2007). The overall goal of this last stage is to helping individuals develop the capacity for feeling joy, happiness, and an overall sense of enjoyment or purpose for life (Miller et al., 2007).

Within this approach, one of the primary components is the skills development group. Skills group material includes a step-by-step methodical group manual of worksheets which introduces and teaches the topics of interpersonal effectiveness, distress tolerance, mindfulness, and self-regulation (Macpherson et al., 2012; Rathus & Miller, 2015; Shelton et al., 2011; Shelton, Sampl, Kesten, Zhang, & Trestman, 2009). Augmentation from the original format of DBT has occurred in order to better suit DBT to adolescent populations include a shortening of the skills group process from one year to 24 weeks (Rathus & Miller, 2015), involving family members in skills group and individual counseling, as well as adding material to suit the needs and experiences of adolescents (Macpherson et al., 2012; Rathus & Miller, 2015).

The key mechanism allowing DBT to enact change in the expression of impulsivity exists within the origins of BPD. Theory regarding BPD states that it results as a combination of biological predisposition and exposure to invalidating environmental experiences (Rathus & Miller, 2015) Whereas invalidating environmental experiences shape the behaviors that manifest the diagnosis of BPD, it is the biological predisposition to this disorder that opens the door. These predispositions arguably include impulsivity (Shelton et al., 2011), as well as limbic and executive functioning dysregulation. Likewise, as discussed above, many impulse control disorders stem from a similar biological predisposition or damage. These findings suggest that the behavioral dysregulation that DBT addresses results directly from an imbalance between the limbic and executive functioning systems.

Working memory training. Within executive functioning, working memory is a key area that supports the functioning of short-term memory and is responsible for holding and manipulating information while also blocking outside stimulation and distractions (Grant & Potenza, 2012; Klingberg, 2010). To perform this task, this system utilizes related skills such as information recall, planning, problem-solving (Kermani et al., 2016), task switching, goal setting (Baddeley, 2007), and strategizing (Grant & Potenza, 2012). The concept of working memory training posits that deficits in working memory, and therefore executive functioning, can be improved by exercising this system of the brain. This process is achieved by engaging in tasks that utilize skills of strategizing, problem-solving, planning, visual manipulation, sustained attention, and response speed (Alloway & Alloway, 2014). Many studies and programs achieve this process through the use of computer-based programs. However, training of working memory can also occur through structured games and activities (Kermani et al., 2016).

It has been proposed that working memory training produces changes brain functioning through the concept of neuroplasticity (Klingberg, 2010). Neuroplasticity is a term that essentially reflects the brain's ability to grow and change depending on the needs and tasks with which it is presented (Cramer et al., 2011). It was once believed that the brain was concrete and that once it finished developing, functioning could not be changed for the better. However, more recent science has shown that there is some capacity for different systems of the brain to change if the need is presented in the right way (Cramer et al., 2011). Working memory is one of the many brain systems to which the concept of neuroplasticity applies (Klingberg, 2010).

In looking closer at the processes of working memory, studies indicate that higher levels of working memory functioning are linked with higher amounts of neural connectivity in the fronto-parietal section of the brain (Klingberg, 2010). Therefore, the concept of neuroplasticity

suggests that by exercising this system through working memory-related tasks, neural connectivity can be increased (Klingberg, 2010). Notably, studies that have utilized brain scanning technology have been able to demonstrate increases in brain activity in relation to working memory training (Klingberg, 2010).

As mentioned above, to perform its duties, working memory relies on a number of related skills. Two of these related skills are impulse control and inhibition. Studies suggest that if one area of the working memory is trained, improvements can be seen in all or most other areas as well (Klingberg, 2010). Therefore, since working memory and impulse control are in the same system, improving one causes improvements in the other.

In further explaining this relationship, studies indicate that working memory training may lead to a decrease in dopamine receptor cites, thus decreasing the amount of dopamine that is active in the brain (Klingberg, 2010). This change is notable for a number of reasons, the first of which being that small decreases of dopamine in animal studies have been linked to improvements in working memory (Klingberg, 2010). However, more notably, increased levels of dopamine are a primary factor in the expression of impulsivity (Grant & Potenza, 2012). Therefore, working memory training may work to produce changes in impulsivity through a number of mechanisms, including both neuroplasticity as well as changes in neurochemical uptake.

Research on the use of working memory training indicates that for it to produce the most effective outcomes, a few key elements must be present in both the training program as well as participants undergoing the training. The first important programmatic aspect involves the use of activities and interventions that challenge the participant in a manner that progressively increases in complexity (Dunning et al., 2013; Klingberg et al., 2002). This process is very similar to the

learning theory of scaffolding in that learning and growth occurs through tasks that build on previously learned and supported skills (Dunning et al., 2013). This principle is also consistent with the concept of neuroplasticity, which requires this system of the brain to be consistently challenged or taxed to produce the need for improvement and encourage growth. The second element that must be present for this approach to be effective is motivation (Cramer et al., 2011; Minear et al., 2016; Wass et al., 2012). Lastly, a final key element is the existence of working memory deficits. Interestingly, research indicates that the gains in working memory produced by training appear to be limited to those with existing deficits (Melby-Lervåg & Hulme, 2013). In other words, working memory training only appears to help individuals improve their skills up to a standard developmental level, and it does not appear to support cognitive gains significantly above normative age standards.

Application

The purpose of this application is to propose a therapeutic intervention that can address executive functioning deficits, as well as increase prosocial motivation in adolescents with impulsivity. To achieve this aim, this application proposes an integration of working memory training into DBT for adolescents. This integration is presented in the form of a treatment manual, which augments the existing DBT skills group for adolescents curiculum.

In this manual, working memory training is utilized to address executive functioning deficit; whereas, the DBT approach and DBT skills group are used to increase motivation for participation and treatment engagement. Simultaneously, core living skills such as distress tolerance, emotional regulation, mindfulness, and interpersonal communication are addressed in an effort to increase them. This manual presents an integration in the form of an augmented DBT skills group and focuses on providing a format for including a working memory training section

into the adolescent DBT skills group format, as presented by Rathus and Miller in their 2015 skills group manual.

To facilitate this integration, the manual replaces the first segment of DBT group, which is traditionally used for homework review (Rathus & Miller, 2015), with structured experiential working memory training activities. Therefore, the augmented group structure opens with a brief mindfulness exercises, moves into working memory training, breaks as necessary, then closes with the traditional skills focused session. The only module that will not be augmented in this fashion is that of mindfulness, as mindfulness shares a unique relationship with working memory, a process addressed in this manual.

This manual maintains the 24-week structure that is proposed by Rathus and Millers (2015) in their adolescent DBT manual, in which groups meet one time a week for a minimum of two hours. To meet the need for increasing challenge, working memory training in this manual is presented in stages that increase in complexity as participants progress. Stage one of the working memory training sections focuses on introducing participants to working memory skills through basic activities. In this stage, group members are given tasks that they can completed individually, that have one to two primary components. In other words, participants only have to use one or two skills to complete the task. In the second stage, task complexity increases. This may be achieved through a number of means. Tasks given may increase in complexity by requiring more skills, integrating multiple levels, or utilizing multiple tasks. In the third stage, complexity is added by including an element of timed activities or competition. In this section, group members must complete similar activities from previous stages but do so as quick as possible. This component adds an element of healthy stress and pressured thinking. In the final stage, the element of group participation is added. This addition requires participants to utilize

working memory skills but adds the element of planning and strategizing to involve more than one person.

For the purpose of this manual, working memory training is intended to occur in a manner that provides a structured experiential process, such as that of a game, puzzle, or other interactive activity. The overall goal is to provide participants with an activity that will engage them in an interactive way, while also challenging their working memory skills. For this manual, facilitators are free to choose their own activities, as long as the activities meet the requirements of the identified working memory stage and are appropriately challenging to participants. When looking for activities, facilitators should focus on games and tasks that utilize the skills such as problem-solving, planning, visual manipulation, sustained attention, strategizing, and response speed (Alloway & Alloway, 2014). Examples of potential activities are provided in the manual.

As mentioned above, motivation is a key factor in both DBT as well as working memory training. Due to the challenging nature of working memory training tasks, this manual encourages facilitators to consider utilizing tangible external motivators to gain and maintain group member participation. These techniques may include elements such as candy, small prizes, points, or other elements that participants would be willing to work to gain.

Audience

In the distribution of the resulting product, the intended audience varies. The primary audience is treatment providers who work with adolescents experiencing impulsive symptomology within a criminal justice setting. However, this manual can be used with any provider or agency interacting with youth who may be impacted by the expression of impulsivity, such as probation officers or teachers. Further, this product may also be helpful for families of adolescents who are experiencing impulsivity. With all of these potential populations,

the intend use is to provide more information regarding the formation and expression of impulsivity, as well as how these symptoms can be addressed to decrease negative consequences to health, relationships, legal standing, and much more.

Conclusion

Throughout this process, this paper focuses on addressing three primary questions, the first of which explores the relationship between impulsivity and adolescent crime. Once this relationship was established, this paper sought to explore the second question which examined the factors that influence impulsivity in adolescents. As a result of the findings from this question, this paper turned to its third question regarding what steps can be taken therapeutically in order address impulsivity, thus also intervening in adolescent criminal behavior.

With regard to the first question of this paper, focusing on the relationship between impulsivity and adolescent crime, it was shown that impulsivity is a primary predictor of adolescent criminal offending (Bechtold et al., 2014; Chen & Jacobson, 2013). In relation to these findings, it appears that impulsivity specifically relates to earlier onsets of drug and alcohol use (Khurana et al., 2013), greater vulnerability to substance use and addiction, and greater inclinations to engage in risky and reward-seeking behaviors (Grant & Potenza, 2012). All factors that specifically increase an individual's chances of engaging in criminal behaviors.

With regard to the second question of this paper which explored the influences and causations for dysfunctional impulsivity, the literature identified three primary factors. The first, and most prevalent, of these factors being an imbalance between the limbic and executive functioning systems (Grant & Potenza, 2012). Further, studies indicated that this imbalance can result from genetic predisposition, traumatic brain injury (Grant & Potenza, 2012), insecure attachment, psychological trauma, or prolonged exposure to a high-stress environments (Diseth,

2005). The second factor identified is that of an imbalance in neurochemicals such as dopamine and serotonin, as well as many other related neurochemical systems (Grant & Potenza, 2012). Lastly, the third is a lack of prosocial motivation that results from sociological and environmental factors such as lack of parental monitoring (Chen & Jacobson, 2013), deficits in neighborhood connectivity, and decreased community efficacy (Vogel & Barton, 2013).

