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Avoidance as an Explanatory Mechanism for Poor Outcomes in Treatment for Substance Use Disorders

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AVOIDANCE AS AN EXPLANATORY MECHANISM FOR POOR OUTCOMES IN TREATMENT FOR SUBSTANCE USE DISORDERS

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Substance use disorders (SUDs) are prevalent and lead to significant impairments in people's lives in a variety of ways. One area which has gained attention is that of SUDs and their high comorbidity with mood and anxiety disorders. Many theories exist as to why these conditions often occur together, and the self-medication hypothesis is one that has perhaps the most research and general support behind it. The self-medication hypothesis states that individuals use substances to reduce negative affect which creates a feedback loop of negative reinforcement. Individuals then develop problematic substance use in addition to emotional dysregulation. One recent theory is that of an Avoidance-Coping Cognitive Model by Bacon and Ham (2010) which states that some individuals have an increased propensity to use alcohol to reduce social anxiety because of a heightened sensitivity to social threat. This reduction is achieved through automatic processes as a result of the chemical effects of alcohol and a controlled process of shifting attention away from a threatening stimulus. This paper proposes that such a relationship is not unique to alcohol or social anxiety and instead multiple components of avoidant coping (e.g. behavioral, cognitive, and emotional avoidance) form negative reinforcement feedback loops for a variety of substances and types of emotional dysregulation. The present study was conducted at a men's transitional living SUD

treatment center. Participants in the study filled out several measures of emotional functioning, avoidant coping styles, and completed a behavioral avoidance task. Treatment outcome measures were also collected with participant consent. A mediation model was hypothesized, such that avoidant coping would be related to both emotional dysfunction and treatment outcomes and would explain the relationship between emotional dysfunction and treatment outcomes as well. Results showed that higher avoidant coping did predict lower treatment completion and was related to greater emotional dysfunction, but the mediation model was not supported. A moderation analysis showed individuals who discontinued the behavioral avoidance task showed a different pattern of relationships with studied variables than individuals who completed the task. Implications of the present study and future directions for research are discussed.

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Introduction

Substance use disorders (SUDs) are a major concern for both individuals whom they affect as well as communities in which those people live. SUDs are related to many areas of health, including short-term consequences such as traffic accidents, or long-term consequences such as heart disease (Goetzel, Hawkins, & Ozminkowski, 1999). Mortality rates are higher for individuals who have a SUD (Rehm et al., 2002). Globally, an estimated 3-8% of all deaths are somehow associated with alcohol use (Rehm et al., 2009). SUDs are also a common problem, with the prevalence estimated to be over 9% in the United States, when considering people who have met DSM-IV criteria for a SUD in the last 12 months (Grant et al., 2004).

SUDs are also highly comorbid with other mental health disorders, adding to the impact that they have on general health. Anxiety and mood disorders in particular have high overlap with SUDs (American Psychiatric Association, 2013; Currie et al., 2005; Grant, 2005; Swendson & Merikangas, 2000). Individuals with a substance use disorder are about twice as likely to be diagnosed with a mood or anxiety disorder as the general population, and individuals with a mood or anxiety disorder are about twice as likely to be diagnosed with a substance use disorder as the general population (Conway, Compton, Stinson, & Grant, 2006). Such high overlap between SUDs and other mental health disorders indicates a need for further understanding and examination into its etiological underpinnings.

The bulk of research in this area focuses on diagnostic categories of SUDs and other mental health disorders. However, evidence shows that general emotional

dysregulation is often more relevant to SUDs than any specific diagnostic category (Cheetham, Allen, Yucel, & Lubman, 2010). It appears that such emotional dysregulation conveys a significant vulnerability to SUD development and maintenance (Cheetham et al., 2010) Studies examining possible etiologies to explain the connections between emotional dysregulation and SUD development have grown over the years to help researchers understand these connections (Bernadt, & Murray, 1986; Mueser, Drake, & Wallach, 1998). The three primary explanations developed to explain the high comorbidity between SUDs and other mental health disorders are that other mental health disorders lead to SUDs, that SUDs lead to other mental health disorders, or that some underlying factor predisposes people to developing either SUDs or other mental health disorders (Lehman, Myers, & Corty, 2000). Studies examining the predisposition to these conditions involve genetics, shared environments, or other related underlying conditions (Edwards et al., 2011; Shivola et al., 2008). Evidence that substance use disorders can lead to mental health disorders often involves direct consequences of the substance use disorders as negative life stressors (Fergusson, Boden, & Horwood, 2009). The explanation that appears to currently be most prominent, though, is that mood or anxiety disorders often lead to substance use disorders (Mericle et al., 2012).

The hypothesis that emotional disturbance leads to SUDs is most often referred to as the self-medication hypothesis (Khantzian, 1985). This hypothesis states that people tend to cope with their negative emotions, such as anxiety or mood symptoms, by using substances as a form of negative reinforcement (Khantzian, 1985). After a regular pattern of this substance use to cope with negative emotionality, substance use disorders develop

in addition to the other mental health disorder. Because of the unhealthy patterns of substance use developed to alleviate short-term distress, unhealthy substance use generalizes to other areas of life and causes functional impairments, such as loss of employment or relationship difficulties (Carrigan & Randall, 2003; Khantzian, 1985). Research into the etiology of the comorbidity between SUDs and other mental health disorders has shown that most often the age of onset for anxiety and mood disorders is earlier than the age of onset for SUDs, which would be consistent with the self-medication hypothesis (Falk, Yi, & Hilton, 2008; Kessler, 2004; Mericle et al., 2012). Evidence is not unanimous in this regard, with some evidence suggesting that substance abuse occurs before other mental health disorders and substance dependence occurs afterward (Falk, Yi, & Hilton, 2008; Fergusson, Boden, & Horwood, 2009). While the etiological considerations of these two complex disorders is still under investigation, the self-medication hypothesis remains a prominent theory which helps to explain the high comorbidity between SUDs and other mental health disorders (Carpenter & Hasin, 1999; Carrigan & Randall, 2003; Morris, Stewart, & Ham, 2005).

The self-medication hypothesis assumes a linear causal relationship with emotional dysfunction leading directly to substance use, which alleviates a negative mood state (Chutuape & de Wit, 1995; Khantzian, 1985). One possibility that has not been examined explicitly is the potential that a desire to avoid negative affect is an underlying mechanism that would explain the apparent causal relationship between emotional disturbance and SUDs. Avoidance as this mechanism would serve as an alternate theory to help explain the development of SUDs from emotional disturbance. In

the self-medication hypothesis, individuals use substances to avoid negative emotionality. It is known that avoidance is typically heightened among people who have difficulties with emotional disturbances (Chawla & Ostafin, 2007; Kingston, Clarke, & Remington, 2010) as well as people who have SUDs (Bunaciu et al, 2010; Levin et al., 2012). If that desire to avoid was shown to be a variable that can predispose a person to the development of SUDs as a result of other mental health disorders, it would significantly impact the current understanding of the etiology of comorbid SUDs and mood or anxiety disorders.

A vital difference exists between what avoidance as a predisposing factor and the standard self-medication hypothesis predict for a person who understands SUD treatment. In the self-medication model, an individual who has successfully stopped using substances to cope with negative emotionality and has also begun to manage those symptoms in a healthy way would likely have a positive future prognosis (Chutuape & de Wit, 1995). If avoidance is the driving force for the link between negative emotions and substance use, these individuals may not have such a positive prognosis. The tendency toward avoidance would still exist (Levin et al., 2012), which does not effectively regulate such emotionality. As negative emotions go unregulated the assumption is that an individual have greater difficulty resisting triggers to use across time [subsequently shorting the latency to relapse].

The present study seeks to further investigate the role that avoidance plays within the overlap between substance use disorders and other mental health disorders. Comorbidity with other mental health disorders is very high, and effect sizes for current

SUD treatment strategies are modest in most cases (Kelly, Daley, & Douaihy, 2012).

Within the next sections, this paper will outline the theoretical background for a study focused on investigating the role of avoidance in SUD treatment. To begin, background on SUDs and their relationships with negative emotionality are discussed, specifically the vulnerability that individuals with SUDs have to negative emotionality. Some theoretical explanations for this connection are reviewed, with the self-medication hypothesis being the strongest current explanation this overlap. Avoidance as a component of self-medication is discussed, including many types of avoidance in a variety of contexts. An avoidance-coping cognitive model explaining the relationship between social anxiety and alcohol is reviewed (Bacon & Ham, 2010), with a proposed generalization to that model to other types of negative emotionality and other substances. The specific effects of avoidance on SUD treatment are then reviewed, including several of the most common approaches to SUD treatment. The effects of gender on avoidance and SUD treatment are then briefly reviewed. Finally, a model of avoidance as a part of a self-medication negative reinforcement loop is introduced. A study that was designed to test this proposed model is then described, providing evidence for the importance of avoidance within the clinical picture of SUD treatment.

Substance Use Disorders, Comorbidity, and Treatment

Treatment for individuals with SUDs is a high priority for public welfare due to the prevalence and harm associated with these conditions (Rehm et al., 2002; Rehm et al., 2009). Such efforts are evident, as treatment for SUDs has undergone many adaptations and advancements over the past century (Marlatt & Witkiewitz, 2005). Despite these

advancements, treatment often fails to have a long-lasting impact, and relapse rates remain high in many cases (Kelly et al, 2012). Up to 50% of people relapse within 12 months of treatment (Miller et al., 2001).

These high relapse rates reflect an incomplete understanding of how to treat individuals with SUDs. The knowledge base has grown over the years about why treatment remains less effective. For example, research shows that polysubstance use, or severe substance use of more than one substance, is more common than once believed (Hasin, Stinson, Ogburn, & Grant, 2007; Hedden et al., 2010; Staines et al., 2001).Theories for the high prevalence of polysubstance use typically address things such as a common culture of people who abuse substances leading to increased opportunities for people to abuse substances of different kinds (Staines et al., 2001). Even when controlling for comorbidity of other mental health disorders, SUDs continue to be highly related to one another, indicating it is likely that underlying predisposing factors related to the development of multiple SUDs are at least partially responsible for the overlap of conditions (Hasin et al., 2007).

The focus of most research efforts has historically been within diagnostic categories due to convenience, simplicity, and effectiveness in communication (Conway et al., 2006). However, more recent attitudes toward these constructs have been shifting away from such rigid adherence to diagnostic categories (Cheetham et al., 2010). General emotional distress, rather than any specific affective disorder, has been shown to be significant predictor of SUD development and maintenance (Cheetham et al., 2010). Such a paradigm shift is especially important as further study of different mood and anxiety

disorders shows high overlap and symptoms such that the diagnostic labels assigned to different constellations of symptoms may not be as distinct from one another as originally thought (Nemeroff, 2002). Some evidence for this phenomenon includes the effectiveness of transdiagnostic treatments for anxiety disorders (Norton & Philipp, 2008), the high positive correlation between measures of anxiety and depression (Nemeroff, 2002), and the efficacy of psychotropic drugs for a variety of disorders (Rivas-Vazquez, 2001). While diagnostic labels are far from useless, they do fall short in explaining all the variance in symptom presentation seen in clinical and research settings.

Even for the definition of SUDs themselves, attitudes of diagnostic labels have shifted over the years. With the publication of the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association, 2013) diagnostic labels have changed from the fourth edition (DSM-IV-TR; American Psychiatric Association, 2000). Many diagnoses have remained relatively unchanged (i.e. Major Depressive Disorder), but within the realm of SUDs the definition has altered to adhere to a more dimensional model than in previous iterations of the DSM. SUDs had previously been split into "abuse" and "dependence" labels, with dependence being more severe, and have been changed to be different severity levels of substance use disorders instead (American Psychiatric Association, 2013).

Because of these overlapping symptoms and etiology, the model discussed in the present study eschews the use of diagnostic labels for anxiety and affective symptoms. As mentioned previously, avoidance is a transdiagnostic construct and the model seeks to address how it affects people regardless of the specific endorsement of diverse emotional

difficulties. The nature of the specific difficulty is less important to the model as compared to the way that it may motivate someone toward seeking to avoid those negative feelings. The validity of the specific constructs of different anxiety or mood disorders is not necessary for the model itself to be explanatory in its relationship to SUDs.

SUDs are also highly co-occurring with mood and anxiety disorders, such that the SUD and mental health disorder interact in a way as to affect the course and prognosis of both disorders (American Psychiatric Association, 2013). The three main explanations for such comorbidity have been purported: 1) SUDs lead to other mental health disorders, 2) these other mental health disorders lead to SUDs, or 3) there is a common underlying factor that predisposes people to both of these conditions (Lehman, Myers, & Corty, 2000). Each of these explanations has its own merits and evidence, which is often the case for complex conditions such as these with no simple explanation capturing the entire picture (Falk et al., 2008). As such, different factors could play a role for different people, such that each explanation accounts for some of the comorbidity observed between SUDs and other disorders; the different explanations are not de facto mutually exclusive (Sher & Levenson, 1982).

Evidence that SUDs lead to other mental health disorders primarily revolves around the negative consequences that that often occur as a result of SUDs (Fergusson, Boden, & Horwood, 2009). The link between negative life stressors and the onset of mood and anxiety disorders is well-established (Monroe & Simons, 1991; Nugent, Tyrka, Carpenter, & Price, 2011). In addition, many of the symptoms and related phenomena of

SUDs are such negative life stressors (American Psychiatric Association, 2013). Individuals suffering from SUDs have poorer relationships with their families, have a difficult time maintaining employment, and often face imprisonment as a result of either the substances themselves being illicit or accompanying behaviors (e.g. drinking and driving) being illegal (American Psychiatric Association, 2013). Individuals who experience these negative behaviors as a result of SUDs could then develop mood or anxiety disorders in light of the increased life stress (Fergusson, Boden, & Horwood, 2009). An example in this case may be that a person with heavy episodic drinking may lose his or her job because of that drinking, which then has a potential to lead to a depressive episode (Nugent et al., 2011).

The discussion of causality is further complicated by evidence of "substance-induced" mood or anxiety disorders (Schuckit, 2006). In these conditions, individuals exhibit symptoms of a mood or anxiety disorder (e.g. depressed mood) during periods of substance use, but these symptoms disappear during periods of sustained abstinence (Gawin, 1986). Many substances have a direct effect on mood, including many types of stimulants like cocaine and depressants like alcohol (National Institute on Drug Abuse, 2015). Over time, such substances can lead to longer-term effects on mood (Schuckit, 2006). An exemplar study on alcohol had individuals drink up to 25 standard drinks over a 24 hour period, and all 10 participants began exhibiting depressive symptoms after a few weeks, including four that exhibited suicidal ideation; all depressive symptoms disappeared after returning to abstinence from alcohol (Isbell et al., 1955). An increase in mood or anxiety symptoms during active substance use does not preclude either causal

direction of substance use leading to mental health disorders or vice versa. Instead, the presence of substance-induced disorders adds to the complexity and heterogeneity of these conditions (Schuckit, 2006).

Research has not always taken into account these different etiologies. A study by Terra and colleagues (2006) showed that receiving targeted treatment for an alcohol use disorder does not always reduce anxiety symptoms. Even though they were not directly examining alcohol-induced anxiety disorders, if these disorders were highly prevalent among the studied sample, such a decrease in anxiety symptoms would have likely been seen in this study. However, because in many studies substance-induced mood or anxiety disorders are not specifically assessed, they could be having varying impacts from one study to another. Such comorbidity between these SUDs and other mental health disorders is therefore a continuing problem regardless of the reason for the comorbidity. A person who presents with comorbid alcohol use disorder and depressive symptoms, for example, may or may not have had depressive symptoms before he ever drank alcohol and those depressive symptoms may or may not go away if that person stops drinking alcohol.

