ALCOHOL RELATED PROBLEMS AS A MEDIATOR OF THE ASSOCIATION BETWEEN ALCOHOL USE AND SUBSEQUENT PSYCHOSOCIAL FUNCTIONING

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ABSTRACT OF THE DISSERTATION

Alcohol related problems as a mediator of the association between alcohol use and subsequent psychosocial functioning

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Alcohol use disorder (AUD) is characterized by both physical (e.g., withdrawal symptoms) and psychosocial (e.g., alcohol use interfering with major obligations at school, work, or home) characteristics. Furthermore, it has been shown that alcohol use and alcohol related problems tend to be reciprocal, at least amongst individuals suffering AUD. More in-depth understanding of the associations among alcohol use, alcohol problems, and subsequent psychosocial functioning has important clinical as well as theoretical implications regarding post AUD intervention/treatment clinical course and intervention/treatment delivery. Given this background, secondary data analyses were conducted, using data from the outpatient arm of Project MATCH (N=952), to examine post AUD treatment initiation associations among alcohol use, alcohol related problems, and subsequent psychosocial functioning; mediation and moderated-mediation analyses were conducted to explore these relationships. In addition, analyses were conducted to examine the associations between post AUD treatment initiation drinking behavior stability and psychosocial functioning.

Study results showed that greater alcohol use post AUD treatment initiation was associated with a greater occurrence of alcohol problems, and that a greater occurrence of alcohol problems, in turn, was associated with poorer psychosocial functioning (i.e., alcohol related problems mediated the association between alcohol use and subsequent psychosocial functioning). In addition, drinker stability analyses revealed substantial stability throughout the follow-up period, while simultaneously reflecting considerable instability. With respect to drinker stability, individuals classified within abstainer or moderate drinker groups reported better psychosocial functioning than individuals classified within the heavy drinker group. Study results indicate that alcohol related problems are important determinants of psychosocial functioning and that the avoidance of frequent heavy drinking is associated with better psychosocial functioning.

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Chapter I: Introduction

Throughout history alcohol has been used for social interaction, celebration, and pain relief. Alcohol use in American society is ubiquitous and the majority of drinkers do so without experiencing any problems. Social (i.e., responsible) drinking can enhance social interactions, which in turn can influence feelings of life satisfaction and reduce the risk of both physical and psychological disorders (Baum-Baicker, 1985). For example, there has been research showing the benefits of moderate alcohol consumption (defined as up to four alcoholic drinks for men and three for women in a single day and a maximum of 14 drinks for men and seven drinks for women per week; National Institute on Alcohol Abuse and Alcoholism, 2017) on diverse health conditions such as cardiovascular disease, breast cancer, obesity, and ischemic stroke (Standridge, Zylstra, & Adams, 2004; Sacco et al., 1999).

Although alcohol consumption, particularly wine, has been shown to have positive health effects, there is considerable variation as alcohol consumption affects people differently depending on their age, gender, frequency of use, quantity of use, family history, and health status (Crum, Bucholz, Helzer, & Anthony, 1992). Results from a recent survey in the U.S. indicated that more than 140 million people, aged 12 or older, reported that they had consumed alcohol and 66 million people (47.4 percent of current alcohol users) were categorized as current heavy drinkers, which was defined as

drinking five or more drinks per occasion for males and four or more drinks per occasion for females on at least one occasion during the past month (Center for Behavioral Health Statistics and Quality (CBHSQ), 2018). A significant portion of drinkers experience problems sufficiently severe to satisfy criteria for an alcohol use disorder (AUD), which is defined as an inability to quit or control the use of alcohol in spite of experiencing alcohol related social, occupational, psychological and/or physical problems (CBHSQ, 2018).

Recent survey results indicate that 15 million people, aged 12 or older reported that they had been diagnosed with an AUD (CBHSQ, 2018). Several studies have shown that AUD often co-occurs with certain mood and anxiety disorders. In fact, alcoholics were two to three times more likely that non-alcoholics to also have an anxiety disorder. In another study, those with AUD had a more than fourfold-increased risk for a major depressive episode than those without a history of AUD. It also has been reported that people with AUD are more likely to experience traumatic events and abuse (i.e. sexual, verbal, and physical) than their counterparts without an AUD (Kranzler & Soyka, 2018).

Frequent heavy alcohol use, in particular, has been associated with increased illness and mortality (Stinson, Nephew, Dufour & Grant, 1996). In this regard, over 60 medical conditions such as liver disease (e.g., cirrhosis) and related deaths, as well as increased risk of cancers have been associated with heavier alcohol use (Rehm, Room, Graham, Monteiro, Gmel, & Sempos, 2003; Yoon & Chen, 2016). It has been estimated that 88,000 people die from alcohol-related causes annually (e.g., traffic crashes and other accidents, risky behavior, violent behavior and/or suicide and homicide; CDC, 2013). Furthermore, the cost of excessive alcohol consumption defined as heavy

drinking, under-age drinking, and drinking during pregnancy was estimated at $249 billion in the US in 2010. About 77% of this cost was attributed to heavy drinking (Sacks, Gonzales, Bouchery, Tomedi, & Brewer, 2015).