After the identification of causal factors, the focus of this paper turned to answering the third research question which explored therapeutic interventions to address each of the three identified influencing factors. With regard to the factor of imbalanced neurochemicals, the literature indicates that some efficacy has been demonstrated for the use of psychopharmaceuticals such as anti-depressants, anti-convulsants, anti-psychotics, and opioid antagonists (Grant & Potenza, 2012). Although many authors cite the application of cognitive behavioral strategies, little researcher exists to support this claim. Unfortunately, research also indicates that little to no therapeutic approaches exist to address the imbalance between the limbic and executive functioning systems.

Due to this identified gap in available treatment modalities, this paper provides a detailed response to the need for an intervention that addresses both behavioral motivation and neurocognitive imbalance. As a result, this paper proposes the integration of two treatment modalities. The first of these approaches being Dialectical Behavior Therapy (DBT), which through it's theory of change, therapist's approach, and skills group, works to arguably increase participant motivation for prosocial behaviors. In addition to this approach, the intervention of working memory training also emerges as a solution for addressing the imbalance between the executive functioning and limbic systems. Therefore, in order to address the need to intervene in

adolescent impulsivity, an integration of working memory training into DBT skills group is provided.

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APPENDIX

Addressing the Impulse

A Working Memory Training Addition to Dialectical Behavior Therapy for Adolescent Impulsivity

By

Kira M. Hansen

Introduction

How do you teach someone to change the things they do before thought or consequences occur? How can those behaviors they do without even thinking that get them into so much trouble, and the behaviors they seem to do over and over again with the same or worse results, change? How many times as treatment providers and staff, probation officers, teachers, and parents have we been faced with these questions?

It was during my time as an intern at a Youth Facility that these questions became mine as well. At first I resorted to the standard explanation that sometimes people are not ready to change or sometimes they have not found the right skills yet. I consoled myself with the thought that when they are ready, these young adults would change their actions to fit the future that they wanted; therefore, what they needed was motivation, encouragement, and skills.

I found plenty of individuals who wanted to make a change, as well as plenty who were not quite ready. As with most counselors, I went about mapping out treatment goals, identifying underlying problems, and working towards therapeutic objectives and skills. Again as with much counseling, a majority of this work centered on Cognitive Behavior Therapy (CBT) and identifying and changing beliefs, thoughts, feelings, and actions. However, the one issue that came up the most was how to change impulses and the behaviors we do before we even get to

think. It was here that we, both the clients and I, often found the core to much of their problem-based behaviors.

It was also here that as a counselor, I found myself the most challenged. I questioned how much as counselors we are really doing to give our client's the best chance at change. I also questioned whether I was really addressing the problem if I was not addressing the core underlying issue of impulsivity.

Therefore, it was because of these questions and this opportunity that I set out to answer them. I sought to understand impulsivity, its functions and expressions, and most importantly its treatment. What I found was that I was not all wrong in the beginning. We do need to provide motivation, encouragement, and skills. However, the key is how and what skills we are teaching.

Intended Use and Companion Text

It is the intention of this manual to provide a guide for teaching skills and interventions to adolescents for the purpose of addressing impulsivity and its subsequent impacts on behavior and interpersonal relationships. In doing so, this manual will utilize the existing approach of Dialectical Behavior Therapy (DBT) skills training for adolescents and propose the addition of Working Memory Training to address neurological features of impulsivity. As such, this manual will provide proposed additions in reference to an existing DBT skills manual. For this manual, the author has chosen *DBT skills manual for adolescents* (2015) by Jill Rathus and Alec Miller. However, other adolescent DBT skills based manuals should be appropriate for adaptation with the proposed methods as well.

TABLE OF CONTENTS

PART I

Impulsivity, DBT, and Working Memory Training

IMPULSIVITY

What is impulsivity?

There are a number of definitions that have been proposed to describe impulsivity. Perhaps the simplest is that impulsivity is the concept of engaging in an action or behavior before thinking of the immediate or long-term consequences. However, there are many processes that impact the expression of this behavior. In trait based assessments of this concept, researchers identify four defining characteristics: urgency, lack of premeditation, minimal perseveration, and sensations seeking (Sperry, Lynam, Walsh, Horton, & Kwapil, 2016).

The concept of urgency refers to an individual's tendency to react to intense negative or positive emotions in a rash or regrettable fashion (Sperry et al., 2016). Similarly, the characteristic of lack of premeditation represents an individual's tendency to engage in action before thinking of possible outcomes (Sperry et al., 2016). Lack of perseveration represents the concept of failing to remain focused on a task, thus leaving it unfinished, completed late, or poorly executed (Sperry et al., 2016). Lastly, the concept of sensation seeking represents a need or drive for excitement, pleasure, or novel experiences (Sperry et al., 2016).

The expression of these concepts in individuals can take a number of forms, and not all persons express each of these characteristics. One of the behaviors that can be observed in adolescents is that of risk taking (Grant & Potenza, 2012). These behaviors may include rule breaking, risky sexual behaviors, and engaging in dangerous activities. In relation to this factor, another process that may be observed

is reward seeking and sensitivity (Grant & Potenza, 2012). In other words, engaging in behaviors because they provide a pleasurable feeling, such as drug or alcohol use, and directly seeking out activities or processes that will provide this pleasurable feeling.

In doing so, some individuals also engage in delay discounting (Grant & Potenza, 2012). Delay discounting describes the concept of choosing immediate rewards despite the knowledge of negative future outcomes (Grant & Potenza, 2012). For example, smoking marijuana even though you know you are going to have to check in with your Probation Officer tomorrow. At the core of this process is a dysfunction in goal-directed behaviors and an inability to value long-term over short-term gains. In other words, it's not that adolescents are being apathetic or do not care, rather it's that cognitively the short term outweighs the long-term. Given this factor, it's not surprising that lack of planning and difficulty maintaining future focused goal-driven behaviors is also demonstrated by adolescents with impulsivity (Grant & Potenza, 2012). Another behavioral feature that may also be demonstrated is emotional dysregulation (Mitchell, Robertson, Anastopolous, Nelson-Gray, & Kollins, 2012). Emotional dysregulation may be seen in behavioral factors such as hypersensitivity to emotions, difficulty appropriately expressing emotional experiences, or general over-reactivity to emotions.

When is impulsivity dysfunctional or harmful?

When discussing impulsivity, it is important to remember that impulsivity, like other behaviors, has an evolutionary function. In fact, functional impulsivity is a positive factor that helps to promote survival and safety in times when quick thinking and reaction is necessary (Dickman, 1990). Take, for example, applying car breaks quickly to avoid an accident when another driver cuts you off, or quickly responding to the remaining questions of a timed test when you are running out of time. In both of these situations, automatic/impulsive responding is beneficial.

What happens though when we engage in this type of automatic decision making or behavior when it is not necessary? For example, racing through a test and answering impulsively, when it's an open book test and untimed. In fact, this is the definition of dysfunctional impulsivity. Dysfunctional impulsivity occurs when individuals engage in fast and inaccurate responding or choice making when doing so is not beneficial, and doing so leads to negative outcomes/consequences. Researchers have found that dysfunctional impulsivity is linked to vulnerability for substance use, gambling disorders, aggressiveness and antisocial behaviors (Adan, Natale, Caci, & Prat, 2010). Further, dysfunctional impulsivity has been directly linked to the measures and factors of trait impulsivity (urgency, lack of premeditation, minimal perseveration, and sensation seeking) (Smillie & Jackson, 2006).

What causes impulsivity?

Impulsivity can best be understood through the biopsychosocial model. In this model biological, psychological, and sociological factors all come together to impact the expression and creation of impulsivity. Each factor is explained below.

Biological considerations

The biological factors that emerge for impulsivity center in the processes of neurocognitive brain functioning. Impulsivity emerges as a product of changes to the functions of a few key brain processes. One of the primary changes is an imbalance between the limbic and executive functioning systems (Bickel, Jarmolowicz, Mueller, Gatchalian, & McClure, 2012; Leshem, 2016). In the brain, the limbic system is the center for emotions and rewards. As such it creates impulses to act or engage in certain behaviors (Grant & Potenza, 2012). The executive functioning system exists in the prefrontal cortex of the brain to balance out these impulses (Grant & Potenza, 2012). Therefore, the executive functioning system controls processes such as inhibition, attention (Stautz, Pechey, Couturier, Deary, & Marteau, 2016), emotional response and regulation (Persampiere, Poole, & Murphy, 2014), and planning (Brooks, 2016).

The healthy functioning of impulse control centers around the balance and interplay between these two systems. If either side of these systems becomes stronger or weaker than the other, imbalances ensue. For adolescents, this imbalance can occur in a number of different ways. One such way is through the natural process

of adolescent brain development. In the development of the brain, the prefrontal cortex and executive functioning system are the last to mature, not fully completing maturation until the middle to late 20's (Grant & Potenza, 2012). This is a key to understanding adolescent impulsivity as a brain development process.

Outside of developmental processes, this imbalance can also occur as a result of traumatic brain injury as well as genetics (Grant & Potenza, 2012). Intense or reoccurring trauma to the prefrontal cortex of the brain can result in damage and degeneration to the functioning of this area of the brain, and it can lead to decreases in executive functioning (Grant & Potenza, 2012). However, outside of physical trauma, changes to the functioning of these structures can also be a result of genetic expression and predisposition (Grant & Potenza, 2012).

Within the changes that result from genetic expression, research indicates that impact occurs primarily to the functioning of neurochemical processes within the brain (Grant & Potenza, 2012). Whether due to genetics or through other means, neurochemical imbalance is another primary neurocognitive change that has been linked to the expression of impulsivity. The most prevalent changes that have been identified include increased levels of dopamine, increased levels of norepinephrine, and decreased levels of serotonin (Grant & Potenza, 2012).

Psychological factors

Given the impact of neurochemical and neurocognitive structures, it's not surprising that impulsivity has also been found to be present in a number of mental health disorders. Disorders that have been linked to impulsivity include attention

deficit/hyperactive disorder, bipolar disorder, conduct disorder, borderline personality disorder, antisocial personality disorder (Moeller, Barratt, Dougherty, Schmitz, & Swann, 2001), schizophrenia (Grant & Potenza, 2012), depression, and social anxiety (Erez, Pilver, & Potenza, 2014). However, outside of as an expression of a mental health disorder, impulsivity has also been linked to the experience of psychological trauma and interruptions to early attachments (Diseth, 2005).