One major reason that the concept of substance-induced mental health disorders does not have as many supporters as the primary explanation for increased comorbidity between these conditions is that the age of onset for SUDs is typically later than it is for mood or anxiety disorders(Falk, Yi, & Hilton, 2008; Kessler, 2004;Mericle et al., 2012). The theoretical explanation here is that of the self-medication hypothesis, which states that individuals use mind-altering substances to cope with difficult or overwhelming

emotions as a form of negative reinforcement (i.e., substances effectively dispel negative emotions, which increases use patterns). For example, a person struggling with major depression may drink alcohol to intoxication to reduce the negative feelings experienced in the moment. Alternatively, a person with social anxiety may use alcohol as "liquid courage" to reduce the negative affect that person experiences in social interactions. It should be noted that some studies have also shown that substance use can lead to many other mental health problems in addition to anxiety and depression (e.g. Fergusson, Boden, & Horwood, 2009; Pacek, Martins, & Crum, 2013).

This paper proposes the idea that a self-medication hypothesis is part of a predisposition to developing anxiety, mood, or substance abuse problems more so than the simple explanation that people develop SUDs because of their other mental health concerns. These discussions of vulnerabilities usually focus on things like a shared environment, or shared genetic factors (Edwards et al., 2011; Shivola et al., 2008). Indeed, evidence does show that a negative developmental environment often leads to poorer health outcomes, including both mood/anxiety disorders and SUDs (Almeida et al., 2012; Goodman & Huang, 2002; Murphy et al., 1991). Being raised by a parent with a SUD is also related to having a higher risk for substance use problems in the child (Biederman, Faraone, Monuteaux, & Feighner, 2000). Moreover, genetic links have been found that are related to a higher risk of developing either SUDs or other mental health disorders, regardless of developmental environment (Edwards et al., 2011; Shivola et al., 2008). Impulsivity in particular is a strong predictor of later development of SUDs (Verdejo-Garcia, Lawrence, & Clark, 2008).

Two specific neurobiological explanations have been examined in detail, specifically that comorbidity arises due to addiction and other mental health disorders being different expressions of similar neurobiological abnormalities and that chronic drug administration leads to neuroadaptation which then mediates mental health disorders (Brady & Sinha, 2005). Moreover, research has shown that dopamine and serotonin function appear to be highly related to both mood and anxiety disorders and to the development of SUDs (Markou, Kosten, & Koob, 1998). Such evidence supports a self-medication hypothesis, such that individuals who experience significant distress seek to regulate neurotransmitter function through drug administration, which has a direct or indirect effect on neurotransmitter levels (Brady & Sinha, 2005). Vulnerabilities to experiencing negative distress as a result of neurotransmitter functioning abnormalities also predispose individuals to abusing substances (Brady & Sinha, 2005).

Self-Medication Hypothesis

The self-medication hypothesis, as previously introduced, is the explanation that posits individuals use substances to cope with negative emotionality (Khantzian, 1985). This regular use of substances to cope with negative emotionality then leads to maladaptive coping methods and eventually SUDs. This approach has been studied in many forms for several decades, including under other names that examined the same basic construct, such as reinforcement theory (Conger, 1956).The strongest support for this hypothesis is that individuals with SUDs commonly self-report that they use to cope with negative emotions (Carpenter & Hasin, 1999; Carrigan & Randall, 2003). Despite this self-report data, the evidence is mixed as to whether or not people experience a short-

term reduction in mood or anxiety symptoms as a result of their substance use (Bacon & Ham, 2010; Carrigan & Randall, 2003).

Evidence examining the actual distress reduction effects of various substances is relatively limited, likely due to the ethical and practical limitations associated with the administration of different drugs in an experimental setting. Because of these limitations, research on alcohol and nicotine are the most often studied substances in this context. In a study by Naftolowitz and colleagues (1994), researchers gave individuals either a placebo drink or an alcoholic drink before placing them into social anxiety-provoking experience. Results showed no effects of the alcohol on subjective anxiety, although they admitted to several methodological limitations in their study such as low levels of alcohol utilized as part of the study (Naftolowitz et al., 1994). In addition, evidence shows that individuals who drink to cope with negative mood are more likely to develop problematic drinking (Kassel, Jackson, & Unrod, 2000). One study on the effects of nicotine administration by Salin-Pascual and colleagues (1995) showed a short-term reduction in depressed mood among individuals with major depressive disorder after nicotine administration. One study on amphetamine administration showed increased mood after administration of the drug (Vollenweider et al., 1998).

Overall, the research base indicates that using substances may actually be insufficient to cope with some forms of negative emotionality (Kassel et al., 2000). The effectiveness of such forms of avoidance coping may vary depending on the specific substance in question. However, evidence is currently not strong enough to make any definite statements about the efficacy of using substances to cope with negative

emotionality, despite the strong evidence that people do use substances as a form of avoidance coping (Carpenter & Hasin, 1999).

The argument for a self-medication hypothesis makes three main assumptions (Chutuape & de Wit, 1995). The first is that negative emotionality, or some sort of distressing mood, predicts later substance use. Heightened symptoms must lead to increased substance use, or else the self-medication model cannot appropriately fit the observed phenomenon. Secondly, individuals believe that the substance reduces negative symptoms. Some discussions of the self-medication hypothesis state that symptoms must actually be reduced in order to fulfill this assumption, but much evidence exists that people are not always accurate in describing their subjective moods, especially in retrospect (Ben-Zeev, Young, & Madsen, 2009; Parkinson, Briner, Reynolds, & Totterdell, 1995). They may assume, for example, that they felt worse before their substance use than they actually would have described their mood at that time. Such subjective reduction in symptoms is therefore the required portion of the self-medication hypothesis rather than objective measurement of a reduction in negative mood. The third assumption is that the subjective relief obtained by an individual's substance use then leads to continued and increased use of that substance for further symptom reduction. Such a principle is in line with basic behavioral psychology, with a negative reinforcement loop of reduced symptoms leading to increased repetition of the specific behavior. When combined into a singular theory, the diagram shown in Figure 1 illustrates the self-medication hypothesis.

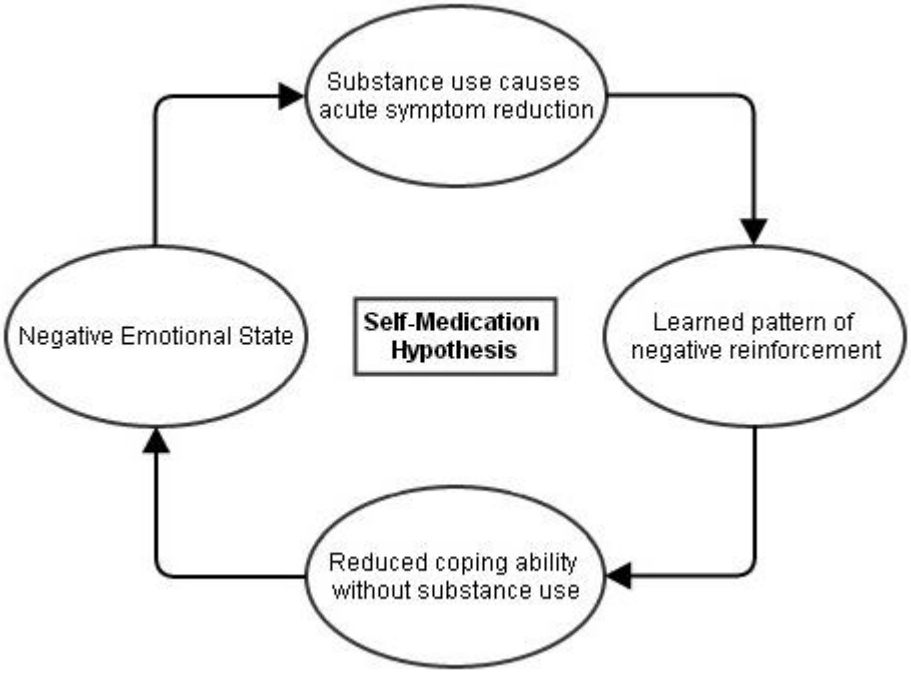

Figure 1. Self-medication Hypothesis Negative Reinforcement Loop

This paper presents a more comprehensive model of the relationships between problematic substance use and emotional dysregulation. The original model states that people use substances to avoid negative affect. Avoidance of negative affect is usually contextualized within the desire to seek substances that alleviate short-term negative emotionality. The proposed model in this paper instead examines avoidance as a vulnerability factor to the development of both problematic substance use and emotional dysregulation. Hayes and colleagues (1996) have discussed how functional analysis shows significant relationships to treatment while being difficult to develop into testable classifications. However, such transdiagnostic thinking has been increasing over recent years, and such examination outside of the typical syndromal classifications of SUDs and

other mental health disorders has been gaining research support as well (e.g. Cheetham et al., 2010; Nemeroff, 2002).

This approach would fit the current self-medication hypothesis as well potentially explain some of the aspects of SUD treatment that have been most difficult to explain through this version of the self-medication hypothesis, such as the high relapse rates after successful SUD treatment (Kelly et al., 2012; Miller et al., 2001). Theoretically, if an individual breaks the cycle of negative reinforcement seen in the self-medication hypothesis then that individual should not be prone to relapse after a certain amount of time, as the behavior of substance use to cope with negative emotionality should be extinguished. However, if these individuals are prone to avoidant coping that could explain their tendency to turn to substances even after maintaining a significant period of abstinence. From this conceptualization, self-medication is part of an avoidant coping paradigm, rather than avoidant coping being a part of a self-medication paradigm. This paper supports such an alteration in the conceptualization of the levels of functioning at which SUD treatment, relapse, and subjective reduction of negative emotionality through substance use operate in the general population. The present study also sought to further support for such a conceptualization.

Avoidance and Distress Tolerance

Expanding beyond the self-medication hypothesis of substance use (e.g., Levin et al., 2012), avoidance is a broader construct that takes many forms and has applications to many areas of psychology (e.g. Bacon & Ham, 2010; Blalock & Joiner, 2010; Bunaciu et

al., 2010; Carlin & Ahrens, 2012; Chawla & Ostafin, 2007; Dickson, Ciesla, & Reilly, 2010; Hayes et al., 1996).In general, avoidance involves an attempt to reduce the negative valence stimulus through directing resources away from that stimulus as means of protecting oneself from psychological harm (Hayes et al., 1996). Such avoidance is comprised of emotional, behavioral and cognitive features. As will be discussed below, these features are conceptually overlapping and not necessarily mutually exclusive within extant literature (Hayes et al., 1996)**.** Regardless of the overlap, however, avoidance constructs consistently predict maladaptive coping styles and impairment (Blalock & Joiner, 2000; Bunaciu et al., 2010; Fledderus et al., 2010) with some research showing that avoidance explains the relationship between maladaptive coping styles and poor outcomes (e.g., substance use/impaired mental health; Fledderus, Bohlmeijer, & Pieterse, 2010). Moreover, avoidance has been shown to persist among those in recovery and/or abstinence from substances (Gossop, Stewart, Browne, & Marsden, 2002). As such, many view avoidance as a key underlying mechanism linking substance use with mental health problems (Levin et al., 2012).

As previously stated, there are specific types of avoidance that tend to overlap conceptually and have yet to be statistically differentiated from prior literature. For example, *experiential avoidance* describes the practice of experiencing something but not allowing the mind to dwell on that feeling or thought because of the negative value placed on it (Levin et al., 2012). Whereas, *emotional avoidance* is a similar construct that is geared toward reducing the experience of a negative emotional state (Hayes et al, 1996). Emotional avoidance is also seen as a type of avoidance in which a person has a

reluctance to engage in situations that bring about uncomfortable emotional states and attempts to alter the intensity or frequency of those contacts (Hayes et al., 2004). Moreover, *behavioral avoidance* is the specific action that is aimed at reducing some unwanted feeling or state (Wolgast et al., 2013). Such avoidance can be part of emotional or experiential avoidance, or it can be that a specific action is unwanted due to the anticipated consequences. Lastly, *cognitive avoidance* is conceptualized as the process of keeping thoughts from dwelling on a certain topic or area relevant to the person's life at the time (Dickson, Ciesla, & Reilly, 2012). This type of avoidance involves a focus of attention away from a stimulus perceived as threatening, distressing or otherwise negative in some aspect (Blalock & Joiner, 2000). Depending on the context and the exact part of avoidant coping being examined at the time, the term experiential avoidance is sometimes substituted for either cognitive or emotional avoidance as well (e.g. Hayes et al., 1996). Given that there are no clear differential effects of types of avoidance on substance use and mental health outcomes, the present study examined all types of avoidance.

In order to comprehensively discuss avoidance, one must understand avoidance in relation to the construct of distress tolerance. Distress tolerance is defined as the ability to continue pursuing a goal as a result of the associated perceived physical and/or psychological discomfort (Brown et al., 2005). Distress tolerance and avoidance have not always been examined together, but when jointly considered they are often considered as similar aspects of emotional functioning (e.g. Iverson et al., 2012). For example, a person who has low distress tolerance is likely to engage in significant avoidance and a person

who often exhibits avoidance behaviors is likely to have a low distress tolerance. Theoretically, when a person reaches his or her limit of tolerance to something distressing, that is the point that the person will engage in avoidance of that aversive stimulus (Leyro, Zvolensky, & Bernstein, 2010). This area of research has many studies that have linked low distress tolerance to an increased risk of mood, anxiety, and substance use disorders (Mennin, Heimberg, Turk, & Fresco, 2002; Otto, Powers, & Fischmann, 2005; Zvolensky & Otto, 2007). Low distress tolerance is related to poorer outcomes in SUD treatment (Brandon et al., 2003; Daughters et al., 2005).

Research involving distress tolerance has used a variety of methods for measurement. The cold pressor task is one in which individuals place their hand into ice water and remove their hand as soon as the pain of the cold water becomes intolerable to them, with higher times indicating higher distress tolerance (e.g. Burns, Bruehl, & Caceres, 2004). In the mirror-tracing task, people trace difficult shapes when viewing the object through a mirror or using a computer mouse that is programmed to go the opposite direction it is moved (Strong et al., 2003). Some initial work has been done comparing measurements of experiential avoidance and outcomes on distress tolerance tasks which showed they had no significant correlations with each other (Schloss & Haaga, 2011). Because of this low correlation, the present study used measures of both distress tolerance and avoidant coping to develop a fuller picture of emotional functioning in the study participants.

Avoidant Coping and Substance Use

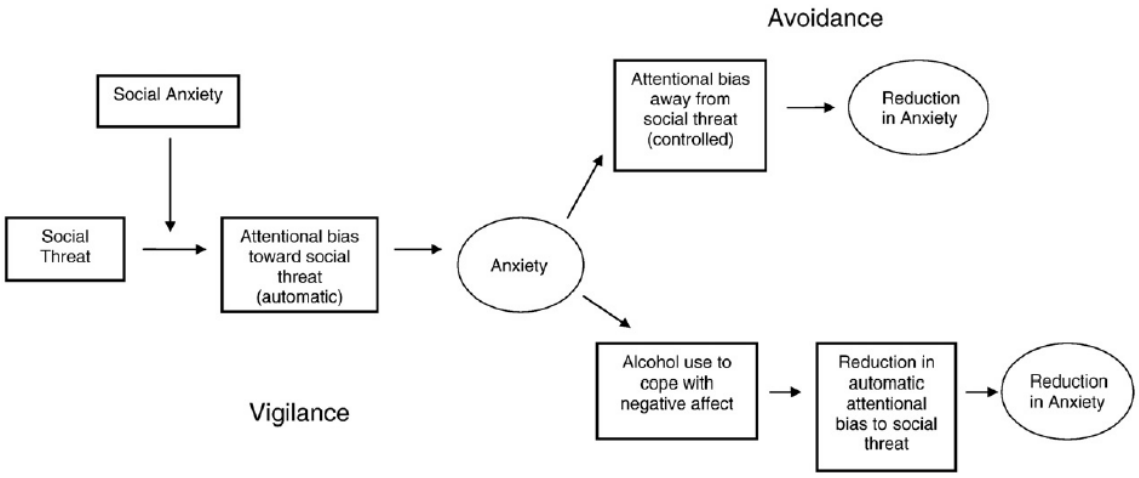

Figure 2. Avoidance-Coping Cognitive Model

As discussed above, avoidance is implicated as a maladaptive coping strategy within substance use (Bunaciu et al, 2010; Levin et al., 2012) and mental health (Chawla & Ostafin, 2007; Kingston, Clarke, & Remington, 2010). An avoidant coping pathway has been postulated by Bacon and Ham (2010) which complements this research and attempts to marry these separate fields examining avoidance independently. This illustrative theory suggests that people use alcohol to reduce their negative emotional state in social situations but that for some people this anxiolytic effect is stronger than for others. The people who tend to experience more anxiety reduction from alcohol are more likely to have higher levels of baseline social anxiety, indicating that these individuals have a much stronger pull than do many others to abuse alcohol in social situations. They put forth the idea that could explain the high comorbidity specifically between social anxiety and SUDs. This theory explains the observed link to be one primarily based on attention. Taken from Bacon and Ham (2010), their model is depicted in Figure 2 (below).

Their explanation, as shown by Figure 2, is that first an individual experiences a social threat. The threat is a perceived possible negative consequence due to a present or future social interaction. This initial threat leads to social anxiety, and individuals with social anxiety are shown to have an attentional bias toward that social threat (Bacon & Ham, 2010). Because the individual is paying closer attention to the threat, they experience heightened anxiety. At this point they experience two types of coping mechanisms, an automatic and a controlled response. The controlled response involves an individual making a conscious decision to avoid the threat through diverted attention. An example of this would be a person who is at a social gathering and experiencing social anxiety might have an increased sense of threat from the other people at the gathering that the individual does not know. The controlled response would be to actively keep large distances from those people in order to reduce the likelihood of social interaction with them.

The automatic response comes into play when people engage in substance use, specifically alcohol in this theory. People experience an effect called alcohol myopia when under the influence of alcohol (Steele & Josephs, 1990). Alcohol myopia is typically described as a reduction in the range of attention that a person has, or a narrowing of their perception (Steele & Josephs, 1990). Individuals who turn their attention from a threatening stimulus will better be able to divert their attention due to the decreased perceptual field that they experience (Steele and Josephs, 1990). The authors also suggest that an alcohol myopia explanation would also help rectify some of the mixed findings in actual reduction of negative moods as a result of alcohol consumption

(Bacon & Ham, 2010). Individuals who continue to have their attention drawn to stressful stimuli would not experience symptom relief, while individuals who are successful in diverting their attention would have symptom relief (Mogg, Bradley, de Bono, & Painer, 1997). Because this attention differential is difficult to measure in many of these studies, the results could be clouded by such a complicating factor.

As a result of both the automatic and controlled mechanisms, people often find alcohol use to be negatively reinforcing if they have significant social anxiety. This model fits into the self-medication hypothesis well, as individuals who then find negative reinforcement from alcohol would be more likely to engage in drinking behavior again when put in the same anxiety-provoking situation in the future. These individuals therefore have the negative reinforcement loop posited in the self-medication hypothesis as a powerful motivator to continue and possibly increase drinking behavior over time as they confront more social threats that they wish to avoid.

While this theory does not expand to other substances or to other mood or anxiety disorders in its current form, it is not necessary to limit their discussion to only alcohol and only social anxiety. Similar patterns of increased attention to threat are present in many different anxiety and mood disorders, such as generalized anxiety disorder, posttraumatic stress disorder, and major depressive disorder (Bar-Haim et al., 2007). Because of this increased attention to threat, both the automatic and controlled processes could be activated to divert that attention and create the same negative reinforcement loop as with social anxiety. In addition, alcohol is not the only substance that could fit the same pattern. While other substances do not affect the brain and other mental faculties in

the exact same way as alcohol, they also have significant impacts on capacity for attention and concentration (McKetin &Mattick, 1998; Solowij, Michie, & Fox, 1995). Due to the plausibility of such generalizations of Bacon and Ham's (2010) theory, a more generalized model is proposed in Figure 3.

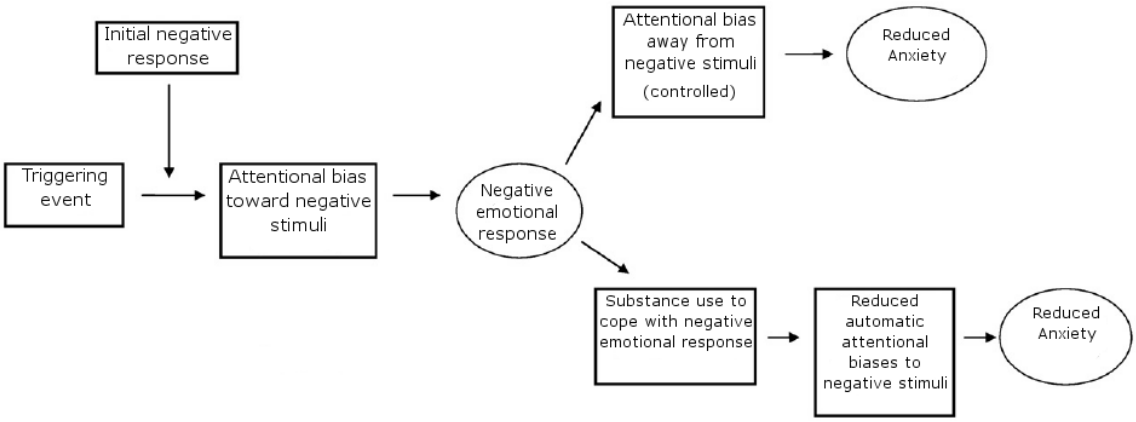

Figure 3. Generalized Avoidance-Coping Model

In this model, an event first triggers an initial negative response, such as a social threat triggering social anxiety in the original Avoidance-Coping Cognitive Model. Individuals may subsequently have an attentional bias toward that threat which leads to a negative emotional response. The individual then has both automatic and controlled responses to that negative emotion which each lead to reductions in that emotion. The controlled response involves a cognitive, behavioral, or emotional avoidance response to reduce the effect of the negative emotion. The automatic response involves substance use which leads to a reduced attentional bias and therefore reduced negative emotions.

Escape Behavior

The primary focus that both the original Avoidance-Coping Cognitive Model and the generalized version is that of diverted attention through automatic and controlled processes. While an important topic to consider empirically, attentional avoidance can be seen as a specific form of cognitive avoidance. Cognition becomes directed away from a negative stimulus and therefore the salience of that stimulus is reduced in the short term. Other types of avoidance, such as more direct emotional avoidance or complete behavioral avoidance, may not be as active in this attentional model. Complete escape behavior may be less common in an attentional model, for example. Escape behavior such as this would involve complete avoidance of negative stimuli as opposed to only mitigating the effect of the negative stimuli through decreased attention that counteracts other attentional biases. Such extensions of attentional avoidance are not meant to imply that these current theories of avoidance coping are inadequate. In fact they appear to be comprehensive in describing the phenomenon that was observed in the studies from which the original model was derived.

An important consideration to note, though, is that the studies in question were primarily anxiety studies. Because these were foremost meant to be anxiety research studies, many of them excluded individuals with a diagnosis of substance abuse or dependence even though they were studying the effects of substance use related to social anxiety or another mood or anxiety disorder (Bacon & Ham, 2010). Historically, substance use has been treated to be within normal limits or an individual is considered to have substance abuse or dependence. However, with the publication of DSM-5, the

paradigm has shifted to a more dimensional approach of diagnosis with "substance use disorder" of varying severity being the only diagnosis (American Psychiatric Association, 2013). Such a shift indicates a changing mindset toward substance use behaviors and therefore a potential decrease in the treatment of individuals with SUDs as categorically different from those without SUDs as we currently classify them. Having exclusionary criteria of the more severe cases of substance use could also mitigate some of the effects of the avoidance patterns seen for reducing discomfort. While it is not a necessary conclusion to say that more severe forms of avoidance would manifest with more severe forms of substance use, it is an important factor to consider for future research.

Proposed Model

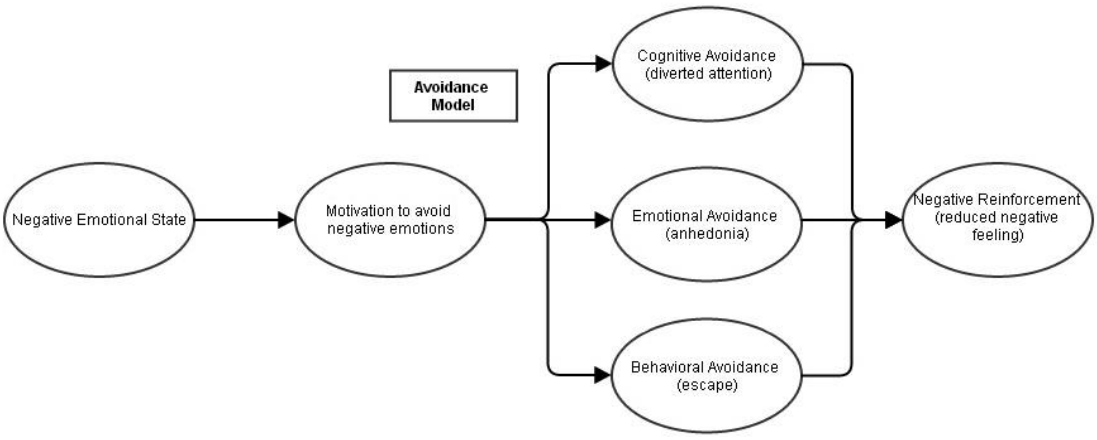

Figure 4. Proposed Avoidance Model for Present Study

The proposed model shown in Figure 4 is developed from the generalized avoidance-coping model discussed previously, in light of the many areas touched on thus far. Avoidance serves as a predisposing factor for SUDs among people with emotional dysregulation given all the theoretical background and proposed mechanisms of action.

As mentioned, a divergence from the standard self-medication hypothesis and the avoidance-coping model would be the assumption that a desire to avoid negative emotions leads to each type of avoidance. Within a population of people with problematic substance use, the substance use itself would fall most cleanly under the category of cognitive avoidance. As discussed in the Bacon and Ham (2010) model, substance use can act as a means of attentional shift and a reduction in the tendency to disproportionately focus on negative stimuli. Substance use would also have some experiential avoidance components because of the reduction in emotional sensation that accompanies the use of most substances. An important thing to note in this model is that even without the actual use of substances the mechanisms of the model would still be in place, so long as the individual in question still has emotional disturbance and a desire to avoid negative affective states. In the standard self-medication hypothesis, after an individual removes him or herself from the negative reinforcement loop of problematic substance use, he or she would be able to continue to remain abstinent from substances with relative ease, which is not typically seen in treatment outcome research. It is therefore important when testing this model to capture components of each type of avoidance in order to pinpoint whether one aspect of avoidance is driving the effect or if it is the general construct of avoidance, which is responsible.

Avoidance in SUD Treatment

One highly relevant factor to the current discussion toward avoidance is the possibility of avoidance that persists when people attempt to abstain from drugs or alcohol. People who have SUDs have developed a maladaptive behavioral pattern that

has caused them real life consequences, often very serious and long-lasting consequences such as divorce, lost employment, or incarceration. Treatment for any mental health condition often involves major restructuring of the status quo, or the way that people approach their lives. SUD treatment specifically involves people changing their lifestyle, their daily habits, and many other things that have led them to the current point in their lives, regardless of the specific treatment modality used (Witkiewitz et al., 2005). Currently the primary treatment methods used involve relapse prevention, twelve-step facilitation, and motivational enhancement.

Relapse prevention is a cognitive-behavioral therapy based on a model by Marlatt & Gordon (1985) in which the primary objective is to prevent relapse, or a return to heavy substance use after a period of reduced use, for an individual with problematic substance use (Larimer, Palmer, & Marlatt, 1999). The central tenets of this therapy are to have an individual identify situations that are high-risk and could lead to relapse and to develop healthy coping mechanisms in response to those identified high risk situations. An unwillingness to engage in therapy and open up about those high risk situations and why they might lead to relapse would likely cause an individual to not learn how to handle those situations effectively when they come up in the future (Larimer, Palmer, & Marlatt, 1999). In addition, substance use behavior is seen as a normal process of relapse prevention, and individuals are instructed to learn from "lapses" rather than allow them to become "relapses" (Larimer, Palmer, & Marlatt, 1999). Individuals who are unwilling to examine these negative experiences would then be more likely to depart from the treatment protocol and therefore return to heavy substance use behavior. Avoidance in

this treatment is not addressed specifically, although it encourages a reduction in avoidant coping through examining negative experiences. Because the treatment does not specifically address avoidance, it is possible that higher avoidant coping could be leading to a lack of long-term improvements and relapse.

Twelve-step facilitation is an approach to substance use treatment focused on getting people engaged in 12-step groups such as Alcoholics Anonymous (AA) or Narcotics Anonymous (NA; Nowinski, 2000). Effectively this treatment seeks to help individuals in their AA or NA involvement through building their acceptance of their need for abstinence and their inability to maintain abstinence through willpower alone (Nowinski, 2000). AA and NA 12-step programs use a system of peer-supported group sessions and individual peer sponsors that focus on helping people through twelve different "steps" on their road to long-term abstinence from mind-altering substances (Alcoholics Anonymous World Services, 2002). Examples of these steps include admitting powerless over alcohol (step one) and making amends with people wronged in the past by drinking behavior (step nine; Alcoholics Anonymous World Services, 2002).Many aspects of AA, NA, and twelve-step facilitation in general have the potential for different forms of avoidance to interfere with treatment progress. As with most therapies, attendance and engagement in the subjects under discussion is requisite in being able to find support from those methods. Because the peer groups are integral to AA and therefore twelve-step facilitation, engagement in those groups is also necessary. However, simple attendance at those groups has not shown to be related to better treatment outcomes; rather measures of engagement are predictors in treatment outcome

(Montgomery, Miller, & Tonigan, 1995). Individuals with higher emotional avoidance, even if they attended AA or NA meetings, would likely choose to not share their personal struggles with others or seek support from a sponsor which is necessary for recovery according to the AA model (Alcoholics Anonymous World Services, 2002). Step nine, as previously mentioned, involves making amends with those who the individual has wronged in the past, something that could lead to significant distress so that those with high avoidant coping would be unlikely to fully complete this step. Avoidance in this treatment is only addressed as part of examining behaviors or attitudes that lead to poor engagement and attendance at twelve-step meetings. Broader impact of avoidance, specifically ways that avoidant coping reduce engagement, are only talked about in vague detail without specific strategies for reducing such avoidance (Nowinski, 2000).

Motivational enhancement therapy is a treatment approach, which seeks to aid clients in developing motivation for change regarding their harmful use of drugs and alcohol (Miller, 2000). The theoretical approach involves viewing drugs and alcohol as having inherent motivating properties, which have overtaken competing desires and motivations despite consequences, related to their use. Although not done in a confrontational way, individuals are directed to examine the negative consequences of their behavior and to identify reasons and ways to change those behaviors to fit their long-term goals (Miller, 2000). If individuals are highly averse to the discomfort felt when they think about negative consequences and subsequently avoid those thoughts and feelings, they are unlikely to be able to develop healthy coping strategies in regards to those behaviors. Avoidance in this treatment approach is addressed as a way that

examining the negative parts of substance use are often ignored due to their discomfort. It encourages engaging in such uncomfortable cognitions, although the terms avoidance and avoidant coping are not typically used in this treatment modality (Miller, 2000).

Regardless of the specific type of treatment being sought or provided, individuals often have a difficult time in seeking treatment for SUDs and do not always have a positive outcome when they do engage in treatment. Attrition rates are high among people in SUD treatment (Stark & Campbell, 1988), and as mentioned previously relapse rates are high even for people who do complete their treatment regimens. A tendency to avoid negative emotional states could help account for these difficulties, especially if those who have a tendency toward avoidance are the ones who often fail to complete treatment or relapse after their treatment is complete. People who have a tendency toward those negative emotional states (i.e. individuals with higher levels of psychopathology) and are highly averse to those states would theoretically be the most likely to fail to engage in SUD treatment.