Both psychological trauma and interruptions to early attachment produce a stress based response in the body (Diseth, 2005). When faced with prolonged exposure to stress, the body begins to decrease its production of stress hormones that leads to increased production of dopamine and noradrenaline, resulting in hyperarousal (Diseth, 2005). This processes of decreasing neurochemical production is called down regulation, and normally occurs as a protective measure when the brain is receiving too much of a chemical for a prolonged period of time. In addition, this prolonged exposure and down regulation also results in degeneration of brain structures related to the executive functioning and limbic systems (Diseth, 2005).

Social factors

The factors that influence impulsivity through sociological and environment means, do so by acting on motivation. In this sense, motivation relates to the likelihood of engaging or not engaging in certain behaviors. Environment factors work as inhibitors or promoters of risky, unhealthy, or even illegal behaviors. Research indicates that adolescents' neighborhoods are an important consideration

in terms of the amount of informal social control and collective efficacy they have to address delinquent behavior (Vogel & Barton, 2013). How likely a neighborhood is to report crimes or misbehaviors to parents or law enforcement, as well as how much control they feel they have in being able to change their surrounding environment, is a strong influencer of the behaviors exhibited by youth (Vogel & Barton, 2013). As a neighbor's responsiveness and willingness to take action decreases, adolescents are less likely to be reported for their behaviors; therefore, they are more likely to engage in disruptive or unhealthy actions.

Another primary factor that plays into this equation is family/parental connectivity and monitoring. Research indicates that elements of parental monitoring, knowledge of adolescent actions and whereabouts (Neumann, Barker, Koot, & Maughan, 2010), family warmth (Chen & Jacobson, 2013), and attachment (Chapple & Johnson, 2007) all work to lessen the likelihood of criminal offending and other risky behaviors in adolescents. Through these factors adolescents receive deterrents for risky behaviors, and as such, increase their motivation to engage in healthier behaviors. Likewise, parenting style can also play a significant role in this process. Studies indicate that overly authoritarian, as well as inconsistent parenting styles, have been linked to the expression of impulsivity (Jiménez-Barbero, Ruiz-Hernández, Llor-Esteban, & Waschgler, 2016).

One factor that has been shown to cause impact to both neighborhoods as well as family structure is that of socioeconomic class. In fact, socioeconomic class has been shown to impact the formation and expression of impulsivity (Arán-

Filippetti & Richaud de Minzi, 2012). In exploring this relationship, researchers point to the influence of low socioeconomic status (LSES) on increasing stress, poor housing conditions, instability, and diminished available resources for cognitive stimulation of developing youth (Arán-Filippetti & Richaud de Minzi, 2012).

Lastly, factors such as negative peer groups, as well and gender socialization, have also been identified as impacting impulsivity. Negative peer groups include influences that may expose or pressure an adolescent into engaging in risky or illegal behaviors. As such this exposure has been shown to increase the risk for increased expression of impulsivity (Menting, Van Lier, Koot, Pardini, & Loeber, 2016). Likewise, gender socialization also plays a significant role in shaping and informing beliefs regarding appropriate behavior, especially around the use of aggression (Chapple & Johnson, 2007).

Treatments needs and considerations

Given these factors, three primary treatment needs emerge in addressing impulsivity. The first is that of rebalancing the executive functioning and limbic systems. This manual addresses this concern through the use of both Dialectical Behavior Therapy (DBT) as well as working memory training. Both interventions are described in the literature as viable and supported interventions.

The second factor involves addressing neurochemical imbalance. This process can be achieved through the use of medication, should it be deemed that such interventions are necessary (Grant & Potenza, 2012). Whereas this manual

acknowledges the application of medication to the treatment process, it will not specifically address the use of medication for the treatment of impulsivity. Should individuals be interested in integrating psychopharmaceutical intervention into treatment, it is recommended that they consult with a qualified physician, psychiatrist, or other appropriately licensed individual.

The third and final treatment need is motivation. In the treatment process, motivation is a key component in both changing behavioral choices and expression, as well as improving treatment outcomes (Kermani, Mohammadi, Yadegari, Sadeghi, & Haghighi, 2016; Minear et al., 2016; Wass, Scerif, & Johnson, 2012). In this manual, motivation is addressed through the use of DBT. Specifically, the therapist's approach to engaging, building a working alliance, and treating adolescents follows a DBT model to facilitate the building of skills to promote alternative, effective behaviors.

DIALECTICAL BEHAVIOR THERAPY (DBT)

What is DBT?

DBT was originally created around 1970 as an adaptation to CBT to address patterns of self-harm and suicidality in clients with borderline personality disorder (BDP) (Miller, Rathus, & Linehan, 2007). Since its creation, DBT has been adapted for numerous settings and populations including that of adolescents with emotional dysregulation (Miller et al., 2007). In its approach, DBT works to support behavioral

change through the combination of behavioral science, dialectical philosophy, and Zen practices (Miller et al., 2007).

In its treatment of BPD, DBT presents a biopsychosocial theory regarding the formation of symptomology (Miller et al., 2007). This theory is made up of two key elements. The first of which is a biological predisposition to emotional dysregulation (Miller et al., 2007). Little is said regarding the origin for this predisposition, only that it may result from a variety of sources such as genetic predisposition as well as stressful or traumatic events in early life (Miller et al., 2007). Notably, impulsivity is primary predictor of BPD (Grant & Potenza, 2012; Moeller et al., 2001).

Second, in addition to this predisposition, individuals are exposed to an environment in which they receive invalidating messages and feedback (Miller et al., 2007). Invalidation can be defined as behavioral or verbal messages that dismiss or discredit the experiences of another individual (Miller et al., 2007). For example, denying or discrediting someone's fear after being assaulted intentionally or unintentionally. This invalidation can originate in the home or from other environmental sources such as in school or the community (Miller et al., 2007).

As a response to these two factors, DBT proposes that individuals engage in dialectical thinking which then informs behaviors. Dialectics are considered thoughts that are at opposing spectrums (Miller et al., 2007). In DBT, these dialectics are unrelenting crisis versus inhibited grieving, emotional vulnerability versus self-invalidation, and active passivity versus apparent competence (Miller et

al., 2007). In the adolescent adaptation, authors add three more dialectics to reflect commonly experienced family dynamics including excessive leniency versus authoritative control, normalizing pathological behaviors versus pathologizing normal behaviors and forcing autonomy versus fostering dependence (Rathus & Miller, 2015).

In response to these dialectics, DBT utilizes the concept of accepting and validating emotional and behavioral reasoning in the moment but working towards long-term change (Miller et al., 2007). In other words, to keep clients engaged in treatment, and not engage in further invalidation, DBT validates an individual's reasoning and feelings but works toward highlighting how behavioral choices to said reasoning and feelings could be changed to effect a different outcome.

However, working on dialectical thinking and behavior is only one aspect of DBT. In fact, DBT has five primary functions: improving client motivation for change, enhancing the client capabilities (through skills training), learning new behaviors and generalizing them to all areas of life, structuring the environment, and enhancing therapist capabilities and motivation (Miller et al., 2007)

DBT works to meet these criteria through both individual and specific skills focused group sessions that address emotional, interpersonal, behavioral, and cognitive dysregulation (Miller et al., 2007). Skills group sessions specifically focus on teaching distress tolerance, emotional regulation, mindfulness, and interpersonal effectiveness (Miller et al., 2007). In this process, therapists work from a hierarchical standpoint which addresses safety and behavior regulations problems

first, emotional distress symptoms second, self-respect and personal goals third, and joy and meaning last (Miller et al., 2007).

Why use DBT to address impulsivity?

When we turn to the research on impulsivity, we learn that a large percentage of impulsivity is caused by biological neurocognitive impairments. Because of these impairments, individuals demonstrate difficulty regulating emotion, inhibiting behaviors, and maintaining relationships. When we view these concerns through DBT theory a conceptual framework for understanding impulsivity as biological predisposition for emotional dysregulation emerges. In fact, it is likely that the same biological impairments that contribute to impulsivity also underlie BPD, which is further supported by the strong relationship between BPD and impulsivity. As such, it appears that DBT may be uniquely designed to help address the behavioral expressions of impulsivity. Additionally, DBT also provides a therapeutic framework, comprised of stepwise interventions, to increase client motivation for behavioral change.

WORKING MEMORY TRAINING (WMT)

What is working memory training?

Within executive functioning, working memory is a key area that supports the functioning of short-term memory and is responsible for holding and manipulating information while also blocking outside stimulation and distractions (Grant & Potenza, 2012; Klingberg, 2010). To preform this task, this system utilizes

related skills such as information recall, planning, problem-solving (Kermani et al., 2016), task switching, goal setting (Baddeley, 2007), and strategizing (Grant & Potenza, 2012).

The concept of working memory training posits that deficits in working memory, and therefore executive functioning, can be improved by exercising this system of the brain. This process is achieved by engaging in tasks that utilize skills of strategizing, problem-solving, planning, visual manipulation, sustained attention, and response speed (Alloway & Alloway, 2014). Many studies and programs approach this intervention through the use of computer-based programs. However, this is also possible through structured games and activities (Kermani et al., 2016).

How does working memory training work?

It has been proposed that working memory training produces changes in functioning through the concept of neuroplasticity (Klingberg, 2010). Neuroplasticity is a term that essentially reflects the brain's ability to grow and change depending on the needs and tasks with which it is presented (Cramer et al., 2011). Recent neuroscience studies have shown the brain's capability for its different systems to change if the need is presented in the right way (Cramer et al., 2011). Working memory is one of the many brain systems to which the concept of neuroplasticity applies (Klingberg, 2010).

In looking closer at the processes of working memory, studies indicate that higher levels of working memory functioning are linked with increased amounts of neural connectivity in the frontoparietal section of the brain (Klingberg, 2010).

Therefore, the concept of neuroplasticity suggests that by exercising this system through working memory-related tasks, neural connectivity can be increased (Klingberg, 2010). Notably, studies have utilized brain scanning technology to demonstrate increases in brain activity in relation to working memory training (Klingberg, 2010).

How does working memory training improve impulse control?

As mentioned above, to perform its duties, working memory relies on a number of related skills. One of these related skills is impulse control and inhibition. Studies regarding working memory and training of it suggest that if one area is trained, improvements can be seen in all or most other areas as well (Klingberg, 2010). Therefore, since working memory and impulse control are in the same system, improving one causes improvements in the other.

In further explaining this relationship, studies indicate that working memory training may lead to a decrease in dopamine receptors (Klingberg, 2010). This change is notable for a number of reasons, the first of which being that small decrease of dopamine in animal studies have been linked to improvements in working memory (Klingberg, 2010). However, more notably, increased levels of dopamine are a primary factor in the expression of impulsivity (Grant & Potenza, 2012). Therefore, working memory training may work to produce changes in impulsivity through a number of mechanisms, to include both neuroplasticity as well as changes in neurochemical uptake.