The high relapse rates seen in individuals who do successfully complete SUD treatment also fall in line with the proposed theory of underlying avoidance. In the self-medication hypothesis, individuals who develop ways to reduce or eliminate their problematic substance use would no longer be "self-medicating" their negative symptoms. Also, if people manage their negative emotionality then they no longer have that temptation to return to their problematic substance use. However, we know that many people do return to that substance use. As discussed, life in recovery from SUDs can be difficult even separate from a diagnosis of any other mental health disorder. If

these individuals, particularly those with a bias to focus on threatening stimuli as shown in the avoidance-coping model, continue to have a tendency to avoid their negative affective states then it is irrelevant in a sense whether they are "self-medicating" at that point. These individuals would be self-medicating as a means of avoidance rather than self-medicating as an end unto itself. As these individuals begin to rebuild the negative reinforcement cycle of avoidance (emotional, cognitive, behavioral), it becomes only a matter of time for many people when their relapse occurs.

Gender

Gender is an area that often arises when discussing SUD treatment as well as when discussing avoidance. SUDs are much more common among males than females, as evidence has shown in many cases, among many different types of substances (Conway et al., 2006). On the other hand, many of the other mental health disorders discussed, such as anxiety or mood disorders, are often more common among women (Conway et al., 2006). Specific evidence shows that women are more likely to engage in avoidance within a variety of different contexts (e.g. Stoyanova & Hope, 2012). If increased avoidance is related to a higher prevalence of substance use disorders, and women engage in more avoidance than men, then it seems that SUDs might have at least some reason for being more common in women, which is not the case.

Research shows that women also seem to have more protective factors than men which may offset this potential vulnerability. Women may be less likely genetically to develop SUDs, for example, and they have greater social stigma related to alcohol use

(Nolen-Hoeksema & Hilt, 2006). Women also tend to have less positive expectancy for alcohol when placed in stressful situations (Abrams & Wilson, 1979). Men who have positive expectancies of alcohol use, on the other hand, appear to have avoidant coping lead to greater amounts of alcohol use (Cooper et al., 1992). Men with psychological distress also tend to have greater amounts of negative drinking consequences than women (Geisner, Larimer, & Neighbors, 2004). Overall, men tend to have greater drinking behavior and consequences related to drinking, especially when they exhibit avoidant coping strategies, even though women tend to have more avoidant coping in general. Gender is a complicated matter that deserves much study in the context of SUD treatment. For the purposes of the present study, though, examining a male-only population of people in SUD treatment will eliminate the influence of gender and has significant implications for improving outcomes for this population. Examining only males allows for a more defined examination of the relationships between emotional variables, avoidance, and SUD treatment. The limited focus of the present study does not in any way diminish the importance of SUD treatment in females nor the importance of studying the gender effects of SUD treatment in general.

Study Context

The present study examines avoidance among men going through SUD treatment at a transitional living facility in a Midwestern city. Clients at this facility have been abstinent from substances of abuse for between three and six months before entering the treatment facility. Examining individuals in this context will help to shed light on the relationships among avoidance, emotional dysregulation, and treatment outcomes.

Avoidance is defined as exhibiting avoidant coping strategies either through self-reported avoidant coping on questionnaires or through a more ecologically valid behavioral measure of avoidant coping administered as part of the present study. Emotional dysregulation is defined as elevated scores on measures of emotional functioning given as part of the facility's screen measures, which include standardized measures of anxiety, depression, and general distress. Treatment outcomes are defined as either successful completion of treatment at the studied facility as defined by the facility and total number of days spent in treatment. Further details of these aspects of the present study are described in the methods section below. The method in the present study expands on the extant literature in significant ways, by bringing together important aspects of SUD treatment and beginning to examine specific ways that SUD treatment may be altered in the future to improve long-term SUD treatment outcomes. For example, utilizing a behavioral method of examining avoidant coping allows for examination of behavior to a greater depth than only self-report, the most common method of examining avoidant coping (e.g. Hayes et al., 1996).

Aims

The first aim of the present study was to establish that emotional dysregulation is predictive of SUD treatment outcomes such that greater emotional dysfunction is related to poorer treatment outcomes. Some research has shown this relationship does not hold true in every context (e.g. Terra et al., 2006) so determining whether this is the case in the present study would be the first step toward testing the significant of avoidance within a

dual diagnosis framework as has been shown other studies (e.g. Bradizza, Stasiewicz, & Paas, 2006).

The second aim of the present study was to show an association between an avoidant coping style and emotional dysregulation. These connections have been found in many studies (Chawla & Ostafin, 2007; Kingston, Clarke, & Remington, 2010). It is predicted that the present study will also find this relationship, such that individuals with greater emotional disturbance have a higher tendency to avoid negative affective states.

The third aim of the present study was to show that a desire to avoid negative affective states explains the relationship between emotional disturbance and poor treatment engagement. While the present study does not have any manipulation of avoidant tendencies or a control condition to examine how the avoidance task itself may be affecting outcomes, these are directions that future studies could take. For example, it seems possible that an intervention specifically targeted at reducing different types of avoidance could drastically improve SUD treatment outcomes, irrespective of co-occurring treatment for other mental health disorders. One related endeavor that has begun in its earliest stages is that of cognitive bias modification. This technique involves multiple sessions targeted at reducing negative biases toward certain stimuli (Shoenmakers et al., 2010). The bulk of this research has been done involving anxiety and mood symptoms, but some efforts have begun with cognitive biases surrounding addiction as well (Shoenmakers et al., 2010). Cognitive bias modification is not identical to avoidance in its focus on neurocognitive processes and changing cognitive patterns,

but using a similar approach with avoidance could prove to be fruitful for the treatment of SUDs.

The fourth aim of the present study was to examine possible differential effects between individuals that have different substances as their primary substances. The original avoidance-coping model by Bacon and Ham was suggested to only be explanatory for the use of alcohol, and it is possible that individuals who use different substances may have different reactions to aversive stimuli. Methamphetamine is a powerful stimulant, while alcohol is a depressant, and they lead to very different short-term biological effects as a result. This paper hypothesizes that the specific substance used will not have a significant impact on the long-term tendency to use substances as a way to avoid aversive stimuli. However, this hypothesis will be tested by examining the specific effects for individuals with different primary substances.

Being able to guide individuals' tendencies toward avoidance or tolerance of negative emotional states could be very important in treatment outcome research. As mentioned previously, higher avoidance is shown to be a risk factor for many different psychological disorders. Pinpointing the exact role that avoidance has in the development, maintenance, and overlap between disorders could cause a radical improvement in treatment approaches for co-occurring disorders, whether SUDs are involved at all or not. Treating underlying avoidance issues, even through psychoeducation or simple tasks akin to cognitive bias modification, could lead to major improvements on the fronts of many different psychological disorders.

Method

Sample

Data were collected from a men's residential substance use treatment facility in a Midwestern city. The facility acts as a transitional living treatment program for people who have significant substance abuse or dependence problems but are still able to function independently in most areas of their lives. The majority of these individuals is indigent and has recently been homeless. Individuals served at this facility have used a variety of substances, including alcohol, methamphetamine, benzodiazepines, cocaine, opiates, and marijuana being the most commonly reported. All individuals at this facility are diagnosed with substance use disorder of at least one type. The facility offers individual and group therapy for SUDs, as well as therapy for other mental health conditions. This facility offers treatment from a relapse prevention model, with components of twelve-step facilitation as well. The clients who are treated in this program are adult males who have been abstinent from substances for three to six months upon admission and have undergone primary residential substance use treatment within the last twelve months. As part this facility's normal intake procedures, many demographic and emotional variables are collected via self-report measures upon intake to the facility. Some of this information was used with informed consent as part of the current study as appropriate for investigating the current hypotheses. See Table 1 for a list of the different measures collected at the different time points.

Table 1. List of Data Collected at Different Time Points of Present Study

Admission to Facility	Active Portion of Study	Discharge from Facility
- Demographic information - Acceptance and Action Questionnaire - Multidimensional Experiential Avoidance Questionnaire - Distress Tolerance Scale - Brief Symptom Inventory - 18 - PTSD Checklist - Civilian Version - Brief Fear of Negative Evaluation Scale	- Algebra Avoidance Task - Ruminative Responses Scale - BIS/BAS Scales - COPE Inventory - Barratt Impulsiveness Scale	- Treatment completion - Days spent in treatment

Data were collected only from this facility in order to reduce any cohort effects of receiving treatment at different facilities during the time of administration. Utilizing individuals currently undergoing a transitional treatment allows for examination of engagement in treatment to a greater degree than either using individuals in a more intensive treatment program or a more independent treatment program. Individuals in a more intensive treatment often have little personal choice in the amount of treatment they receive. In the transitional program used in the current study, clients have certain expectations of treatment (attending meetings, attending individual sessions, etc.) but also have the freedom to choose whether or not to engage in that full treatment regimen. Because the treatment facility also completes diagnostic information all individuals in the program, participants in the present study already had diagnostic information collected which reduced the time burden on participants engaging in the study. Informed consent

was received from the participants indicating their willingness to allow their treatment and demographic information to be used during the present study, as well as their desire to complete the active portion of the study.

Data collection for the present study began in January 2014 and ended in October 2014. During this nine-month period, 97 clients entered the treatment facility. All individuals entering treatment at the facility were offered a chance to participate in the present study upon their intake to the treatment facility. Of those 97 clients who were treated at the facility during these months, 60 clients consented to participate in the present study. The first five participants in the study were run as pilot data to test the effectiveness of the study procedure, leaving 55 participants in the study for data analysis. See Figure 5 for graphical depiction of participant flow. At the time of the active portion of the study, participants completed informed consent both to engage in the nonclinical portion of the study and to allow their clinical outcome data to be used for research purposes. The nonclinical portion of the study included completing questionnaires and an avoidance task specific to the research hypotheses. Maximum time for this portion of the study for each participant was 45 minutes, with individuals taking 30-45 minutes depending on completion or early termination from the avoidance task. Data collection for each participant was completed after that person discharged from the treatment facility and outcome data were available. Participants were informed that their decision to participate in the study had no bearing on their status as clients in the treatment facility and that treatment providers were not involved in the research study.

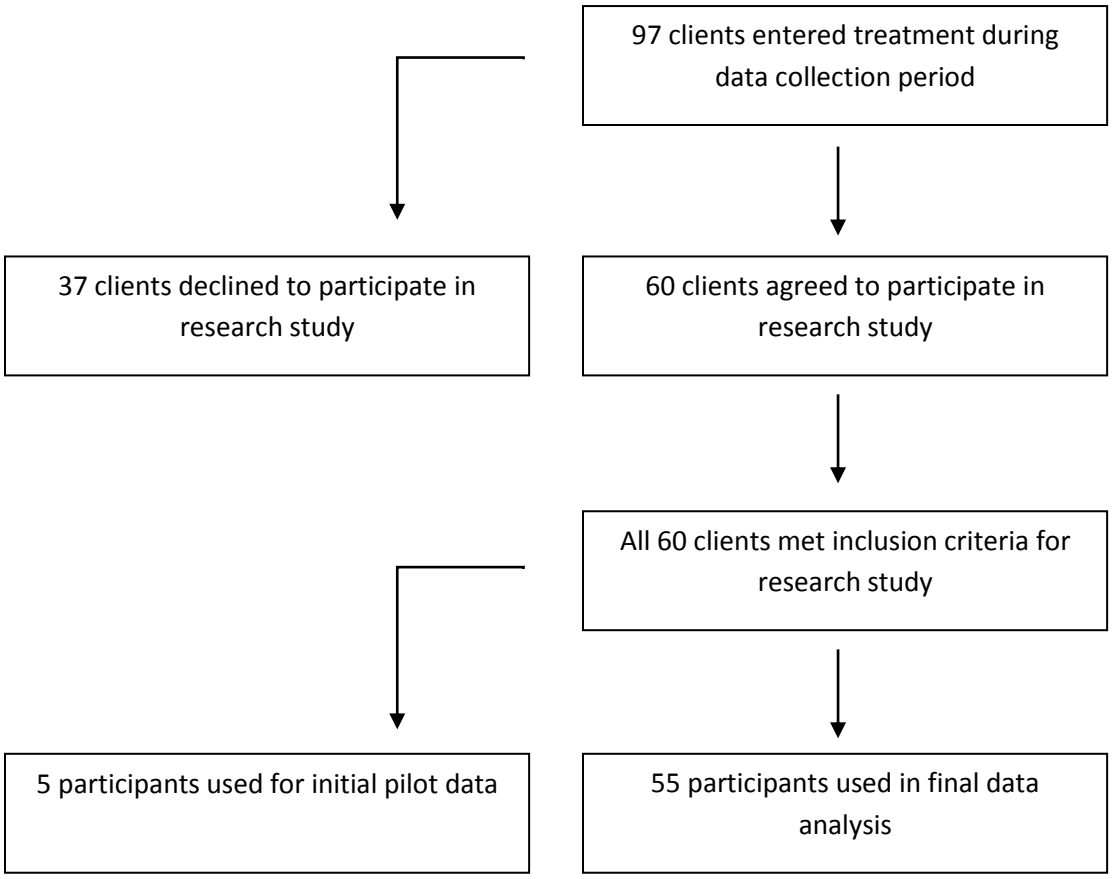

Figure 5. Flow of Participants in Present Study

The primary inclusion criterion for the present study was a current diagnosis of a substance use disorder, a condition necessarily met by all clients in the treatment facility. Years of formal education were used as an exclusionary criterion due to the academic nature of the avoidance task used in the present study. Because it was expected that an individual with reduced educational experience could experience undue difficulty with the proposed task, while high levels of education would be associated with artificially low levels of discomfort in the present study. Exclusionary criterion was expected to be less than eight years of education or a bachelor's degree or equivalent. However, no

participants who consented to research met these exclusionary criteria and therefore no individuals were excluded from analysis due to years of education. Additionally, current enrollment in school was an exclusionary criterion due to a greater familiarity with skill-based tests. No individuals who consented to research were enrolled in school at the time and therefore no individuals were excluded from analysis due to current school enrollment. Participants were paid $3 for research participation and paid an additional amount depending on task performance described below, up to a total for $12 for participation.

Avoidance Task

The primary task utilized in the present study was a series of word-based algebra problems originally developed by Smith and Kirby (2009) and also used by Carlin and Ahrens (2012). The task, the algebra avoidance task (AAT), is intended to be a distressing task composed of nine problems of increasing difficulty. The task paradigm followed was adapted from Carlin and Ahrens (2012). Individuals were given a certain amount of time to complete each question in the task, and were instructed to move on to the next question when time expired, whether or not they completed that question. Participants were also given the full allotment of time regardless of performance or early completion of the question, to maintain uniformity among participants throughout the study. In order to account for the increasing difficulty of the items, participants were given one minute to complete each of the first two questions, two minutes each to complete questions three through five, and three minutes each to complete questions six through nine. See Figure 6 for a graphical depiction of these time allotments. Total

administration time was therefore a maximum of 20 minutes. Participants were first given two untimed practice problems to orient them to the types of questions on the task. If participants correctly answered the two practice problems, they were given positive feedback before the task began. If they answered either problem incorrectly, they were given brief instruction on how to correctly complete the problem before being given the first test question. See appendix for list of questions asked as part of this task.

Participants were instructed that they could discontinue the task at any time with no penalty. If they chose to discontinue the task, they would not be given any more of the remaining problems. They were also instructed that they would be paid $1 for each question answered correctly on the task in addition to the $3 paid for participation and that there were nine questions in total. The primary measure for the task was whether or not the individual chose to discontinue the task early or completed the full 20-minute period for the nine test questions. The difficulty of the questions is such that no participants are likely to be able to complete all possible problems, as was the case with previous administrations of this task (Carlin and Ahrens, 2012), which was administered solely to college students, a population with a higher average education level than the present sample was expected to have. In this sample, no individuals completed more than six of the nine questions administered.

In addition to the primary outcome measure of early termination, other variables collected at part of this task included number of questions answered correctly, the point at which individuals terminated the task, and subjective level of discomfort before, during, and after the task was completed. Subjective discomfort was measured on a 0 to 100

scale, with participants being instructed on how to rate their discomfort using the scale as part of the instructions for the task. At the end of the task, participants were given debriefing, which described the nature and purpose of the study.