What is necessary for working memory training to be effective?

Research on the use of working memory training indicates three primary elements must be present for this model to be effective. First, activities and interventions that challenge the participant in a progressively increasing manner must be utilized (Dunning, Holmes, & Gathercole, 2013; Klingberg, Forssberg, & Westerberg, 2002). This process is very similar to the learning theory of scaffolding, in that learning and growth occurs through tasks that build on previously learned and supported skills (Dunning et al., 2013). This principle is also consistent with the concept of neuroplasticity, in that to encourage growth this system of the brain must be consistently challenged or taxed to produce the need for improvement. However, it is important to remember that tasks given to participants should be challenging but attainable. If training tasks are consistently too complicated to complete participants are likely to disengage and lose their motivation for participation.

This is particularly important because participant motivation is the second element that must be present for this approach to be effective (Cramer et al., 2011; Minear et al., 2016; Wass et al., 2012). Tasks supplied in this training are purposefully complicated, and emotional regulation skills of participants are often lacking; therefore, motivation is a key aspect in keeping participants engaged and learning. Motivation in the facilitation of this process is supported in a number of ways; however, research stresses the importance of counselor/facilitator involvement in the motivational process (Holmes et al., 2009).

Lastly, a final key element is the existence of working memory deficits. Interestingly, research indicates that the gains of working memory training appear to be limited to those with existing deficits (Melby-Lervåg & Hulme, 2013). In other words, working memory training only appears to help individuals improve their working memory skills up to a standard developmental level, and does not appear to support cognitive gains significantly above normative age standards.

INTEGRATING WORKING MEMORY TRAINING INTO DBT

This manual incorporates working memory training into DBT skills group to best meet the treatment needs of impulsivity. Working memory training is utilized to address executive functioning deficit, while the DBT approach and DBT skills group is used to increase motivation for participation and treatment engagement. DBT is also used to increase core living skills such as distress tolerance, emotional regulation, mindfulness, and interpersonal communication. This manual presents this integration in the form of an augmented DBT skills group and focuses on providing a format for including a working memory training section into the adolescent DBT skills group format in the *DBT skills manual for adolescents* authored by Rathus and Miller (2015).

To facilitate this integration, this manual has replaced the first segment of DBT group that is traditionally used for homework review (Rathus & Miller, 2015) with structured experiential working memory training activities. Therefore, the augmented group structure opens with a brief mindfulness exercises, moves into

working memory training, breaks as necessary, then closes with the traditional skills focused session. The only module that is not augmented in this fashion is that of mindfulness, as mindfulness shares a unique relationship with working memory, a process that will be addressed later in this manual.

PART II

Treatment format, structure, and overviews

Audience and population

This manual is intended for use with adolescent populations ranging from ages 12-19. It should be noted that this age range is suggested by Rathus and Miller (2015) in their *DBT skills manual for adolescents*. These authors express the potential for flexibility in age ranges, but they caution facilitators to be mindful of how different developmental age groups interact in order to create a therapeutic environment conducive to motivating change (Rathus & Miller, 2015).

Due to the relationship between impulsivity and risky/criminal behavior, the format of this manual is designed for an inpatient correctional setting. The considerations made for this population include participant length of stay, integration of new members, and environmental constraints. However, adaptations can be made to best match other populations and settings.

Delivery format

The delivery method of this adapted intervention utilizes a group format. This format has been chosen with a number of considerations in mind. First and foremost being that DBT teaches the primary portion of its material through group sessions, the material being adopted for this product already exists in a group format. A second consideration is the nature of working memory training and the experience that a group setting can provide. As will be discussed later in this section, the group setting is utilized to produce a scaffolding effect as participants advance through working memory training task. In addition, the experiences that occur within the

group format are utilized to examine and facilitate DBT skills practice and discussion.

Although this manual will not explore the delivery of individual sessions, it should be noted that DBT includes the use of individual sessions to support the skills learned in group and individual client based goals (Rathus & Miller, 2015). In addition, adolescent adaptations to DBT utilize individual sessions to integrate family members and address environmental factors contributing to presenting concerns (Rathus & Miller, 2015). Therefore, if individual sessions are offered in the treatment setting, facilitators and counselors are encouraged to utilize a DBT adherent approach for these services to further support therapeutic gains and reinforce individual progress.

Family involvement and therapy

One of the primary adaptions made to the DBT process for adolescents is the inclusion of family members into the treatment group process (Rathus & Miller, 2015). Due to the nature of working memory training, the group format, and the target population of this project, individual therapy sessions—including the integration of family—is not addressed in this manual. However, the integration of family into the treatment process is highly recommended. As noted above, it is recommended that efforts be made to involve family members in individual sessions, when possible, to explain and support the skills that are being conveyed throughout the group process.

Treatment overview

This treatment program is made up of five primary skills modules, delivered over a 24-week period (Rathus & Miller, 2015). Skills modules include mindfulness, emotion regulation, distress tolerance, interpersonal effectiveness, and walking the middle path, as outlined by Rathus and Miller (2015) in their adolescent DBT skills manual. Adaptations have been made to the order in which modules are presented to best integrate working memory training.

Group sessions occur one time a week, for a length of at least two hours. Group facilitators may find it necessary to make adaptations to group length and frequency to best fit their population. Adaptations should maximize group participation and learning, all while covering all of the required material and activities. As such, it is recommended that if group sessions must be shortened, additional sessions be added to compensate.

Emotion regulation, distress tolerance, interpersonal effectiveness, and walking the middle path skills modules are all delivered in focused chunks (Rathus & Miller, 2015). Mindfulness exercises and skills are delivered on the first week of a new module and during brief opening activities at the beginning of every group (see treatment schedule and session outline for examples). Due to the addition of extra working memory training material, this manual adopts the "1-plus-5" week format, one week of mindfulness and five weeks of core module material (Rathus & Miller, 2015, p.20).

The intended population for this project is adolescents within a correctional center who will randomly start and end treatment; therefore, this manual is based on an open group format. This format allows for new residents to join group at the beginning of a new module and cycle through, instead of waiting for a new group to begin. Additionally, the open group format helps to compensate for a small population size, as there may not be enough new members to start a new group once a group cycle is completed. However, due to the scaffolded intensification of working memory training additions, facilitators should consider the appropriateness of introducing members at times when advanced skills are being taught, and may opt to have members join when an introductory module begins.

Given the open nature of this group, orientation can occur in a number of different manners. When first beginning a skills group, orientation should occur in a group setting during the first meeting of the group (Rathus & Miller, 2015). As new members join, orientation can occur individually, or in group as a review for existing members. In their group outline, Rathus and Miller (2015) indicate that orientation should be provided as needed at the beginning of each new module.

Structured working memory training

To meet the need for increasing challenge, working memory training in this manual is presented in stages that increase in complexity as participants progress. Stage one of the working memory training section focuses on introducing participants to working memory skills through basic activities. In this stage, group

members will be given tasks that they can complete individually, each task having between one and two primary components. In other words, participants only have to use one or two skills to complete the task.

In the second stage, task complexity will increase. This may be achieved through a number of means. Tasks given may increase in complexity by requiring more skills, integrating multiple levels of skills, or requiring multiple tasks to be completed. In the third stage, complexity is added by including an element of timed activities or competition. In this section, group members must complete similar activities from previous stages but do so as quick as possible. This component adds an element of healthy stress and pressured thinking. In the final stage, the element of group participation is added. This addition requires participants to utilize working memory skills but adds the element of planning and strategizing to involve more than one person.

What type of activities does working memory training include?

There are a multitude of processes that require working memory skills. For the purpose of this manual, working memory training is intended to occur in a manner that provides a structured experiential process, such as that of a game, puzzle, or other interactive activity. The overall goal is to provide participants with an activity that will engage them in an interactive way, while also challenging their working memory skills.

For this manual, facilitators are free to choose their own activities, as long as the activities meet the requirements of the identified working memory stage and are appropriately challenging to participants. When looking for activities, facilitators should focus on games and tasks that utilize skills such as problem-solving, planning, visual manipulation, sustained attention, strategizing, and response speed (Alloway & Alloway, 2014). Suggestions and examples of possible activities will be provided in the module outline as well as at the end of this manual.

Using motivators and reinforcers

As mentioned above, motivation is a key factor in both DBT as well as working memory training. Due to the challenging nature of working memory training tasks, facilitators are encouraged to consider utilizing tangible external motivators to gain and maintain group member participation. These techniques may include elements such as candy, small prizes, additional points (if your treatment program utilizes a points system), or other elements that your participants would be willing to work to gain.

Utilizing working memory experiences to practice and illustrate DBT skills and material

Each of the four stages of working memory training correspond to a DBT skills module, and progress to the next stage as participants move into a new skills module. DBT skills modules in this manual have been specifically arranged, allowing participants to maximize their benefit from the integration of the interventions occurring through working memory training into DBT skills modules.

As such, the purpose of this pairing allows facilitators to utilize the events and participant reactions that naturally transpire in working memory training to highlight and facilitate the use of DBT skills and information. In sum, it provides real time experiences requiring participants to practice their DBT skills in session.

Working memory training stages and DBT skills pairings

WMT Stage one: Walking the Middle Path

WMT Stage two: Emotional Regulation

WMT Stage three: Distress Tolerance

WMT Stage four: Interpersonal Skills

Mindfulness and working memory

Mindfulness can be defined as a process or activity that requires participants to pay attention in a focused manner, on a particular aspect, in a way that brings awareness to the present moment in a nonjudgmental way (Sanger & Dorjee, 2015). Mindfulness skills are key components of DBT skills training. As such, they are presented in a skills module unto themselves and they are integrated into the beginning of each skills group (Rathus & Miller, 2015). In this manual, one group every 6 weeks is devoted to teaching mindfulness skills. Notably, these sessions are the only groups that have not been augmented to include working memory training.

This exception has been made due to the relationship that has been demonstrated between mindfulness meditation and working memory. Research has

demonstrated that the facilitation of even brief mindfulness training and meditation has been linked to improvements in working memory functions (Quach, Mano, & Alexander, 2016; Marek, Franklin, Phillips, Baird, & Schooler, 2013). Researchers theorize that this effect is the result of practicing focused attention and inhibition of distraction (Quach et al., 2016). Therefore, similar to working memory training, practicing the processes of focusing, sustaining, and redirecting attention helps to grow and improve the processes of working memory.

STRUCTURAL OVERVIEW

Treatment Schedule

Orientation (in the beginning and during mindfulness sessions as necessary)

Module 1
Length: 6 weeks

Week 1: Mindfulness Skills- Session 1

Weeks 2- 6: WMT stage 1 & Walking the Middle Path Skills modules

Module 2
Length: 6 weeks

Week 1: Mindfulness Skills- Session 2

Weeks 2-6: WMT stage 2 & Emotion Regulation Skills modules

Module 3
Length: 6 weeks

Week 1: Mindfulness Skills- Session 1

Weeks 2-6: WMT stage 3 & Distress Tolerance Skills modules

Module 4
Length: 6 weeks

Week 1: Mindfulness Skills- Session 2

Weeks 2-6: WMT stage 4 & Interpersonal Effectiveness Skills modules

Total length: 24 weeks

GROUP STRUCTURE

Group session outlines

Core skills sessions

10-20 minutes: Brief mindfulness exercise

40-50 minutes: Working memory training (WMT) structured exercise

(Optional: 5-10 minute break)

50-60 minutes: DBT skills module

Total length: 2 hours

Mindfulness skills sessions

(first week of each new module, every 6 weeks)

10-20 minutes: Brief mindfulness exercise or orientation material as needed

40-50 minutes: DBT Mindfulness skills module

(Optional: 5-10 minute break)

30- 40 minutes: Mindfulness oriented structured exercise

20-30 minutes: Discussion/reflection

Total length: 2 hours

Orientation

Before, or during their first group meeting, all DBT skills group members must engage in orientation to group. The opportunity for group orientation arises every 6 weeks as group members begin a new skills module (Rathus & Miller, 2015). During this process, facilitators should include information about the function and format of DBT skills group, the DBT theory and its underlying beliefs, DBT treatment assumptions, and the DBT treatment contract (Rathus & Miller, 2015). There are a total of seven handouts available for this process. However, facilitators may find that this is too much information for one sitting (Rathus & Miller, 2015). In response, authors of the adolescent skills manual encourage facilitators to pick key worksheets to match their orientation needs and present the remaining sheets during the next orientation (Rathus & Miller, 2015). This approach allows facilitators to present different topics, in depth, during each orientation, thus giving new information to pre-existing participants (Rathus & Miller, 2015). For more information regarding the orientation process, facilitators should reference chapter 5 of the DBT skills manual for adolescents (Rathus & Miller, 2015).

Group session components

Brief mindfulness exercises

To begin each core skills group, group members should all participate in a brief mindfulness exercise. Mindfulness exercises should last between 3 to 5 minutes, but shorter versions (1-2 minutes) may be chosen for groups who are new

to mindfulness meditations (Rathus & Miller, 2015). Before, or directly afterward, facilitators should link the mindfulness skill that is presented to a treatment goal to reinforce to applicability of mindfulness skills to everyday situations and DBT skills (Rathus & Miller, 2015). Traditionally, these activities take the form of brief guided meditations. However, facilitators can choose other formats as long as they promote the growth and practice of mindfulness skills (Rathus & Miller, 2015). A list and description of mindfulness exercises for adolescents can be found on pages 115 through 123 of the DBT skills manual for adolescents (Rathus & Miller, 2015). After this process, facilitators may choose to have participants check-in and share their experience with the meditation (Rathus & Miller, 2015). Once this is complete, facilitators may present any group announcements or reminders that need to be addressed for the day, such as upcoming holidays, group cancellations, or approved member absences (Rathus & Miller, 2015).

Working memory structured activities

After completing the brief mindfulness exercise and announcements, group members should move into the working memory structured activity for the day. In beginning the activity, group members should be introduced to the day's activity and be given any rules or special instructions that may apply. Group facilitators may also choose to remind participants of group rules as well as any DBT skills that may apply to the activity. Afterward, members should be supplied with any necessary materials to complete the activity. Facilitators may find it necessary to rephrase or repeat the activity instructions once participants begin the activity. This portion of

the group should last no longer than 40 to 45 minutes, as some time will be necessary for cleaning up material from the activity. Engagement in this portions should be largely experiential and hands on. After wrapping up this portion of the group, facilitators may choose to provide participants with a short break. Facilitators may find that breaks not only help to refocus participant attention, but also create a firm delineation between the end of working memory exercises and the beginning of DBT skills time.

DBT skills presentation

Following working memory training and the optional break, facilitators should move into the traditional DBT skills portion of the program. This process begins by introducing the rationale for the day's skills in an interactive manner, such as a story, question, or explanation (Rathus & Miller, 2015). Following this introduction, facilitators should present the skills material for the day (Rathus & Miller, 2015). Prior to the beginning of group, facilitators need to plan out how they would like to approach and convey new skills to the group, utilizing varying techniques to enhance group involvement (Rathus & Miller, 2015). In this process, group facilitators work to have clients reflect on how new skills apply to their behaviors, and how the skills can be used to create a different behavioral outcome (Rathus & Miller, 2015). During this process, facilitators are encouraged to utilize events that occur during the first section of group, in working memory training, to discuss or examine new skills. For example, if a group member becomes noticeably discouraged or angry during the working memory activity, facilitators should come

back to this behavior during skills group and examine ways in which DBT skills could have been applied.

A note about homework

In the traditional DBT skills group format, homework is given after every group and then reviewed during the first half of the next group (Rathus & Miller, 2015). Due to the proposed adaptations in this manual, this time has been taken by working memory training. Therefore, homework practice exercises have been integrated into the material to be covered during the regular skills group time. As such, facilitators may use these practice exercises as interactive group activities. If necessary, group members can be directed to complete practice exercise in specific reference to the working memory activity that just occurred.

This change has been made not only because of time constraints but population constraints as well. By complete these activities in group, facilitators increase the likelihood that the activities will be completed. Personal experiences have demonstrated that giving out work to be completed independently rarely results in successful completion. However, this is not to say that facilitators can not choose to assign these practice exercises as homework. If facilitators do choose to utilize this option, skills group can be opened with the homework review and group length may need to be extended in order compensate.

Utilizing the DBT behavior chain analysis

Behavior chain analysis is a key concept in DBT therapy that is utilized to promote change through awareness of behaviors as well as the integration of DBT

skills (Miller et al., 2007). Behavioral chain analysis is utilized to examine problem behaviors, to identify the core pieces that drive the behaviors, and explore ways in which the behavior can be changed (Miller et al., 2007). In doing so, behavioral chain analysis should identify the specific precipitation event, any subsequent environmental or emotional reactions, the problem behavior, the reinforcing outcomes, and the resulting consequences (Miller et al., 2007).

Behavioral chain analyses are a large portion of the individual counseling process of DBT but are also utilized in the group setting to address problem or dysregulated behaviors (Miller et al., 2007). Notably, however, this process is only briefly examined in the DBT skills manual for adolescents by Rathus & Miller (2015). However, facilitators are encouraged to incorporate this process into the DBT skills group in response to behaviors that are disruptive or dysregulated. This may include behaviors such as being late to group, having an aggressive outburst in group, being disrespectful to peers, or disengagement.

Due to their challenging nature, working memory training activities can result in group member frustration. Therefore, when and if group members do engage in dysregulated or disruptive behavior as a result of these activities, this behavior should be addressed with the use of a behavior chain analysis at the beginning of the DBT skills portion of group. Further, facilitators may also find it appropriate to use behavior chains to address behaviors that occur outside of the group environment if these events become relevant to group.

In utilizing this technique, it is important for facilitators to provide education on how to complete a behavior chain, as well as when group members will be expected to complete one. Additionally, clients should be responsible for completing their own chain analysis. Therefore, it may become necessary for facilitators to prompt and guide participants as they move through this process.

Module overviews

WMT Stage 1 and walking the middle path

Summary: Stage one of the working memory process has been paired with the walking the middle path skills module as an introduction to working memory training and DBT principles. Stage one of working memory training introduces members to working memory activities by beginning them on simple one to two objective tasks. Walking the middle path material emphasizes information such as dialectical thinking, thinking errors, validation, and making behavioral changes (Rathus & Miller, 2015). As such, group experiences in stage one of working memory training can be used to emphasize these topics by giving group participants concrete and recent events to reflect on. Themes that may emerge from working memory training for further group exploration include self-invalidation, thinking errors that occur as a result of having difficulty with tasks, and dealing with frustration.

Goals: For group facilitators the goals of this section are to: provide members with a structured and consistent group environment; provide a functional understanding

of working memory activities; gain an understanding of individual group member functioning within working memory training and DBT skills group; motivate participates to engage in group and group activities; and convey the topics of dialectics, thinking errors, validation, and invalidation in a manner that helps members learn these topics.

For participants, the goals of this section are to: have a functional understanding of the group process and expectations of participants; engage in working memory training activities; have the ability to identify validating and invalidating thoughts; increase awareness of personal use of thinking errors; and demonstrate an understanding of dialectics.

WMT stage 2 and emotion regulation

Summary: Stage two of working memory training has been paired with the skills of emotional regulation. In stage two of working memory training, activities become progressively more difficulty by adding in extra tasks or levels. As tasks become more complicated, group members are likely to have emotional reactions to their experiences of challenge and failure to complete task. Most likely these behaviors will begin to emerge in stage one, but increase or carry over into stage two. For this reason, the emotional regulation skills module was chosen for introduction during this module. In the emotion regulation skills groups topics of emotional identification, emotional psychoeducation, positive coping skills, self-care, and problem-solving are introduced (Rathus & Miller, 2015). In this stage, group

facilitators can utilize participant reactions to teach and reinforce DBT emotion regulation skills.

Goals: For facilitators, the goals of this section are to: supply participants with working memory tasks that progress in intensity; support engagement in and completion of working memory tasks; continue to support motivation for group engagement; convey the skills of emotional regulation in a manner that supports group participation and learning; and integrating working memory task experiences into group topics and skills learning.

For group members, the goals for this section are to: demonstrate problem-solving, persistence, and motivation in the completion of working memory tasks; demonstrate an advancement in working memory tasks; be able to identify emotions and their purpose; be able to identify and complete a basic behavior chain analysis; identify positive coping skills for dealing with emotions; and identify vulnerabilities and self-care techniques.