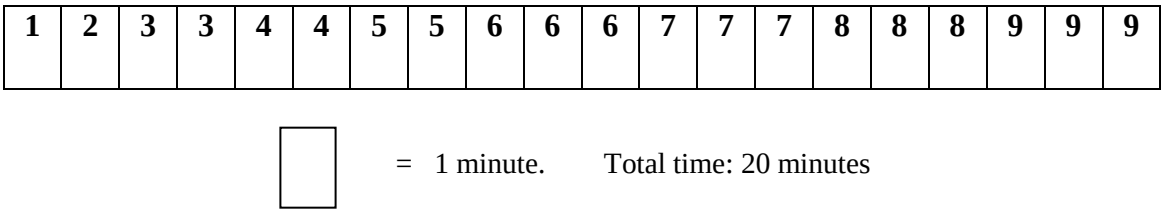

Figure 6. Breakdown of Time Allotments in Algebra Avoidance Task

Demographic Variables

Demographic variables collected included age, marital status, years of formal educations, race, drug of choice, legal status upon admission, and number of prior substance use treatment episodes. These variables were collected as part of normal clinical outcome data by the treatment facility upon discharge from the facility.

Measures

The Acceptance and Action Questionnaire (AAQ) is one self-report questionnaire administered to clients upon intake to the facility, which will be examined for the present study. The AAQ (Hayes et al., 2004) is a nine-item self-report questionnaire in which individuals respond to statements relating to experiential avoidance (e.g. “Anxiety is bad”). This questionnaire measures participant’s feelings regarding anxiety and the thoughts and feelings that they typically have or attempt to avoid when confronted with

negative feelings (Hayes et al., 2004). Participants answer how true each statement is for them on a 1-7 Likert scale with answers from “never true” to “always true”. Higher scores indicate greater experiential avoidance. Reliability on this measure has been shown to be fair, with alpha coefficient of .70 (Bond et al., 2011).

The behavioral avoidance subscale of the Multidimensional Experiential Avoidance Questionnaire (MEAQ) was also collected as a measure of avoidance. This subscale of the MEAQ (Gámez et al., 2011) is an 11-item self-report questionnaire in which individuals state the degree to which they agree to each statement on a 1-6 Likert scale with answers from “strongly disagree” to “strongly agree”. Items specifically address behavioral responses to emotional discomfort. High scores indicate higher levels of behavioral avoidance. The scale has good reliability in patient populations, with alpha coefficient of .88 (Gámez et al., 2011)

The Ruminative Responses Scale (RRS; Treynor, Gonzalez, & Nolen-Hoeksma, 2003) is a 22-item self-report questionnaire, which asks about tendencies toward brooding or self-reflection. Individuals state how often they engage in different types of ruminative behaviors on a 1-4 scale with answers from “almost never” to “almost always.” Higher scores indicate higher levels of ruminations. Scores on this scale are directly related to cognitive avoidance, such that higher levels of rumination show a lower amount of avoidance of negative thoughts. This scale has good reliability, with alpha coefficient of .90 (Treynor et al., 2003)

The BIS/BAS scales (Carver & White, 1994) were given to examine participants' general approach to positive or negative stimuli. These scales were developed in accordance with a theory that a behavioral approach system (BAS) will cause people to engage with potential rewards, while the behavioral inhibition system (BIS) is a separate system that causes people to avoid unpleasant stimuli. In this study, a person with higher BAS scores may persist in negative situations longer if he perceives a potential reward, even if the BIS scores are also high. This questionnaire is a 24-item self-report questionnaire in which participants answered on a 1-4 scale with answers ranging from "very true for me" to "very false for me." These scales have adequate reliability, with alpha coefficient of .74 (Carver & White, 1994).

The COPE inventory (Carver, Scheier, &Weintraub, 1989) is a measure of different ways that individuals cope with adverse situations. It is divided into strategies that are related to both positive and negative coping strategies. The scale is a 60-item self-report questionnaire in which participants answered on a 1-4 scale with answers ranging from "I usually don't do this at all" to "I usually do this a lot." The COPE has been shown to have adequate reliability, with alpha coefficient of .73 (Litman, 2006).

The Barratt Impulsiveness Scale (BIS-11) is a 30-item self-report questionnaire measuring several components of impulsiveness (Barratt, 1959; Patton & Stanford, 1995). The component examined most closely in the current study is perseverance, related to participants' willingness to continue in adverse circumstances. Items on this scale are answered from 1-4, with answers ranging from "rarely/never" to "almost

always/always." This scale has been shown to have adequate reliability in a substance abuse population, with alpha coefficient of .79 (Patton & Stanford, 1995).

The Brief Symptom Inventory – 18 item version (BSI-18; Derogatis 2001) is a self-report questionnaire that examines broad mental health factors. The BSI-18 is a shortened version of the Brief Symptom Inventory (Derogatis & Melisaratos, 1983), which is itself a shortened version of the SCL-90-R (Derogatis 1992). The BSI-18 has been shown to be an effective tool for screening depressive and anxiety symptoms quickly. Individuals answer each of the item items on a 5 point Likert scale, with answers of "not at all," "a little," "some," "quite a bit," and "extremely." The BSI-18 has three subscales, which are defined as somatization, anxiety, and depression, with higher scores in each subscale indicating more difficulties in that area. All subscales show high reliability, with alpha coefficients of .90 or higher in a sample of people struggling with substance abuse (Wang et al., 2010).

The PTSD Checklist – Civilian Version (PCL-C; Weathers et al., 1994) is a 17-item self-report questionnaire that asks questions specifically geared toward the diagnostic criteria of Posttraumatic Stress Disorder per the DSM-IV-TR. The PTSD Checklist was originally developed for a military population, given the high prevalence of PTSD among military personnel. The items were then adjusted to fit a civilian population, and the PCL-C has been widely used in identifying PTSD and its related effects. Items on this questionnaire are answered on a 1-5 Likert scale with answers ranging from "not at all" to "extremely" with higher scores indicating greater difficulties in that area. Reliability for this scale is good across many populations, including

individuals with substance use disorders, with alpha coefficients about .90 (Wilkins, Lang, & Norman, 2011).

The Brief Fear of Negative Evaluation Scale (BFNE; Leary, 1983) is a 12-item self-report questionnaire measuring fear of negative evaluation as part of a social anxiety construct. Higher scores indicate greater fear of being evaluated in a negative way by another person. Answers are given on a 5 point Likert scale with answers ranging from "Not at all characteristic of me" to "Extremely characteristic of me." The BFNE has shown high reliability among individuals diagnosed with social anxiety disorder, with alpha coefficient of .89 (Weeks et al., 2005).

The Distress Tolerance Scale (DTS; Simons & Gaher, 2005) is a 15-item self-report questionnaire measuring subjective ability to cope with distress and negative emotional states. Higher scores indicate greater tolerance of these negative states. Answers are given on a 5 point Likert scale with answers ranging from “strongly agree” to “strongly disagree.” The DTS has shown high reliability among cigarette smokers, with alpha coefficient of .91 (Leyro et al., 2011).

Length of stay in treatment is measured as the number of days clients stay in the treatment facility before discharge, which is measured as part of normal outcome data for the treatment facility. Whether or not an individual successfully completed treatment according to the treatment facility's standards was also coded as a yes or no variable. This information as well as days in treatment were collected as a normal part of the treatment facility's outcome monitoring. No formal treatment outcome data are collected from this

treatment facility, and no follow-up data were collected for the present study. Evidence shows that individuals who do completely SUD treatment are less likely to relapse than those who do not complete treatment (Moos & Moos, 2006). Longer treatment length is also associated with more positive treatment outcomes (Hubbard et al., 2003; Simpson et al., 1997). Therefore, in the absence of long-term follow-up data, these measures were used as ways of determining outcomes for participants in the study.

Analytic Plan

Pearson's correlations amongst the criterion variables, predictors, and potential covariates were examined. Covariates were chosen theoretically and statistically based on their potential for influencing time spent in treatment. Age and years of education were used as covariates in the present study because of their theoretical connections to levels of psychiatric comorbidity and treatment outcomes (Jorm, 2000; Ouimette, Finney, & Moos, 1999). It is expected that a relationship will be found between measures of emotional dysregulation and treatment outcomes such that high emotional dysregulation will be associated with poorer treatment outcomes. It is also hypothesized that higher levels of emotional dysregulation will be related to higher levels of avoidance.

To determine the more complex relationships among the variables of avoidance, emotional dysfunction, and treatment outcomes, hierarchical linear regression was conducted. This analysis allowed for a test of mediation among these variables, to determine whether avoidance explains the relationship seen between emotional dysregulation and poor treatment outcomes. The Baron and Kenny (1986) approach was used, which states that three things must be true to test mediation: 1) the independent

variable must be related to the mediator, 2) the independent variable must be related to the dependent variable, and 3) the mediator must be related to the dependent variable. It was hypothesized that avoidance would explain the relationship between emotional dysregulation and poor treatment outcomes. Two regression models were tested, one for each of the dependent variables of days in treatment and successful completion of treatment at the facility. Variables were entered in a stepwise linear regression model such that covariates were entered first to control for the effect they had on the predictor variables of days spent in treatment and successful completion of treatment. In a second step, self-report avoidance measures were entered. The behavioral avoidance measure of early termination of the study task was entered as a third step. The fourth and final step entered was the self-reported measures of emotional difficulties.

Results

Preliminary Analysis

See Table 2 for descriptive statistics of studied variables. Zero order correlations between target variables and demographic variables were conducted (Table 3). In addition, results of the Algebra Avoidance Task were examined to determine details regarding individuals' performance on this task and how it related to other studied variables. Figure 7 and Figure 8 show the number of correct answers that participants got on the nine questions of the task. Mean number of items correct on the task was 2.4, and the median and modal number of correct items was 2. 10.9% of participants did not get any items correct and no participants got more than 5 items correct. Notably, performance on AAT correlated with any other studied variable in the present study.

One study aim was to examine whether specific drug of choice had a significant impact on the variables of avoidant coping and treatment outcome. Based on the sample collected for the present study, comprehensive analysis of this aim was unable to be conducted. The most common drug of choice for the present study was alcohol (42.3%), followed by methamphetamine (30.8%), marijuana (13.5%), opiates (9.6%), cocaine (1.9%) and other hallucinogens (1.9%). The majority of individuals also had multiple SUDs, indicating multiple drugs of choice (84.9%). Because of these findings, independent samples t-tests were done comparing individuals who had alcohol as their primary drug compared to individuals whose primary drug of choice was not alcohol. Results showed that individuals with a primary drug of alcohol were significantly more

likely to complete the Algebra Avoidance Task (73%) than individuals with a different primary drug (37%).

Subjective units of discomfort (SUDS) was measured throughout the AAT as a manipulation check to see if individuals were experiencing subjective discomfort during the task. SUDS numbers indicated that individuals did have elevated discomfort ratings during the task. Because of the subjective nature of SUDS ratings and the lack of standardized measurement of these ratings, qualitative analysis of these numbers was done as a manipulation check. An average SUDS rating for individuals before beginning the task was 19.9. Average SUDS ratings upon discontinuation of the task was 53.4, indicating that on average people had higher ratings of their own discomfort when they chose to discontinue the task than when they began the task. Additionally, average highest SUDS ratings for each problem ranged from 18.9 for the easiest problem, to 51.9 for one of the difficult problems, which no one got correct. See Figure 8 for details on question-level performance on the AAT. It is also noted that the SUDS ratings for individuals who discontinued the task were higher than the SUDS ratings for any of the individual problems, indicating that it is likely that the individuals who chose to discontinue the task were experiencing higher subjective discomfort than individuals who chose to continue with the task. In total, 26 out of 55 people chose to discontinue the task early.

Table 2. Descriptive Statistics of Sample

	M	*SD*
Race	90.4% = White	
Years of Education	12.20	1.27
Age	36.96	10.96
Days in Treatment	106.02	87.06
Treatment Complete	*n*=25 (45%)	
AAT Discontinue	*n*=26 (47%)	
AAQ	34.57	6.62
MEAQ	33.86	12.08
DTS	3.73	0.87
SIAS	23.08	12.29
BFNE	31.49	8.28
PCL-C	26.49	10.51
BSI	9.79	11.08
BIS	75.26	11.82
RRS	45.05	14.61
COPE	76.09	10.42
BAS-BIS	14.96	3.69

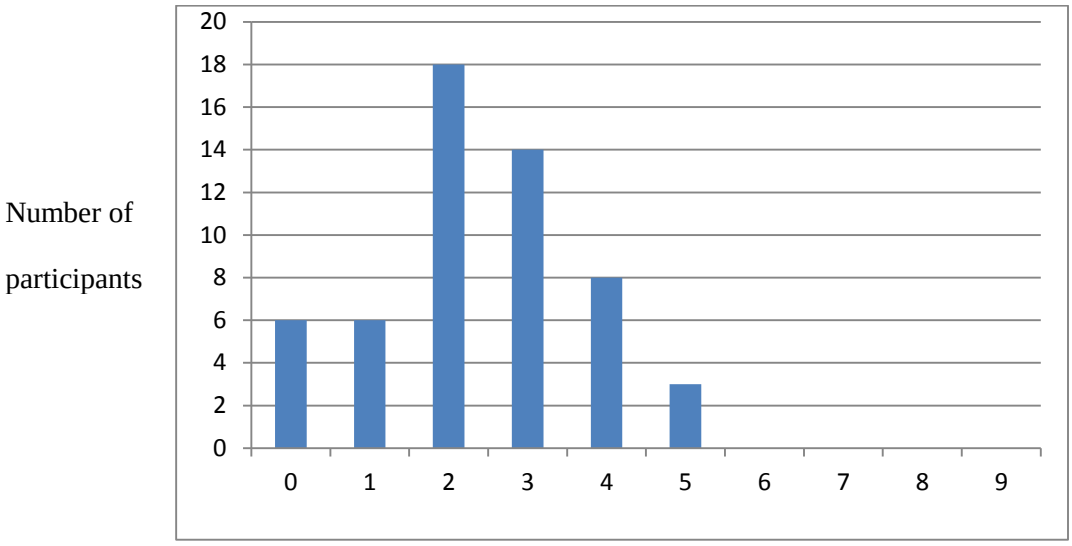

Figure 7. Participant performance on Algebra Avoidance Task

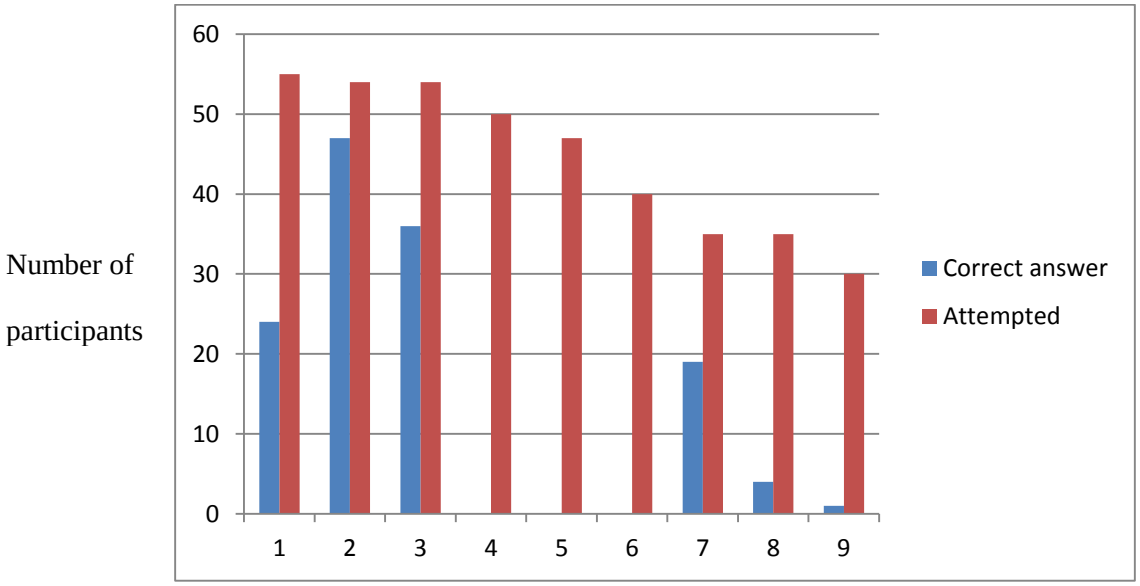

Figure 8. Algebra Avoidance Task question performance

Table 3. Zero-order Correlations of Studied Variables

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Years of Education																
2	Age	-.200															
3	Days in Treatment	-.078	.140														
4	Treatment Complete	-.045	.185	.648**													
5	AAT Discontinue	-.238	.063	-.095	-.269												
6	AAQ	-.093	.018	-.104	-.313*	.160											
7	MEAQ	-.059	.126	.075	.081	.100	.517**										
8	DTS	-.002	-.082	-.176	.024	-.084	-.383**	-.160									
9	BFNE	-.096	-.098	.058	-.109	.169	.504**	.257	-.321*								
10	SIAS	.079	-.113	.000	-.103	.081	.488**	.501**	-.468**	.694**							
11	PCL-C	.395**	.006	-.145	-.284*	.099	.292*	.369**	-.256	.259	.510**						
12	BSI	.224	.086	-.218	-.272	.061	.354*	.264	-.330*	.385**	.547**	.572**					
13	BIS	.101	-.114	.015	-.113	.117	.288	.333*	-.399**	.342*	.413**	.360*	.201				
14	RRS	.297*	-.137	.021	-.042	-.084	.243	.052	-.531**	.361**	.417**	.402**	.239	.473**			
15	COPE	.317*	-.082	.122	.214	-.228	.035	.150	-.061	.023	.082	.284*	.141	.305*	.411**		
16	BAS-BIS	.061	-.008	.032	-.016	-.100	-.288*	-.352*	.086	-.454**	-.414**	-.136	-.269	-.034	-.173	.099	

* = correlation is significant at the .05 level.

** = correlation is significant at the .01 level.

Model Construction

Hierarchical linear regression was conducted to test the hypothesized model that higher levels of avoidance are associated with both higher levels of emotional dysregulation and poorer outcomes in substance use treatment. See Figure 9 for graphical depiction of the hypothesized model. In order to test the model, demographic variables shown to have a relationship theoretically with the outcome variable were entered as the first step in a linear regression model. In the second step, avoidance measures were entered. In the final step, measures of emotional functioning were entered in the model. Avoidance was entered in the second step before emotional functioning variables because in the current theoretical model, individuals are conceptualized as having a predisposition to emotional dysregulation because of their tendency toward avoidance. Because, theoretically, avoidant coping would come before any specific emotional dysregulation, measures of avoidance were placed in the model before measures of emotional functioning. In order to obtain a more parsimonious model based on the bivariate relationships observed and the resulting collinearity in a hierarchical linear regression model, some measures of avoidance and emotional functioning were excluded from the final analyses.

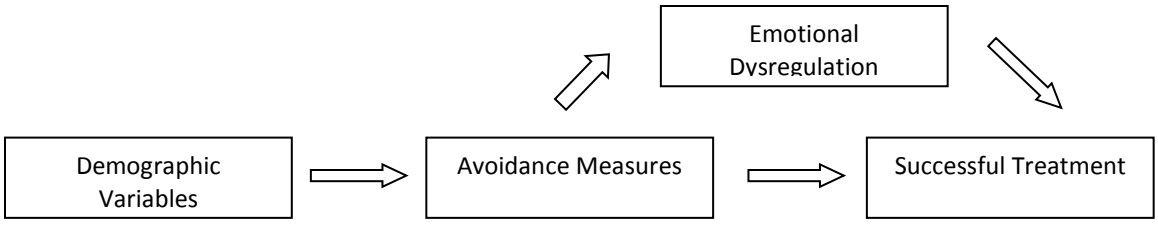

Figure 9. Mediation Model of Avoidance, Emotion Dysregulation, and Treatment Outcome

Time in Treatment

Multiple stepwise linear regression was calculated to predict number of days in treatment based on covariates, avoidance variables, and emotional dysregulation variables. Specifically, covariates included were age and years of education. Avoidance variables included were early discontinuation from the Algebra Avoidance Task (AAT) as well as scores on the Acceptance and Action Questionnaire (AAQ) and the Multidimensional Experiential Avoidance Questionnaire (MEAQ). Emotional dysregulation variables included were the PTSD Checklist - Civilian Version (PCL-C), Brief Fear of Negative Evaluation Scale (BFNE), and the Brief Symptom Inventory - 18 (BSI-18). The resulting regression model was not found to be significant ($F(8,46)=.694$, $p>.05$) with an R^2 of .128. In addition, no specific independent variables were found to be significant predictors of time in treatment. This finding is in keeping with results from the bivariate relationships examined, as no studied variables were found to have a significant correlation with number of days spent in treatment.

Successful Treatment Completion

Multiple stepwise linear regression was calculated to predict successful treatment completion based on covariates, avoidance variables, and emotional dysregulation variables. As previously with time spent in treatment, covariates included were age and years of education. Avoidance variables included were early discontinuation from the Algebra Avoidance Task (AAT) as well as scores Acceptance and Action Questionnaire (AAQ) and the Multidimensional Experiential Avoidance Questionnaire (MEAQ).

Emotional dysregulation variables included were the PTSD Checklist - Civilian Version (PCL-C), Brief Fear of Negative Evaluation Scale (BFNE), and Brief Symptom Inventory (BSI). The resulting regression model was found to be significant ($F(8,46)=2.478$, $p<.05$), predicting 34.3% of the variance in the outcome variable of successful completion of treatment ($R^2=.343$). See Table 4 for all regression coefficients. The model was not significant after the first step using only demographic variables to predict successful treatment ($F(2,46)=1.515$, $p>.05$) with $R^2=.064$. The second step of the regression model added avoidance measures, and the model was significant ($F(5,46)=2.694$, $p<.05$) with $R^2=.247$, or $\Delta R^2=.183$. The only significant predictor in the model at this step was AAQ score ($\beta=-.390$, $p<.05$), although discontinuing the AAT early was approaching significance at this step ($\beta=-.260$, $p=.07$). In the full model, the significant predictors were AAQ score ($\beta=-.430$, $p<.05$) and MEAQ score ($\beta=.355$, $p<.05$) with discontinuing the AAT early approaching significance again ($\beta=-.272$, $p=.05$). $R^2=.343$ for the full model, with $\Delta R^2=.096$. No emotional dysregulation variables were significant in the full model.

Table 4. Hierarchical Linear Regression Full Model Coefficients

Model		Standardized Beta	t	p value
1	Years of Education	-.058	-.386	.702
	Age	.234	1.564	.125
2	Years of Education	-.168	-1.167	.250
	Age	.181	1.274	.210
	Discontinue	-.259	-1.861	.070
	MEAQ	.249	1.572	.124
	AAQ	-.390	-2.436	.019
3	Years of Education	.010	.062	.951
	Age	.229	1.625	.112
	AAT Discontinue	-.272	-1.986	.054
	MEAQ	.355	2.131	.040
	AAQ	-.430	-2.506	.017
	BFNE	.239	1.450	.155
	PCL-C	-.257	-1.442	.157
	BSI	-.175	-1.049	.301

Dependent Variable: Treatment Complete

Moderation Analysis

Although not originally hypothesized, post hoc moderation analysis was conducted based on initial results of the mediation analysis conducted using the Baron and Kenny (1986) approach. Their approach indicates that moderation should be used when an inconsistent or unexpected relationship is shown between a predictor and criterion variable, which was the case in the present study (Baron & Kenny, 1986). Direct effects indicated that avoidance measures were related to both treatment outcomes and emotional variables although emotional variables did not predict treatment outcomes directly. Moderation analysis was therefore conducted to test whether the effect of emotional dysregulation on treatment outcome depended on whether individuals had high avoidance. Simple effects were examined using the previous regression model with

discontinuing the AAT as a grouping variable. Covariates in the model were age and years of education. In the second step of the regression model, avoidance scores including AAQ and MEAQ were added. In the final step, emotional variables of PCL, BFNE, and BSI were added. Among individuals who completed the AAT, the resulting regression model was found to be significant ($F(7,25)=3.080$, $p<.05$), with $R^2=.545$. See Table 5 for all regression coefficients. The model was not significant after the first step using only demographic variables to predict successful treatment ($F(2,25)=2.993$, $p>.05$) with $R^2=.207$. The second step of the regression model was significant ($F(4,25)=3.287$, $p<.05$) with $R^2=.385$, or $\Delta R^2=.178$. The only significant predictor in the model at this step was age ($\beta=.414$, $p<.05$), although AAQ score was approaching significance at this step ($\beta=-.429$, $p=.05$). In the full model, the significant predictors were age ($\beta=.408$, $p<.05$) and PCL-C score ($\beta=-.426$, $p<.05$) with AAQ score approaching significance again ($\beta=-.404$, $p=.09$). For the full model, $R^2=.545$, with $\Delta R^2=.160$ from the second step.

Table 5. Hierarchical linear regression model coefficients for individuals who completed the Algebra Avoidance Task

Model		Standardized Beta	t	p value
1	Years of Education	-.058	-.386	.702
	Age	.234	1.564	.125
2	Years of Education	-.043	-.222	.826
	Age	.414	2.130	.045
	AAQ	-.429	-2.062	.052
	MEAQ	.007	.034	.973
3	Years of Education	.171	.846	.409
	Age	.408	2.245	.038
	MEAQ	.029	.144	.887
	AAQ	-.404	-1.815	.086
	BFNE	.262	1.317	.204
	PCL-C	-.426	-2.212	.040
	BSI	-.161	-.853	.405

Dependent Variable: Treatment Complete

Among individuals who discontinued the AAT early, the resulting regression model was found to be significant ($F(7,20)=2.862$, $p<.05$), with $R^2=.606$. See Table 6 for all regression coefficients. The model was not significant after the first step using only demographic variables to predict successful treatment ($F(2,20)=0.143$, $p>.05$) with $R^2=.016$. The second step of the regression model was also not significant ($F(4,20)=1.212$, $p>.05$) with $R^2=.233$, or $\Delta R^2=.217$. In the full model, the significant predictors were BSI score ($\beta=-1.338$, $p<.05$), BFNE score ($\beta=.618$, $p<.05$), and MEAQ score ($\beta=.730$, $p<.05$) with AAQ score ($\beta=-.462$, $p=.09$) and PCL-C score ($\beta=.744$, $p=.09$) approaching significance. For the full model, $R^2=.606$, with $\Delta R^2=.373$ from the second step.

Table 6. Hierarchical linear regression model coefficients for individuals who discontinued the Algebra Avoidance Task

Model		Standardized Beta	t	p value
1	Years of Education	-.058	-.386	.702
	Age	.234	1.564	.125
2	Years of Education	-.052	-.222	.827
	Age	-.097	-.409	.688
	MEAQ	.549	2.127	.049
	AAQ	-.224	-.880	.392
3	Years of Education	.219	.942	.363
	Age	-.002	-.012	.990
	MEAQ	.730	2.915	.012
	AAQ	-.462	-2.008	.066
	BFNE	.618	2.545	.024
	PCL-C	.744	1.885	.082
	BSI	-1.338	-3.283	.006

Dependent Variable: Treatment Complete

Further moderation analysis was conducted to determine whether different types of avoidance have an effect on each other's relationships with successful treatment completion. Specifically, the potential moderating effect of discontinuing the AAT early had on the relationship between AAQ scores and successful treatment completion. Moderation analysis showed that among individuals who completed the AAT, a significant relationship existed between AAQ scores and treatment completion. Higher AAQ scores were related to lower rates of treatment completion ($r=-.442$, $p<.05$). For individuals who discontinued the AAT, there was no relationship between AAQ score and rates of treatment completion ($r=-.083$, $p>.05$). It should be noted, though, that Fisher's z-test indicated that these two correlations were not significantly different for the

current sample sizes (z=1.3, *p*>.05). See Figure 10 for graphical depiction of this moderation analysis.

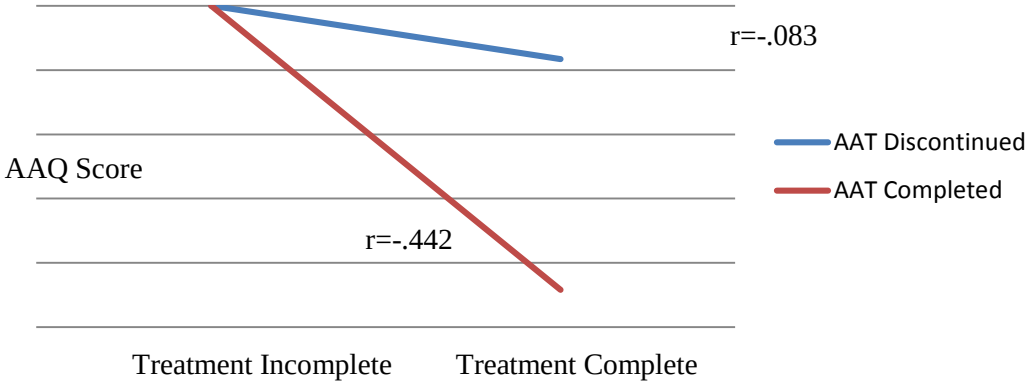

Figure 10. Depiction of AAT Completion as a Moderator between AAQ score and Treatment Completion

Power Analysis

While analyses discussed up to this point showed several significant predictors in many of the mediation and moderation analyses discussed, statistical significance was not always strong as noted by the several predictors, which were of marginal significance in the regression models. In addition, other predictors showed relatively strong effect sizes with no statistical significance. In order to better understand the statistical power of the present study, a post hoc power analysis was conducted. According to Cohen (1992), for the bivariate relationships examined a sample size of 85 would be needed in order to find a true medium-sized effect 80% of the time. For the multiple regression analyses conducted, a sample size of 102 would be needed in order to find a true medium-sized effect 80% of the time (Cohen, 1992).

Discussion

Primary Findings

This study sought to examine the relationships between avoidance, emotional dysregulation, and SUD treatment outcomes. The results were primary mixed, with some hypotheses being supported and others not being supported by the data. Specifically results did show that individuals who exhibit more avoidant coping strategies are less likely to successfully complete SUD treatment. However, the hypothesis of a mediation model was not supported by the present data because variables of emotional functioning tested in the present study were not associated with treatment outcomes. In order for avoidant coping to act as a mediator then that bivariate relationship would have needed to be present in the studied sample. Despite this lack of mediation, an interesting relationship among these studied variables was observed in the present study after they were examined as part of a moderation analysis.

Because the mediation model was not supported due to a lack of an observed direct relationship between emotional dysregulation and treatment outcomes, a moderation analysis was conducted to determine whether this relationship was present within a subset of sample. Specifically, the regression analyses were conducted among individuals who completed the AAT and those who discontinued the AAT early. Theoretically, individuals who exhibit high avoidance may have a different response to emotional dysregulation than individuals who have low avoidance with the same level of emotional dysregulation (Fledderus, Bohlmeijer, & Pieterse, 2010; Levin et al., 2012).

The overall regression model showed that no measures of emotional dysregulation were predictive of treatment outcomes. However, simple effects of this moderation analysis showed that emotional dysregulation was related to treatment outcomes, but the specific variables depended on whether individuals had high or low avoidance. For individuals with low avoidance, higher PCL-C scores predicted poorer treatment outcomes. For individuals with high avoidance, higher BFNE scores and BSI scores predicted poorer treatment outcomes. In addition, it was marginally significant that higher PCL-C scores predicted better treatment outcomes. PCL-C scores indicate distress specifically related to a past traumatic stressor and related difficulties such as hypervigilance and difficulties sleeping (Weathers et al., 1994). BFNE scores indicate levels of anxiety, particularly in social situations (Leary, 1983). BSI scores indicate general distress, particularly related to depressed mood and general anxiety symptoms (Derogatis & Melisaratos, 1983).