WMT stage 3 and distress tolerance

Summary: Stage three of the working memory training has been paired with distress tolerance. In the third stage of working memory training, the element of timed or competitive activities is introduced. In doing so, this factor produces an element of controlled stress. However, by introducing an element of timed or competitive tasks the likelihood of participant distress or dysregulation may increase. Therefore, this module has been paired with distress tolerance, as to help introduce skills for dealing with this new stressful element. Through this reactivity, facilitators are given the

opportunity to highlight the purpose and role of distress tolerance skill, and help participants utilize these skills during working memory training activities. In the distress tolerance module of DBT skills, group members are introduced to distress tolerance skills such as "ACCEPTS," "IMPROVE," "TIPP," self-soothing, and pros and cons (Rathus & Miller, 2015). In addition, group members are also introduced to skills relating to acceptance and problem-solving (Rathus & Miller, 2015).

Goals: For facilitators, the goals of this section are to: supply participants with working memory tasks that progress in intensity and integrate an element of competition or timed activity; support engagement in and completion of working memory tasks; continue to support motivation for group engagement; convey the skills of distress tolerance in a manner that supports group participation and learning; help facilitate the practice of emotion regulation and distress tolerance skills during group activities; and integrating working memory task experiences into group topics and skills learning.

For group members, the goals for this section are to: continue to demonstrate problem-solving, persistence, and motivation in the completion of working memory tasks; demonstrate an advancement in working memory tasks; demonstrate an ability to cope with emotional distress; be able to identify core distress tolerance skills; demonstrate the ability to utilize a distress tolerance skill; and demonstrate an understanding of acceptance principles and techniques.

WMT stage 4 and interpersonal skills

Summary: Stage four of the working memory process has been paired with interpersonal effectiveness. In the fourth stage of working memory training, the element of group activities is added. In this final stage, group members are challenged to utilize all of the skills that have gained up to this point, but use them when they must rely on one or more other people. In doing so, this stage introduces the element of interpersonal stress, communication, and problem-solving. For this reason, this module has been paired with the skills module of interpersonal effectiveness. In this skills module, group members are introduced to skills approaches such as "GIVE," "DEAR MAN," and "FAST" to help participants choose interpersonal approaches and make decisions (Rathus & Miller, 2015). In these approaches, the skills presented help members learn to make informed, balanced, wise, and assertive decisions about their communication and behaviors towards others in their environment (Rathus & Miller, 2015).

Goals: For facilitators the goals of this section are to: supply participants with working memory tasks that progress in intensity and integrate an element of group work; continue to support engagement in and completion of working memory tasks; continue to support motivation for group engagement; convey the skills of interpersonal effectiveness in a manner that supports group participation and learning; help facilitate the practice of all presented DBT skills; and to integrate working memory task experiences into group topics and skills learning.

For group members, the goals for this section are to: continue to demonstrate problem-solving, persistence, and motivation in the completion of working memory tasks; demonstrate an ability to work in a group setting in a manner that demonstrates equal group participation; be able to identify core interpersonal effectiveness skills; and demonstrate the ability to utilize interpersonal effectiveness skills.

PART III

Working Memory Training Session Guides

CORE MINDFULNESS

Session Materials

- DBT mindfulness handouts 1 through 7
- Writing surface or material (white board, large paper, etc.)
- Small bell or singing bowl
- Any material or accessories necessary for the structured mindfulness activity

Session Outline

10-20 minutes: Brief mindfulness exercise or orientation material as needed
40-50 minutes: DBT Mindfulness Session material
(Optional: 5-10 minute break)
30- 40 minutes: Mindfulness oriented structured exercise
20-30 minutes: Discussion/reflection

Total length: 2 hours

Session Breakdown

Session 1: Handouts 1- 4*

Session 2: Handouts 4 – 7*

(* Facilitators do not have to utilize all handouts, and may choose to select the handouts that best meet the needs of the group)

Overview of the Module

Mindfulness is a core function of DBT that exists as a stand-alone module, as well as brief group exercise at the beginning of every group (Rathus & Miller, 2015). Mindfulness is key in supporting the skills presented by DBT, as it promotes nonjudgmental awareness and attentional control that is necessary for engaging throughout the DBT process (Rathus & Miller, 2015). In its original format, all

mindfulness worksheets are reviewed over a 2 session span of time before engaging in each core module (Rathus & Miller, 2015). Due to adaptations in this manual "Session 1" materials (Rathus & Miller, 2015, pg. 98-105) of the mindfulness module will be reviewed in one session, and "Session 2" materials (Rathus & Miller, 2015, pg. 105- 115) will be reviewed 6 weeks later during the next full mindfulness group. This same process is repeated for the next two mindfulness groups, each spaced 6 weeks apart. Therefore, this material is covered a total of two times in a complete 24-week period.

Integrating orientation

Since mindfulness segments begin each new module, these sessions are also an ideal time in which to orient new members to the group (Rathus & Miller, 2015). Facilitators may choose to orient new group members individually prior to joining group or use new group member orientation as an opportunity to also review material with existing group members (Rathus & Miller, 2015). When integrating orientation into this process, it should take the place of the first group activity, the mindfulness exercise (Rathus & Miller, 2015). Other group material and activities may need to be augmented to compensate for the time that is necessary to complete the orientation material. Should this occur, facilitators are encouraged to compensate by shortening the duration of the closing mindfulness structured activity and discussion section.

Mindfulness DBT skills

After orientation or the brief mindfulness exercise, group members move into a 40 to 50 minute section that introduces or reviews the mindfulness skills worksheets. As mentioned above, these worksheets have been split between two different skills modules to devote more space to working memory training and DBT skills presentation. Facilitators are encouraged to utilize a limited selection of the available worksheets to avoid overwhelming group members with too much material (Rathus & Miller, 2015). Due to the repetitive nature of this section, facilitators can present any material that does not get covered during the second rotation of mindfulness skills.

Mindfulness oriented structured activities

As mentioned in the previous section, mindfulness skills and training share a connection with working memory (Quach et al., 2016; Marek et al., 2013). Studies indicate that improving mindfulness also helps to increase the functioning of working memory in a manner that is similar to working memory training (Quach et al., 2016). To be consistent with the practice of skills in a manner that is interactive and experiential, the second section of group has been designed to include a structured interactive mindfulness activity. This section of group should last between 30 and 40 minutes and include a group activity that is experiential, which utilizes and strengthens mindfulness related skills. This section may be shortened to compensate for the time needed for new member orientation.

Example structured mindfulness exercises

Facilitators are free to choose their own group activities, as long as they utilize or support mindfulness skills in an interactive and experiential manner. Many of the mindfulness exercises on pages 116-123 of the Adolescent DBT manual (Rathus & Miller, 2015) also provide experiential mindfulness activities that can be utilized for this process. Facilitators may find it helpful to combine exercises based on themes, such as communication awareness, emotional awareness, etc. The following are examples of activities that could be used for this portion of group:

- Emotion ball/balloon- Prior to this exercise, the group facilitator writes common emotion words on a large balloon or ball in a random and equally spaced manner so the entire surface is covered. Group members toss the balloon/ball to various members. Participants must answer a designated question about whichever emotion is in front of them when they catch the balloon/ball. To encourage mindfulness awareness, facilitators may ask questions related to when participants feel this emotion, where they feel the emotion in their body, or how this emotion feels.
- Listen and draw- In this activity, group members must describe a picture while another member tries to recreate the drawing from their instructions without ever seeing the picture. For this activity, group members pair up into teams of two. Each team must find a place to sit back to back. One team member must be the describer, and one must be the drawer. To prevent peaking or cheating off of

other teams' work, facilitators are encouraged to make different pictures for each team. This is easiest using the insert shapes feature on word.

- Describe a color- In this activity, group members must describe a color without using the name of the color or pointing out an object that is that color. This activity can take place in pairs or as a whole group. For this activity, facilitators should prepare color chips or cards for the describer to reference. When it is a person's turn to "describe" the color the group facilitator should distribute one color chip so no other members can see. The "describer," must then use other terms and references to help other participants guess. Facilitators are encouraged to have multiple colors available and start with simple colors (ex. red, green, or blue) and increase to more complex colors (ex. maroon, fuchsia, or teal).

Discussion and reflection

In the last 20 to 30 minutes of group, facilitators should recap the mindfulness skills that were presented, and identify or discuss how the interactive activity utilized mindfulness skills. During this discussion, facilitators are encouraged to focus on topics such as mindful observations of the experiences, challenges encountered, and how DBT mindfulness skills could have been/or were used to effect a different outcome. Facilitators may also choose to have group members "check out" at this point prior to ending group, by answering a specific question. For example, facilitators may instruct participants to share one thing that was learned, one thing they appreciated, etc. Lastly, before ending group, facilitators

should remind clients of when the next session will take place, make any announcement for the next session, and remind participants of any requirements or assignments that should be completed for next session.

WALKING THE MIDDLE PATH

Session Materials

- DBT Walking the Middle Path handouts 1 through 16
- Writing surface or material (white board, large paper, etc.)
- Small bell or singing bowl
- Working memory training material/activities
- Any material necessary for the brief mindfulness exercise

Session Outline

10-20 minutes: Brief mindfulness exercise
40-50 minutes: Working memory training structured exercise
(Optional: 5-10 minute break)
50-60 minutes: DBT Walking the Middle Path skills material

Total length: 2 hours

Session Breakdown

Session 1: Handouts 1-3*

Session 2: Handouts 4-7*

Session 3: Handouts 8-11*

Session 4: Handouts 12-14*

Session 5: Handouts 15 & 16*

(* Facilitators do not have to utilize all handouts, and may choose to select the handouts that best meet the needs of the group)

Overview of the skills module

Walking the middle path provides participants with skills and information regarding core DBT theory, including dialectics, validation and invalidation, and

behavioral change (Rathus & Miller, 2015). This module is a unique feature to the adolescent DBT skills manual, as this was added by Rathus and Miller (2015) to present unique dialectical considerations to adolescents and their family members. This module has been selected to be the first module presented to group members as it introduces core elements of DBT, and compliments the beginning work that is occurring in working memory training.

Working memory training exercises (WMT stage 1)

In this module, facilitators should utilize entry level activities that are individual oriented and simple in nature. Activities should be given to each participant to complete by themselves and have only one to two primary components. A puzzle activity is a good example of these criteria. Puzzles can be completed by one person and have only one task, putting pieces together (visual manipulation).

In choosing these activities, facilitators should start simple and progress into more challenging activities as group members prove competent. Doing so allows participants to experience success early on in the process, thus build confidence and motivation to continue to participate. If participants are routinely unable to complete tasks at this point, they are at risk of becoming discouraged, preventing them from engaging. If necessary, facilitators should provide hints or assistance to aid in the completion of activities.

Each member of the group may function at a different level in their ability to completing activities. Therefore, since facilitators are aiming for achievable tasks, they should be prepared to have additional tasks on hand for members who complete early. This can include a different version of the same task. For example, if all members of the group are given puzzles, have extra puzzles on hand for members who finish early.