What these results are showing therefore is that the participants in the present study score along a continuum of emotional dysregulation, with some of those people with emotional dysregulation using more avoidant coping strategies than others. Having higher emotional dysregulation was related to poorer SUD treatment outcomes if those individuals tended to use avoidant coping, but there was no relationship if the individuals did not use avoidant coping. Such a finding is supportive of the proposed model of avoidant coping. For individuals who use avoidant coping and are experiencing significant distress as part of SUD treatment, they would be more likely to feel overwhelmed and terminate treatment unsuccessfully than those who may experience the same level of distress who have lower levels of avoidant coping. Generally utilizing

avoidant coping may not lead to treatment dropout if the individuals do not have significant emotional dysregulation. Further study is needed to determine more nuances regarding these relationships, but the current findings shed light on some of the ways that avoidant coping and emotional dysregulation together tend to lead to poor SUD treatment outcomes. While this specific relationship has not been previously examined, some research has shown avoidance acting as a moderator between emotional dysregulation and clinical outcomes, particularly in PTSD (Kashdan & Kane, 2011) and depression (Blalock & Joiner, 2000). The current findings provide new information to the field of SUD treatment but are still in line with growing theories of how avoidance may interact with psychopathology and clinical outcomes (e.g. Hayes et al., 1996).

Moderation analysis of avoidance variables themselves indicated that if an individual discontinued the AAT then there was no significant relationship between AAQ score and treatment completion. For individuals who completed the AAT, higher AAQ was related to poorer treatment completion. Such a finding indicates that while AAQ and AAT were not directly related in the present sample, they had an overlapping effect on SUD treatment outcomes. Theoretically, this finding could indicate that individuals could utilize one primary from of avoidance more than another, such as an individual tending to use cognitive avoidance rather than behavioral avoidance (Hayes et al., 2004). As discussed previously, different types of avoidance have little statistical differentiation in prior literature (Hayes et al., 1996). The current findings indicate that the lack of differentiation may be at least in part due to individuals utilizing one form of avoidance more than others, and such moderation not being previously examined in prior literature.

This finding lends support to the proposed model in the present study, that the tendency to utilize avoidant coping could go through one of a number of pathways rather than lumping all types of avoidance into one construct.

The purpose of the mediation model in the present study was to determine whether avoidance was a driving force behind both poor SUD treatment outcomes and higher emotional dysregulation. Avoidant coping styles were associated with poorer treatment completion and with greater emotional dysregulation. While some evidence exists that psychiatric comorbidity is highly relevant to SUD treatment outcomes (Bradizza, Stasiewicz, & Paas, 2006), other studies have shown these results to not always be the case (Davis, Uezato, Newell, & Frazier, 2008; Terra et al., 2006). It seems possible that in the studied treatment facility, or at least for the collected sample, emotional dysregulation is not a significant factor in determining SUD treatment outcomes.

Bivariate relationships were robust for many of the emotional functioning variables and the measures of avoidant coping, as hypothesized. In particular, the AAQ had significant relationships with BFNE, SIAS, BSI, and PCL-C. These relationships indicate that emotional dysregulation in several areas of mood and anxiety, specifically depressive symptoms, social anxiety symptoms, generalized anxiety symptoms, and anxiety symptoms related to past trauma were all associated with increased avoidant coping. Overall, the study shows that the model of avoidance being a major part of both emotional dysregulation and SUD treatment outcomes is one that warrants further study

and may prove to be an integral part of improving our understanding of these topics in the future.

The results from this study indicated this relationship with successful treatment completion but not with number of days in treatment. This result is especially noteworthy considering the high positive correlation between time in treatment and successful treatment in the present study. Both of these variables have been shown to be indicative of more positive long-term treatment outcomes (Hubbard et al., 2003; Moos & Moos, 2006; Simpson et al., 1997). However, examination of the days spent in treatment variable for this study shows a likely possibility for the null results found. The high variability found in days spent in treatment for this sample led to a high standard deviation and therefore reduced statistical power. Because of this limitation in the present sample, analysis was not reliable for days spent in treatment. While the literature shows time in treatment is a positive predictor of outcomes, the studied treatment facility has a much longer average length of stay than many other primary treatment facilities which only have one to three month treatment stays on average. Future research could therefore examine this predictor variable in another facility which has more standardized and less variable treatment length.

One major component of the present study was to expand on a conceptual model developed by Bacon and Ham (2010) that alcohol has a special relationship with anxiety, and social anxiety in particular. Based on significant overlap between alcohol research and research on motivations for using other drugs (McKetin & Mattick, 1998; Solowij,

Michie, & Fox, 1995), it fit conceptually to empirically test whether an expanded model fit with observed phenomenon. Overall, this expanded avoidance model was supported. Individuals appeared to have exhibit avoidant coping in a variety of ways, including self-report measures of cognitive avoidance and a behavioral avoidance task. This avoidant coping was associated with poorer treatment completion at the facility, indicating that regardless of the substances these people use, they are likely to engage in a behavior to reduce their discomfort when given the chance. A limitation of the study was the inability to directly compare individuals with different drugs of choice. Preliminary analyses of these variables indicated that drug of choice may have had some impact on behavioral avoidance seen in the Algebra Avoidance Task, with more avoidant coping seen in people who had a primary drug of choice other than alcohol. Most individuals at the treatment facility had several drugs of choice as well. That primary drug of choice could either influence or be influenced by a person's tendency toward avoidant coping strategies. Further study with more ability to answer these empirical questions is necessary to further our understanding of how different substances lead to different effects. Being able to directly compare whether a person's specific drug and alcohol history has any relationship with their avoidance strategies would be extremely important in being able to further understand the connections between avoidance and alcohol or drug use.

Research in psychology has a tendency to rely heavily on self-report measures with a tendency to assume that scores on those measures map well onto real behaviors, beliefs, traits, levels of psychological dysfunction, and many other areas of interest.

Research shows that many self-report measures are useful in areas such as clinical outcomes or other important considerations. However, research in psychology in the past has also shown that people are not perfect reporters of what they would do in certain situations or how felt in the past given certain parameters. For example, research shows that many individuals do not accurately report their substance use behavior and that minor variations in wording of questions can greatly alter responses (Del Boca & Noll, 2002; Sudman, Bradburn, & Schwarz, 1996)

The present study utilized both self-report and behavioral measures of avoidance. An important finding of this study is that those two measures had no significant correlation with one another, despite conceptually measuring very similar constructs of avoidant coping. In particular, the AAT and MEAQ were both theoretically measuring behavioral avoidance specifically. Such discordance is not to be taken necessarily as disingenuousness from study participants, rather it can be interpreted more appropriately as an inability to accurately describe their tendencies when faced with discomfort. Individuals also tend to engage in socially desirable responding, such that they overestimate their abilities on self-report questionnaires (van de Mortel, 2008). They may have therefore underestimated their avoidant coping.

Additionally, it is possible that the two types of measures are tapping into slightly different constructs, such as the behavioral tasks focusing more on behavioral avoidance and self-report measures such as the MEAQ focusing on emotional or experiential avoidance despite asking questions related specifically to behavior. Regardless of these

distinctions, an important result to note from this study is that individuals are not always accurate reporters regarding their willingness to face a task despite the possibility of discomfort when doing that task. Additionally, both measures of avoidance had independent predictive power of emotional dysregulation as well as poor treatment outcomes. These results further show that individuals may be exhibiting different aspects of avoidant coping styles that are manifest differently through these different modalities of examination. Future research on avoidant coping should utilize appropriate behavioral measures when possible in order to account for the disparities seen between these types of measures. Such considerations are important across many disciplines of research, although in many cases behavioral correlates of self-report measures are impractical if not impossible to develop (i.e. demographic questions, measure of depression).

One approach used in the present study was to compare measures of distress tolerance and avoidance given the relative lack of unity in the literature despite the large conceptual overlap between these two approaches (Schloss & Haaga, 2011). While not the primary area of investigation, data from this study supported past research indicated the lack of a robust relationship between distress tolerance measures and avoidant coping measures (Schloss & Haaga, 2011). This finding does lend support for continued investigation of distress tolerance and avoidance as separate, albeit sister, disciplines. This area of study warrants future consideration, to determine conceptually what aspects these constructs are tapping into, and what components are similar or different. Some research shows that approach and avoidance mechanisms are not perfectly correlated such that someone with strong approach tendencies does not always have weak avoidance

tendencies and vice versa, rather they exist in a two-factor structure (Elliot & Thrash, 2002). It seems plausible therefore that someone with high distress tolerance such that they are able to withstand negative situations once they are found within them may or may not have a strong tendency to avoid such situations before being placed in them. Someone else may be willing to engage in situations, which cause discomfort regularly but not be willing to maintain such discomfort for long periods of time.

While not found in the present study, an interaction between these constructs could potentially lead to even worse outcomes if a person has both poor distress tolerance and high avoidance coping. An individual with healthy coping in either distress tolerance or in coping strategies may be able to mitigate the effect of the other construct on their functioning. For example, a person with high distress tolerance may be able to engage in something distressing long enough that even though that person typically avoids such situations, he may be able to accomplish his goals in the few times he does engage in them. A person with low distress tolerance and low avoidance may be willing to try something many times and therefore gain its benefits even though each attempt is held to a very short amount of time. Such a line of research would involve many studies and direct comparisons of tasks measuring distress tolerance versus avoidance coping. However, an extensive line of study in this area could prove fruitful in understanding not only the relationships they have with SUDs and other mental health disorders but also general coping mechanisms that people utilize and how to improve such mechanisms. As we begin to understand these general coping mechanisms to a greater depth, applications to areas such as mental health treatment will likely follow over time.

Based on the present findings, it appears that individuals who have low avoidance-coping and have higher distress related to past traumatic events tend to be less likely to successfully complete SUD treatment. Interestingly, individuals who have higher avoidance may actually have better treatment outcomes if they recognize the difficulties they experience as a result of any past traumatic experiences they may have. One possible explanation for this finding is that individuals in the present study are not receiving adequate treatment for the distress related to past traumatic events, such that individuals who do attempt to experience the distress from their traumatic history outside of a supportive treatment environment may lead to treatment attrition as the distress of these traumatic memories is too much for them to handle when going through SUD treatment. The research literature on this topic does not directly speak to these possibilities; such counterintuitive findings reflect a need for better understanding of the role of avoidance and treatment of PTSD and co-occurring disorders in general.

Implications for Treatment

An area of high relevance for the present study and its treatment implications is that of posttraumatic stress disorder (PTSD) treatment. One major component of a PTSD diagnosis is that of avoidance, specifically avoidance of past traumatic memories, reminders of those memories, and other uncomfortable situations (American Psychiatric Association, 2013). Emotional and experiential avoidance are strong in avoiding memories and behavioral avoidance is strong in staying away from situations that cause significant discomfort. Some individuals will try to stay awake as much as possible

because they have such strong fear of the nightmares that they believe they will have whenever they fall asleep (American Psychiatric Association, 2013). Much research on PTSD has shown that such avoidance is a strong factor in the maintenance of PTSD symptoms.

Two of the psychotherapies with the strongest evidence base in their effectiveness are cognitive processing therapy (CPT) and prolonged exposure therapy (PE). In CPT, individuals are encouraged to mentally challenge deeply-held beliefs about how past traumatic events have affected their lives (Resick, Monson, & Chard, 2007). An important part of this therapy is for therapists to be able to identify avoidant behaviors such as homework noncompliance and discuss those tendencies for avoidance, trying to get clients to be willing to engage with topics that cause significant discomfort (Resick et al., 2007). In a more direct way, PE involves having clients "face their fears" by identifying a hierarchy of feared situations and helping individuals to reduce their avoidance of those situations in a structured way (Foa, Hembree, &Rothbaum, 2007). The treatment also has sessions in which the client is asked to recall in detail his or her most significant trauma. Theoretically, this treatment appears to work as individuals become habituated to feared stimuli through such reduction in avoidance and have global reduction in PTSD symptoms over time (Foa & Kozak, 1986).

With avoidance itself being a part of the diagnosis for PTSD, confronting that propensity for avoidance logically is a necessary component for PTSD treatment and research shows that it is a highly effective way of reducing PTSD symptoms (Resick et

al., 2002). However, as conceptualized in the present study, avoidant coping seems to be a factor in the maintenance of many other mental health disorders as well as SUDs even when avoidance is not part of the actual diagnosis. If future research continues to corroborate this theoretical model, then incorporating strategies for reducing avoidant coping into SUD treatment could be a powerful addition to treatment as usual. Such ways of incorporating ways of reducing avoidance could be done in myriad ways. One low burden method of making this change would be to develop a means of providing psychoeducation on the influence of avoidance in symptom maintenance. It is possible that individuals are currently not aware of how much their avoidance of discomfort is leading to an increase in their functional impairments. A structured form of psychoeducation could be done in a brief format, even in a group format to minimize clinician and client burden.

Another method of helping clients reduce their avoidant coping could be done through a training regimen in which clients are taught simple methods of attending to avoided stimuli. Some preliminary research has been done in this area which shows that some individuals with SUDs can reduce their cognitive or experiential avoidant tendencies when instructed to attend to substance-related stimuli, called cognitive bias modification (Shoenmakers et al., 2010). A meta-analysis of cognitive bias-modification showed that it has significant, albeit modest, effect sizes in reducing anxiety symptoms but not depressive symptoms as well (Hallion & Ruscio, 2011). In this paradigm, individuals are instructed to attend to certain substance-related stimuli (e.g. a picture of a beer can) rather than avoid giving it any attention (Shoenmakers et al., 2010). Applying

this strategy into actual SUD treatment as this method becomes more sophisticated over time could utilize similar techniques, through education as previously discussed as well as methods which would teach people how to attend to uncomfortable topics for increasing lengths of time. Preliminary results of this approach shows that adding cognitive bias modification to treatment as usual for individuals going through SUD treatment, relapse rates a year later are lower than for people who did not get cognitive bias modification (Eberl et al., 2013).

In addition, many of the tasks that individuals are already asked to perform as part of SUD treatment, such as seeking a job and reconnecting with family, could be encouraged both for their own sake and also as a way to get people to be willing to do uncomfortable things in general. If individuals are aware that their engagement in discomfort is something that can be helpful regardless of the specific type of avoidance being reduced then it is possible that they will be more willing to reduce such avoidance. Such empirical questions would of course need systematic study to determine how efficacious they are in improving functional outcomes for individuals undergoing SUD treatment.

One related area of study recently gaining attention has been mindfulness. Despite being practiced in parts of the world for thousands of years with its origins coming from Buddhist meditation, mindfulness has only recently been empirically studied (Witkiewitz, Marlatt, & Walker, 2005). The main tenets of mindfulness are typically described as experiencing the present moment and improving awareness, primarily as a way of

reducing experiential avoidance (Witkiewitz et al, 2005; Hayes et al., 1996). Exercises in mindfulness will often include doing activities that are usually done without thought, such as breathing, and focusing all one's attention on that activity for a short time. Experiencing these feelings with heightened awareness is practiced and done without placing a value judgment on these feelings, either positively or negatively. The focus is on simply experiencing these feelings. As mindfulness becomes more and more practiced, the feelings that can be experienced fully include physical feelings, emotions, and thoughts (Penberthy et al., 2013).

One part of mindfulness is therefore to decrease avoidance of thoughts or feelings that are often labeled as negative (Witkiewitz et al., 2005). Rather than seeing feelings like anxiety or sadness as bad, experiencing them mindfully instead would reduce the negative valence of these emotions (Witkiewitz et al., 2005). As such, mindfulness is focused on reducing all forms of avoidance. Mindfulness training could become an important part of SUD and dual diagnosis treatment, as a means of reducing avoidance that is maintaining psychological dysfunction.

Some efforts have been done at investigating the effects of mindfulness-based SUD treatment, with evidence showing some success in reducing problematic substance use in a treatment called mindfulness-based relapse prevention (Bowen et al., 2009). These efforts have been done through adapting relapse prevention to use a mindfulness approach. One strength of incorporating these ways of reducing avoidance into treatments is that they can vary widely in how much focus of the treatment they can take. For

example, mindfulness-based relapse prevention uses a primarily mindfulness-based approach, while other treatments such as motivational enhancement could add some level of psychoeducation as discussed. Reducing avoidance in SUD treatment can therefore be done within almost any treatment modality and is not limited to only certain treatment strategies. Further study in this area could lead to significant improvements of SUD treatment over time.

An area of import for the application of the present study is that of attrition to treatment. Attrition rates for psychotherapy in general remain high and poorly understood (Barratt et al., 2008). Such premature treatment termination is highly problematic in allowing individuals to engage in and benefit from treatment strategies. Attrition rates for SUD treatment are especially high (Stark & Campbell, 1988). Attrition rates add expense to psychotherapy practice as well, including reduced numbers of client contact hours (Joshi, Maisami, & Coyle, 1986), longer waitlists for clients to receive treatment (Barratt et al, 2008), and reduced staff morale (Klein, Stone, Hicks, & Pritchard, 2003). While many efforts have been done to examine ways of reducing client attrition, it continues to be an area of needed improvement (Ogrodniczuk, Joyce, & Piper, 2005). One factor that will need future research related to the present study is whether targeted efforts at reducing avoidance will reduce attrition to treatment. One possible hypothesis would be that individuals who have an early focus in their treatment on avoidance reduction strategies will be less likely to terminate treatment early. As with PTSD treatment a focus on avoidant tendencies and their effects on outcomes in SUD treatment could lead to higher treatment retention and therefore improved long-term treatment outcomes.

Limitations and Future Directions

One assumption in the current research was that the task designed for this study would lead to changes in behavior based on the rewards for completing the task as opposed to the discomfort felt during the task. The goal was get individuals to be able to make a decision as to whether the short term discomfort was worth the long term goal. However, one aspect of this study not investigated directly was whether or not these individuals actually saw the outcome of the study as a significant reward that was worth going through discomfort. The level of reward due to monetary limitations for the present study and due to a desire to limit undue influence on study participants was relatively low. A simple comparison is that the majority of individuals after completing the study had about the same amount of money as if they would have been working at a minimum wage job for the same amount of time. Such a reward may have been imperfect in creating a strong desire to complete the task despite its inherent discomfort. As discussed, an application of the current study is to translate an individual's tendency to avoid short term discomfort despite the presence of long term rewards following that short term discomfort.

However, if it is true that individuals in the present study did not view the outcome of the study as a strong enough motivator, then the direct application of the results of the present study are not as strong as hypothesized. Even more concerning is that some individuals may have seen the amount of money offered as a significant reward while others may have seen it is a small reward, leading to varying levels of reward

which were not directly measured as part of the present study. Including questions about how strong the desire for the reward was may have alleviated some of these concerns in the present study.

Future research efforts on this topic could utilize a similar research protocol with differing levels of reward, such as either a larger base payment for participating in the study or larger payments for each correct question. Increasing the rewards in this way would allow hypotheses of whether the level of reward at the end of short term discomfort has a significant impact on a person's willingness to engage in that activity. Implications for such research could allow for alterations in SUD treatment to help individuals contextualize their treatment efforts at attempting to improve the most important parts of their lives such as their roles as parents or spouses rather than merely improving smaller things such as fulfilling legal requirements.

These investigations would be important for determining the ways that individuals make decisions regarding short term and long term costs and benefits. One of the major factors in SUD treatment in general is the interplay between these factors. In motivational interviewing, one of the treatment strategies used for SUD treatment, clients are asked to specifically identify the costs and benefits of their alcohol or drug use (Miller, 2000). One of the primary outcomes of this strategy is that people realize it is difficult to stop their use because of the short term benefits of use even though there are more long term benefits of abstinence or reduced use. Helping encourage people to focus on those long term benefits is one of the strategies of this treatment technique. Further outcome studies

on the impact of the avoidance piece of those short term costs is important and could lead to improved outcomes over time as the field of SUD treatment understands the decision making processes involved in people's decisions to use or abstain from substance use.

The study of gender and substance use disorders is something that has gained significant attention over the past several years (Brady & Randall, 1999). Research shows that women do not enter treatment as often as men, although their treatment outcomes are the same as men overall (Greenfield et al., 2007). Women do tend to have certain relevant factors such as being the primary caretaker of children that are more salient and predictive of outcomes than for men, however (Greenfield et al., 2007). In addition, gender roles have an influence in providing protective factors for women from developing substance use disorders, such as having a nurturing personality (Nolen-Hoeksema, 2004). Based on these differences in the development, maintenance, and treatment of SUDs in women, assuming equivalence of the impact that avoidance has in the clinical picture for women seems irresponsible. The present study used a male-only treatment facility for in order to have a more focused sample and also because male-only treatment facilities are common in SUD treatment. However, as the gender gap in the prevalence of SUDs continues to shrink, future research efforts focusing on women will be increasingly important (Keyes, Grant, & Hasin, 2008). The study of SUD treatment and how avoidance reduction can play a role in improving treatment outcomes deserves future consideration in subsequent studies.

The current study was unable to examine specifically effects of other areas of diversity as well, such as racial diversity or sexual orientation. Regarding racial diversity, over 90% of the sample collected identified as white, with three participants (5.8%) identifying as Native American, one participant (1.9%) identifying as black, and one participant (1.9%) identifying as Pacific Islander. While the collected sample demographics are close to being representative of the population of the state in which the sample was collected (Nebraska Department of Health and Human Services, 2009), future research using a more racially diverse population would be important to determine if results from the current study are generalizable to other settings.

Conducting research in an active treatment facility allows for easy translation into ways of practically improving treatment. Participants in the present study were real individuals going through SUD treatment and the present study had little impact on their daily routines or treatment plans. Such low demand on participants as well as using people for the research who were already in treatment shows that the relationships seen between studied variables are applicable in the real world and can be interpreted as to what they might mean for future treatment strategies. The few exclusion criteria used in this study also reflect the desire to have high external validity, as individuals who present for SUD treatment are often complex and have multiple comorbid SUDs, mental health disorders, legal problems, and many other concerns (Currie et al., 2005; Grant, 2005; Swendson & Merikangas, 2000). The purpose of the present study was therefore to try and examine some of the underlying factors that are related to many of these concerns,

and therefore excluding individuals with certain diagnoses or certain other complicating factors would have led to a poor ability to use the results meaningfully.

One cost of this study design was experimental control, which could be addressed in a more controlled research study with modified research hypotheses. The present study was not an experiment and therefore had no experimental manipulation or control group, which could have potentially been done in a different research setting. As previously discussed regarding clinical research involving SUDs, much of the experimental research excludes individuals with more severe SUDs or co-occurring mental health disorders in order to reduce potential "noise" or other variables not directly related to research hypotheses (Bacon & Ham, 2010). This increased control does allow for a cleaner pool of data from which to analyze research hypotheses, and the present study had many potential factors which could influence the results. As previously shown, efforts were made for statistical control but it remains that the individuals had relatively high severity of psychological dysfunction compared to many research studies on similar topics. The approach taken in the present study therefore can be seen as a strength and a weakness, with high external validity at the cost of internal validity.

Future efforts at studying these topics could utilize an experimental design if causal hypotheses are to be tested. For example, the hypothesis that avoidance causes both emotional dysfunction and poorer treatment outcomes would technically need an experimental design to be tested. However, this and other similar hypotheses would likely get into ethical dilemmas in which it may not be appropriate to manipulate an individual's

level of avoidance because of concerns for that person's level of care. For example, instructing a person to engage in more avoidance in an experimental design may lead to poorer outcomes, or at least that may be the hypothesis. In addition, manipulating other variables such as emotional dysfunction or SUD treatment outcomes seems especially unethical. The most feasible experimental design may be a clinical trial in which people are randomly assigned to different treatment conditions. One group could receive a standard treatment protocol while another receives additional training on reducing avoidance to negative stimuli. This design would allow for a type of manipulation of avoidance with a focus on developing ways of reducing avoidance in the future.

The present study suffered from low power for a few primary reasons. The small sample size was a consequence of the limited scope of the study, specifically only collecting data from one facility. Limiting the collection to one facility allowed for increased homogeneity and thereby reducing extraneous variance from facility-level differences. However, future research could benefit from examining those facility-level differences to determine whether any treatment aspects of a facility contribute any unique effect to the observed phenomenon. It is likely that even with disparate facilities, as long as the general client base has the same level of impairment related to SUDs and other mental health disorders that aggregate analysis across facilities would lead to a large increase in statistical power. It would be possible to collect data over a longer period from this same studied facility, but such collection would take years at the observed rate for the present study in order to achieve significantly improved power. A facility which has greater numbers of clients per year, achieved either through shorter stays or through a

larger facility, could perhaps achieve the requisite power for more reliable and sophisticated statistics. Future research could benefit from an approach utilizing such a facility if available for future study.

One factor related to the research hypothesis which was de facto impossible to study was the possibility that some people with high avoidance tendencies never presented to treatment in the first place. Particularly in a treatment setting such as the one studied, no individuals were being forced to be in treatment and also were participating in the study of their own volition. Individuals who were completely unwilling to face any discomfort related to their substance use and its consequences may have never made the decision to enter a treatment facility. Such a potential for avoidance is likely to be seen among individuals with the highest avoidant coping and lowest distress tolerance, and therefore the present study may have included a truncated sample by the nature of taking place in a treatment facility. The presence of such a possibility is extant in any clinical research, though, and should not be considered to be a complicating factor for this study in particular. The population under investigation was individuals willing to begin SUD treatment, and future research can investigate methods of improving recruitment for SUD treatment in the first place, perhaps by addressing such avoidant coping. It is possible that a large population of individuals could be helped through these methods as they may receive some treatment through these efforts when otherwise they may have received no treatment.

It is also likely that any research study would suffer from the same truncation due to the need for individuals to make the choice to engage in the study. In addition, recruitment for the present study included telling individuals briefly about the procedure which was a series of tasks that elicited discomfort purposefully, with the informed consent procedure further delineating the research design of a protocol involving facing discomfort. Many individuals may have chosen to forgo the research study even if they were in the treatment facility due to the prospect of facing extraneous discomfort. That aspect of the concern for avoidance is not likely to be a large factor in the present study, based on the high recruitment participation for this study, as discussed previously. These possibilities of avoidance of treatment and the research study are especially salient in this research because avoidance is the primary topic of study. As mentioned previously, all treatment efforts and research studies would likely have about the same level of avoidance before clinical or research efforts can even be made for these individuals.

One other potential confound with the present study was the use of a mathematics-based task in order to create discomfort. While doing difficult math problems appeared to induce discomfort in many individuals, anecdotally some individuals said during the study that they enjoyed challenging their minds and doing the problems just for an intrinsic reward from completing them. Almost any task could create some intrinsic reward for some people simply because it is a challenge and overcoming a challenge can produce positive feelings. However, the mathematics task used in the present study could especially create this confound because of past experiences that participants may have had with challenging mathematics. The only method used to try

and control for this was limiting individuals to a certain range of educational experience, with the assumption that people with very high or very low levels of education would experience the study task in a different way than individuals with relatively equivalent levels of education. Such a proxy for mathematics ability is imperfect at best, with some individuals likely having an affinity for mathematics and others having more difficulties with it during their educational experiences. Results from this study did show a trend toward individuals with greater education as being more likely to complete the entire task without discontinuing, lending credence to the notion that education level is associated with willingness to engage in this studied task. However, getting more problems correct on the task was not associated with continuing the task so there is some evidence that the level of discomfort was not related to ability to complete the problems given.

A method that future studies could adopt would be to use a different tasks, or even several tasks together to form a sort of composite level of avoidance on different tasks. Regardless of the actual task chosen, certain tasks are going to be more or less prone to causing discomfort and lead to avoidance in individuals based on their specific personalities or past experiences. The cold pressor task, a distress tolerance task in which individuals are asked to place their arm into cold water for as long as they can, is not as distressing for individuals who are used to a colder climate (e.g. Burns, Bruehl, & Caceres, 2004). In the mirror tracing task, individuals trace difficult shapes when viewing the object through a mirror, or using a computer mouse which is programmed to go the opposite direction it is moved (Strong et al., 2003). People completing this task will find likely find it to be less distressing if they are very computer literate using the

computerized version and are very comfortable with using a mouse. Overall, no one specific task is free from any bias based on an individual's past experiences, and combining several avoidance tasks into one study could help to reduce these types of confounds in future studies.

Improving and expanding ways of including avoidance reduction strategies are being developed currently and preliminary research shows some promise. Future studies have many directions that they can go to deepen our understanding of the effects that avoidance has in the development and maintenance of SUDs and other mental health disorders. SUD treatment continues to remain an important area of study because of the vast impact that SUDs have on society in terms of cost, lost productivity, and reduced quality of life (Goetzel, Hawkins, & Ozminkowski, 1999; Rehm et al., 2002; Rehm et al., 2009). Fields of study are improving their ability to look past diagnostic labels and examine underlying constructs such as avoidance and the ways that they affect such problems. The high comorbidity of SUDs with other mental health disorders is also important to understand more deeply, and approaches such as the one in the present study can inform researchers about the nature of these connections as well (American Psychiatric Association, 2013; Currie et al., 2005; Grant, 2005; Swendson & Merikangas, 2000). Areas such as substance-induced mood or anxiety disorders (Schuckit, 2006), the self-medication hypothesis (Khantzian, 1985), and the avoidance-coping cognitive model (Bacon & Ham, 2010) are continuing to be understood on a deeper level as research continues to develop in these areas. Over the next several decades, it seems likely that

addiction, mental health, and other such broad topics will experience significant improvements in their treatment as a result of such research efforts.

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Appendix A. Math Problems for the Algebra Avoidance Task

Practice 1) John bought 6 apples for 25 cents each. What was the total cost of the 6 apples (in dollars)?
Answer: 1.50

Practice 2) John cut 6 apples into quarters. He divided the pieces of apple evenly among 8 friends. How many pieces of apple did each friend get?
Answer: 3

1. Bill drove from Boston to Cleveland, a distance of 627 miles, in 11 hours. How fast did he drive (in miles per hour)?
Answer: 57

2. A man's grocery bill is $8, but the store deducts $2 from his bill for coupons. If the man gives the grocery clerk $10, how much change should he get (in dollars)?
Answer: 4

3. The members of a club decided to wash cars in order to earn money for the club. Each member of the club washed 3 cars and charged $2 per car. At the end of the day, the club had $66, which included $6 in tips. How many people were in the club?
Answer: 10

4. Tammy has $9.70 in nickels, dimes, and quarters. The number of nickels is 4 more than 3 times the number of dimes, and the number of quarters is 5 fewer than 2 times the number of nickels. How many nickels does Tammy have?
Answer: 19

5. The Elixir of Life consists of a total of 12 liters containing two solutions: Magic and Triple E. Magic is composed of three solutions: E, Double E, and Triple E in the ratio of 1:2:3, respectively. The concentration of the Elixir's secret ingredient in E is 2%; Double E contains 2.5 times as much secret ingredient as E; and Triple E contains twice as much secret ingredient as Double E. The concentration of secret ingredient in the Elixir itself is 8%. How much Triple E is contained in the Elixir (in liters)?
Answer: 8

6. Seiji invested some money and in three years earned a total of $100 less than 750% of his original investment. The first year, his earnings were $190 less than 300% of his original investment. The second year, he earned $340 more than 50% of his first year earnings. The third year, he earned $314 less than 150% of his second year earnings. How much money did Seiji originally invest (in dollars)?
Answer: 278

7. Two sisters, Alice and Beth, left their house at the same time and rode their bicycles in opposite directions along a straight road. Alice rode at 4 mph, while Beth rode at 8 mph. In how many hours will they be 36 miles apart?
Answer: 3

8. A florist has a total of 198 roses divided into bunches of a dozen or a half-dozen. There are 15 more bunches of a half-dozen than bunches of a dozen. How many bunches of a dozen are there?
Answer: 6

9. Liz is 1 year younger than 3 times her sister Amanda's age. Brother Roger is half as old as Liz will be 5 years from now. Their mother is 5 years younger than 7 times Roger's age two years ago. Their father is 2 years older than their mother. Four years from now, the sum of the three children's ages will be 14 more than one-fourth the sum of their parents' ages at that same time. How old is Liz now?
Answer: 11