During this module, participants should be reminded of the concept of working memory training and the purpose that it serves. Facilitators may find it necessary to remind members that while the activities presented are game, they also have a deeper purpose within the group process. Additionally, group facilitators must be mindful of the messages that are given to, and expressed by, participants. Group boundaries regarding respect, nonjudgment, and validation should be affirmed.

Examples of activities that could be used for stage one of WMT (WMT stage 1)

Facilitators are free to choose their own activities for working memory training. The activities in this stage should be completed by participants individually, and contain about one or two key tasks. Examples of activities that could be used in this stage are:

- Jenga- In this game, group members work as individuals to remove pieces and stack them back onto the tower of wood pieces with the goal of keeping the tower going as long as possible. This activity utilizes working memory skills of

sustained attention as well as strategy. In this game group members often deal with feelings of frustration and coping with failure. This is a good activity for the early stages of group.

- 9 square puzzles- 9 square puzzles are a puzzle game that consists of 9 cardboard squares that have half an image on each side. All 9 squares must be arranged in a 3x3 pattern so that where each piece meets up forms a complete and correct image. These puzzles are also available in digital format for programs that wish to utilize electronic tablets. This game utilizes working memory skills of sustained attention and visual manipulation. These puzzles are frequently challenging and require persistence and sustained effort. This type of puzzle may be more appropriate near the end of this module.
- Word games- Words games such as "double play" require group members to switch and rotate existing letters in a word to create new ones. In this game, players must use working memory skills of sustained attention and visual manipulation. While "double play" is one example, there are many word games available which may be appropriate for use in working memory training. Group facilitators are encouraged to consider reading levels and learning disabilities of group members prior to utilizing these games.

Working memory training and Walking the Middle Path skills

For the skills training portion of group, facilitators should consult the teaching notes as provided by Rathus and Miller (2015) on pages 156 through 189

of the skills manual for specific instruction on the skills of this module. During this portion of group, facilitators should tie material and skills back to experiences from working memory training. Themes that may be explored include, dealing with frustration, coping with not being able to complete a task, and beliefs and thoughts about self and others. Facilitators should use these reflections to highlight core material from this module, including validation and invalidation, thinking errors, dialectics and where they came from, normalizing struggle, and changing behavioral reactions.

EMOTIONAL REGULATION

Session Materials

- DBT Emotional Regulation handouts 1 through 21
- Writing surface or material (white board, large paper, etc.)
- Small bell or singing bowl
- Working memory training material/activities
- Any material necessary for the brief mindfulness exercise

Session Outline

10-20 minutes: Brief mindfulness exercise
40-50 minutes: Working memory training structured exercise
(Optional: 5-10 minute break)
50-60 minutes: DBT emotional regulation skills material

Total length: 2 hours

Session Breakdown

Session 1: Handouts 1-4*

Session 2: Handouts 5-8*

Session 3: Handouts 9-12 &14*

Session 4: Handouts 13, 15-17*

Session 5: Handouts 18-21*

(* Facilitators do not have to utilize all handouts, and may choose to select the handouts that best meet the needs of the group)

Overview of the skills module

The emotional regulation module seeks to further explain DBT theory regarding emotion dysregulation and biological vulnerabilities, as well as develop skills for coping with it (Rathus & Miller, 2015). To this end, this module introduces

concepts such as emotional identification and vocabulary, the purpose of emotions, behavioral chain analysis, self-care, positive activities, and opposite action (Rathus & Miller, 2015). This module has been paired with the second stage of working memory training, as the increased difficulty of activities can often result in emotional reactivity. Therefore, the goal in this section is for participants to learn skills to help them regulate their emotional reactions as they move through this skills module.

Working memory training exercises (WMT stage 2)

This module marks the first increase in working memory training complexity. In the second stage of working memory training, facilitators should utilize activities that are still individual oriented, but integrate multiple levels or tasks. For example, the activity presented may have 5 different rounds that participants work to complete. By integrating multiple elements, group members are challenged to increase their use of sustained attention and problem-solving skills. As tasks increase in difficulty, facilitators are encouraged to remember to keep chosen activities challenging but attainable. In the beginning of this module, facilitators may find it helpful to revisit an activity that has already been used but add elements of complexity.

Each member of the group may still be functioning at a different level in their ability to completing activities. Therefore, it is important to choose tasks that can be completed by all members with support and motivation. However, this is the benefit

of using task that have multiple levels. Beginning levels can be created for members who still struggle completing tasks, while middle and advanced levels can challenge group members who are more proficient.

During this module, if they have not already chosen to do so, facilitators may find it helpful to utilize external motivators such as candy or prizes. As tasks get more difficult, it may be challenging to motivate individuals to complete multiple levels of tasks. However, motivating participants to do so is a key element in supporting the growth of working memory. External motivators can be used to incentivize participants to engage even when tasks seem "too difficult."

During this module, participants should be reminded of the purpose of working memory training, and why it is important for tasks to challenge their thinking and problem-solving abilities. As always, group facilitators must be mindful of the messages that are given to, and expressed by, participants, especially as some participants continue to complete tasks faster or more frequently than other members. Group boundaries regarding respect, nonjudgment, and validation should be affirmed.

Examples of activities that could be used for stage two of WMT (WMT stage 2)

Facilitators are free to choose their own activities for working memory training. The tasks in this stage should be completed by participants individually, and contain multiple levels or tasks. Examples of activities that could be used in this stage are:

- Tangrams- Tangrams are a type of picture puzzle. In these puzzles, each participant has a set of tangram pieces that contain various sizes of square and triangle pieces. Participants must combine these pieces in the right order to recreate a picture. There are a wide variety of tangram puzzles available in varying degrees of complexity. Facilitators can select a few puzzles and challenge members to complete as many puzzles as possible. This activity exercises working memory skills of visual manipulation, sustained attention, and problem-solving. Facilitators can also assign point values to each tangram puzzle and use this in WMT stage 3 as a competitive game.
- Building challenges- In the game "brain builders," participants are given a two-dimensional picture that they must turn into a three-dimensional structure utilizing a set number of wooden building pieces. In this activity, facilitators can supply participants with a pictorial list of structures to choose from, and challenge them to complete as many as possible. This exercise uses working memory skills such as planning, visual manipulation, and sustained attention. This activity can also be augmented to fit the needs of WMT stage 3 and 4.
- Memory and repetition game - In one example of this type of game, group members sit in a circle and are given a phrase to finish (For example, I went to the store today and I picked up some…). Group members finish this sentence in order, and must repeat all of the previous answers before them. (So if the people before them say oranges, bananas, and toilet paper, the individual must list these

in order before adding their own answer). Therefore, the person at the end must remember and repeat all of the groups previous answers before finally adding their own. Facilitators can add to this exercise by including additional challenges such as using alphabetical order, adding describers (3 bananas, 5 oranges), etc. This type of activity exercises working memory skills of sustained attention and strategy, as participants must come up with a plan for how they will remember all of the elements. To distribute the challenge of remembering long sequences equally, group facilitators should shift the starting point of the exercise to different members at the start of each round.

Working memory training and emotion regulation skills

Facilitators are encouraged to review the provided teaching notes for this section on pages 192- 225 of the adolescent DBT skills manual (Rathus & Miller, 2015), for more specific instructions on material and skills delivery. This section seeks to teach participants to minimize their vulnerabilities to emotional reactivity and cope with strong emotional responses (Rathus & Miller, 2015). The goal in pairing this module with increasing difficulty in working memory tasks is to begin to give participants skills they can practice and utilize when faced with these challenges, including those that occur in the group setting. Facilitators should also remember to have group members complete a DBT behavioral chain analysis in response to any behavioral outbursts or dysregulation that occurs during this or previous portions of group.

During this part of group, facilitators should remember tie material and skills back to experiences that occurred during working memory training. Themes that may be explored include coping with frustration, dealing with anger, and staying motivated despite negative reactions or interactions. Facilitators should use these themes to highlight core material from this section to include behavior chain analysis, the purpose for emotions, emotional identification, emotional vulnerabilities, and problem-solving and fact checking (Rathus & Miller, 2015).

DISTRESS TOLERANCE

Session Materials

- DBT Distress Tolerance handouts 1 through 18
- Writing surface or material (white board, large paper, etc.)
- Small bell or singing bowl
- Working memory training material/activities
- Any material necessary for the brief mindfulness exercise

Session Outline

10-20 minutes: Brief mindfulness exercise
40-50 minutes: Working memory training structured exercise
(Optional: 5-10 minute break)
50-60 minutes: DBT distress tolerance skills material

Total length: 2 hours

Session Breakdown

Session 1: Handouts 1, 3, 4*

Session 2: Handouts 5-8*

Session 3: Handouts 9-12*

Session 4: Handouts 2, 13, 14*

Session 5: Handouts 15-18*

(* Facilitators do not have to utilize all handouts, and may choose to select the handouts that best meet the needs of the group)

Overview of the skills module

In the distress tolerance module, the focus is on creating skills and techniques for dealing with crisis situations and times of emotional distress when the problem

can not be solved in the moment (Rathus & Miller, 2015). The goal of this module is to help individuals develop interventions that will prevent them from acting impulsively in the moment (Rathus & Miller, 2015). To support this goal, this module presents two primary approaches to distress tolerance, crisis survival skills and acceptance oriented focus (Rathus & Miller, 2015). This section has been chosen to be presented with the third stage of working memory training as this stage introduces the element of competition and timed completion. The introduction of competition or timed activity adds an element of stress and therefore can result in feelings of distress and overwhelming frustration. Therefore, the goal of pairing these processes together is to build on the emotional regulation skills that members have already received, and help them begin to find skills for dealing with experiences that cause acute distress.

Working memory training exercises (WMT stage 3)

In the third stage of working memory training, activities are still individual oriented, however the element of competition and/or timed completion is added. By integrating this element, working memory training complexity is increased through the necessity for quick responses. Therefore, participants must now use all of the skills that they have been practicing but in a quicker fashion. Many of the activities that have been used up to this point can be adapted to contain either an element of competition or timed completion. As facilitators are beginning this stage, they may find it helpful to use an activity that group members are already familiar with.

Each member of the group may still be functioning at a different level in their ability to completing activities, and it is highly unlikely that all group members will "win" a challenge throughout the course of the group. Therefore, it is important that group facilitators be prepared to deal with the reactions of group members who do not complete first, as well as those who do. If the group size is large enough, facilitators may consider splitting members into two or more different groups based on task completion speed and proficiency. This way group members will be in competition with individuals close to their own level of functioning, thus helping to maintain motivation for engagement. External motivators and incentives may also be helpful in this process.

During this module, participants should be introduced to the purpose of adding timing or competition to working memory skills training. As always, group facilitators must be mindful of the messages that are given to, and expressed by, participants, especially as some participants continue to complete tasks faster or more frequently than other members. Group boundaries regarding respect, nonjudgment, and validation should be affirmed.

Examples of activities that could be used for stage three of WMT (WMT stage 3)

Facilitators are free to choose their own activities for working memory training. The tasks in this stage should be completed by participants individually, and contain an element of timed completion and/or competition. Examples of activities that could be used in this stage are:

- On the dot (or Swish)- In this game, each member of the group is given four transparent cards, each with dots of different colors placed on the card's surface. All members are then shown a picture depicting a specific sequence of colored dots. Using their set of transparent cards, participants must flip, rotate, and overlay cards to replicate the picture that they have been shown. This activity requires working memory skills of problem-solving, planning, and visual manipulation.
- ASAP/last word- Both of these game are quick response word games. In this type or game, participants are give a category and letter, and they must come up with a word starts with the identified letter that fits into the category in a short amount of time. This game can be played in a number of ways, however it is advised that facilitators use only the cards and not any game boards that may come with these activities. This activity utilizes working memory skills of sustained attention, quick response/recall, and problem-solving.
- Set- The game of set is a visual matching and pattern identification game. In this game, there is a collection of cards that have different shapes, colors, and patterns. Participants are introduced to the many ways that they can make a "set" or combination of 3 matching cards. Sets can be made in a variety of ways. A specific number of cards are then laid out on a table, and participants must be the first to identify a set. When they do, they must call out the word "set." This

activity uses working memory skills of sustained attention, visual manipulation, and response speed.

Working memory training and distress tolerance skills

For more information on the delivery of distress tolerance skills material and specific instructions, facilitators should consult pages 126-153 of the adolescent DBT skills manual (Rathus & Miller, 2015). During this portion of group, facilitators are encouraged to integrate experiences from group into the use and practice of DBT skills. Facilitators should also remember to have group members complete a DBT behavioral chain analysis in response to any behavioral outbursts or dysregulation that occurs during this or previous portions of group. Themes that may emerge from working memory training during this section include dealing with frustration, coping with not "winning," responding to perceived bragging or judgment, and coping with urges to act out. In response to these themes, facilitators may highlight skills material such as self-soothing, distracting yourself from the immediate sensation, decision making skills, physical de-escalation, and acceptance skills (Rathus & Miller, 2015).

INTERPERSONAL EFFECTIVENESS

Session Materials

- DBT Interpersonal Effectiveness handouts 1 through 14
- Writing surface or material (white board, large paper, etc.)
- Small bell or singing bowl
- Working memory training material/activities
- Any material necessary for the brief mindfulness exercise

Session Outline

10-20 minutes: Brief mindfulness exercise
40-50 minutes: Working memory training structured exercise
(Optional: 5-10 minute break)
50-60 minutes: DBT interpersonal effectiveness skills material

Total length: 2 hours

Session Breakdown

Session 1: Handouts 1-4*

Session 2: Handouts 5-7*

Session 3: Handouts 7-9*

Session 4: Handouts 10-12*

Session 5: Handouts 13 & 14*

(* Facilitators do not have to utilize all handouts, and may choose to select the handouts that best meet the needs of the group)

Overview of the skills module

The last module in this program is that of interpersonal effectiveness. In this skills module, the focus is attaining skills for building and maintaining interpersonal relationships (Rathus & Miller, 2015). As such, this module focuses on a few

primary goal such as learning to build positive relationships, reducing and resolving conflict, effectively ask for what a person needs and wants, saying no and refusal skills, and maintaining self-respect (Rathus & Miller, 2015). This module has been paired with the fourth stage of working memory training as this stage introduces the element of group and team activities. In this stage, group members will be required to work with one or more team members to complete the presented activity. In doing so, group members are likely to encounter difficulties in communication, compromise, and other interpersonal stressors. Therefore, the goal in pairing these two sections together is for group members to learn to integrate interpersonal skills as they use them in their group activities.

Working memory training exercises (WMT stage 4)

In the fourth and final stage of working memory training, activities shift from being individual oriented to group oriented. Groups may consist of two or more participants, however facilitators may find it best to start with small groups and gradually integrate more members if preferred. Working memory activities may be timed, competitive, or open ended. In the beginning of this process facilitators may want to start with small group open-ended (no timing or competition) activities, but graduate to timed competition as the module progresses. Many of the activities that have been used up to this point can be adapted to contain a group element.

By adding a team element to working memory training, group participants must now strategize and plan to complete tasks using all group members, and not

just themselves. This element challenges participant's inclinations to take over completely or shut down and disengage. Facilitators are advised to create structured group participation rules to account for these inclinations. Facilitators may consider requiring equal group participation as evidenced by equal turn taking and trading off, or giving each member a specific role.

As with all working memory stages up to this point, participants are likely to still function at different levels of speed and proficiency. Therefore, group facilitators are encouraged to assign groups, versus allowing group members to choose for themselves. This will help to ensure equal distribution of skills, as higher functioning participants should be paired with those that still struggle. As elements of competition are added in, it is again unlikely that all groups will "win" at some point during the activity. Therefore, group facilitators must be prepared for dealing with individual's reactions and their tendency to blame or get frustrated with their teammates. As always, group facilitators must be mindful of the messages that are given to, and expressed by, participants, especially as some participants continue to complete tasks faster or more frequently than other members. Group boundaries regarding respect, nonjudgment, and validation should be affirmed.

Examples of activities that could be used for stage four of WMT (WMT stage 4)

Facilitators are free to choose their own activities for working memory training. The tasks in this stage should be completed by participants in groups of two or more,

and include open ended, timed, or competitive activities. Examples of activities that could be used in this stage are:

- Card compromise- In the game of card compromise members must work in teams to compromise, trade, and problem solve to collect a specific number and arraignment of cards (ex. 3-of-a-kind, royal flush, 5 card run). Each team is dealt a specific number of cards, and then instructed that they must trade and compromise with other teams to get an identified pattern of cards. Facilitators can increase the challenge of this activity progressively by decreasing the number of cards dealt to group members, and increasing the challenge of the assigned pattern. In this activity working memory skills of sustain attention, strategizing, and planning are used.
- Q-bitz- In this game, each team is given a set of playing cubes, containing 9 cubes with different black and white patters on each side of the cubes. The goal of this game is to flip the cubes and combine them to create identified patterns that are depicted on a set of cards. This activity includes three levels of play, one in which members can move pieces freely, one where they must role them like dice to get the side of the cube they need, and one where they must remake the image from memory. When using this activity, facilitators are encouraged to set a rule that players must trade off to place cubes in place. This prevents one member from doing all of the work. The first team to recreate the picture wins

the round. This activity utilizes working memory skills of quick response, strategy, and visual manipulation.

- Squint- This activity is similar to Pictionary, in the fact that group members are given a word/describer that they must convey to other members of the entire group using pictures only. However, instead of drawing the pictures themselves, group members have to combine cards that have random shapes on them to create an image that relates to their word. Other groups must try and guess their word, and if someone gets is right both teams earn points. The team with the most points wins. When using this game, it is important to create rules or guidelines that ensure equal group member participation. This activity uses working memory skills of planning, visual manipulation, and quick response.

Working memory training and interpersonal effectiveness skills

For more information on the delivery of interpersonal effectiveness skills material and specific instructions, facilitators should consult pages 228-252 of the adolescent DBT skills manual (Rathus & Miller, 2015). During this portion of group, facilitators are encouraged to integrate experiences from group into the use and practice of DBT skills. Facilitators should also remember to have group members complete a DBT behavioral chain analysis in response to any behavioral outbursts or dysregulation that occurs during this or previous portions of group. Themes that may emerge from working memory training during this session include sharing responsibilities and tasks with group members, dealing with differences of

opinion, compromising, and coping with the frustration and stress in interpersonal relationships. In response to these themes, facilitators should highlight interpersonal skills information relating to identifying goals and priorities, communication approaches and techniques, maintaining self-respect, and resolving disagreements (Rathus & Miller, 2015).

PART IV

Group completion
and
other considerations and helpful tips

Completing a cycle / Graduation

Traditionally, DBT consists of one whole year of skills group participation, in which group member complete all of the skills modules two times (Rathus & Miller, 2015). However, due to population constraints, adolescent DBT has been shortened to one round of DBT skills lasting 24-weeks. Therefore, as participants near completion, programs and participants have a few option. One option is for participants to graduate and compete DBT skills group completely (Rathus & Miller, 2015). Another option is for individuals to graduate but become a part of a graduate group, as described on page 30 of the adolescent DBT manual (Rathus & Miller, 2015). However, a third option is for participants to continue to engage in skills group for a second round as is traditional in DBT.

Working Memory Activities

- 9 square puzzles
- ASAP/last word
- Blokus
- Building challenges
- Card games
- Checkers
- Chess
- Crosswords
- Handheld puzzles and puzzle games
- Jenga
- Memory and repetition games
- On the dot (or Swish)
- Q-bitz
- Scrabble
- Set
- Squint
- Sudoku
- Tangrams
- Uno
- Word finds
- Word games

Suggested Readings

Books

- *DBT skills manual for adolescents* by Jill Rathus and Alec Miller (2015)

  This text is the primary reference for this manual. In this publication, authors introduce the concept of DBT skills group, provide specific notes and instruction on the facilitation of skills group modules, and include group handouts.

- *Dialectical behavior therapy with suicidal adolescents* by Alec Miller, Jill Rathus, and Marsha Linehan (2006)

  This publication is the companion DBT facilitation guide to the *DBT skills manual for adolescents.* In this book, the primary components, theory, and facilitation of the DBT approach is discussed in greater detail.

- *The oxford handbook of impulse control disorders* Edited by Jon Grant and Marc Potenza (2011)

  In this book, editors present information specific to impulsivity and impulse control disorders in both adolescents and adults. This text contains information on the presentation, causation, and treatment of impulse control disorders.

- *DBT skills training handouts and worksheets, second edition* by Marsha M. Linehan (2014)

  This text contains the adult version of DBT skills handouts and facilitation guides. Group facilitators may find it helpful to reference this publication to gain more information on DBT modules and additional group information.

- *DBT skills training manual, second edition* by Marsha M. Linehan (2014)

  This publication is the updated version of the original DBT manual that was published for treatment with adult populations. In this book, readers will find the original outlines of the DBT theory, as written by this theories founder, Marsha Linehan.

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