Irrespective of the fact that those who receive timely help resolving their alcohol problems outperform those who did not, only 6.7 percent of adults satisfying AUD criteria received AUD treatment during the past year (National Institute on Alcohol Abuse and Alcoholism (NIAAA), 2017). Several studies have shown that patients show significant improvement during the year following AUD treatment, although longer-term follow-up studies indicate that treatment often has little effect on long-term outcomes (Room et al., 2005).

Alcohol Use, Alcohol Related Problems, and Psychosocial Functioning

One set of conditions that define AUD is the presence of alcohol related problems. There has been considerable research addressing the association between alcohol consumption and related problems to include short- and long-term health risks, social problems, mental health problems, risky sexual behavior, violent behavior, and injuries (World Health Organization (WHO), 2014). Furthermore, the associations between alcohol use and related problems have been linked to socio-demographic characteristics such as gender, age, education, family history, and ethnicity (Muthen & Muthen, 2000).

Psychosocial functioning represents an individual's ability to fulfill daily life activities and to interact with others in a way that pleases both the individual and others, and that is satisfactory with the needs of the community (Ro & Clark, 2009). Among

AUD clinical samples, the association between alcohol consumption and psychosocial functioning is reciprocal (i.e., frequent heavy alcohol consumption leads to problems and personal problems contribute to increased alcohol consumption; Rodriguez, Lasch, Chandra, & Lee, 2001). Heavy alcohol use has been shown to contribute to increased aggression, self-disclosure, risky sexual behavior, and decreased job performance. For example, heavy drinking has been associated with violence, damaged social interaction abilities, and the misinterpretation of impulsive or provocative reactions (Collins & Schlenger, 1988; Steele & Southwick, 1985). Problem drinking also increases risk for inappropriate sexual behavior and sex offenses commonly associated with rape and spousal abuse (Collins & Schlenger, 1988).

Heavy alcohol use also has been associated with poorer work performance and has been estimated to cost US employers about $71 billion annually due to decreased productivity (Harwood, Fountain, & Livermore, 1998). Along these lines, Blum et al. (1993) reported that heavier drinkers scored lower on job performance scales, including measures of self-direction at work, conflict avoidance at work and interpersonal relations at work, and did less well on technical aspects of their jobs relative to lighter drinkers.

With respect to marital functioning, heavy alcohol consumption interferes with everyday functioning of the family and may determine the level of distress in the alcoholic marriage (Zweben, 1986; Dawson, Grant, Chou, & Stinson, 2007). In particular, being married to, or living with, a problem drinker increases the likelihood of a wide range of physical and mental health problems, which in turn may cause general relationship problems including high levels of conflict with partners and sexual

dysfunction (McCrady et al., 1998; O'Farrell et al., 1997) as well as increased probability of separation or divorce (Nace, 1982; Ramisetty-Mikler & Caetano, 2005)

Heavy alcohol use puts individuals at increased risk for poorer psychological functioning, as it directly affects the brain by altering various brain chemical and hormonal systems associated with the development of many common mental disorders (e.g., mood and anxiety disorders; Koob, 2000). Thus, it is not surprising that alcoholism is associated with a broad range of psychiatric symptoms and signs such as sadness or difficulty concentrating. In fact, such psychiatric complaints often influence people with AUD to seek help (Helzer & Przybeck, 1988), although symptoms and signs may vary in severity depending on frequency and quantity of alcohol use and the duration of drinking as well as on the individuals' psychiatric vulnerability when involved in excessive alcohol consumption (Anthenelli, 1997). During acute intoxication, smaller amounts of alcohol may engender euphoria, whereas larger amounts may be associated with more dramatic changes in mood, such as sadness, irritability, and nervousness. In addition, psychosocial stressors that commonly occur in people with AUD may indirectly influence ongoing alcohol-related psychological disorders, such as depression, tension, and anxiety (Anthenelli, 1997).

With respect to alcohol use and major depression (MD), there are three descriptions of the potential causal relationships: (1) AUD causes MD; (2) MD causes AUD (which may result from attempts at self-medication); and (3) a reciprocal causal relationship between AUD and MD, such that each disorder increases the risk of the other. Among these potential pathways, the more frequent causal pathway is the one in which AUD increases the risk of MD (Boden & Fergusson, 2011). The public health

implications of a causal link from AUD to MD suggest that a significant portion of the burden resulting from MD in the population may be attributed to the misuse of alcohol.

Although excessive alcohol use can contribute to intra- and interpersonal problems, giving up or cutting back on important or interesting activities, involvement in unsafe situations or activities, as well as psychological disorders, such impairment can also lead to increased alcohol consumption. Nevertheless, the more frequent pathway is thought to be from excessive alcohol use to alcohol related problems (Lewis, Neighbors, Geisner, Lee, Kilmer, & Atkins, 2010). To date, well-designed scientific investigations regarding potential mediator variables that explain the associations between alcohol use and psychosocial functioning have been few. Furthermore, many of the studies that have been conducted suffered methodological shortcomings related to experimental design, proper temporal sequencing, statistical power, and adequate control regarding extraneous variables.

Drinking Stability and Psychosocial Functioning

The course of drinking behavior as well as alcohol related problems among individuals with AUD is highly variable (Miller et al., 1992). Often, individuals designated as problem drinkers manifest varying periods of abstinence, nonproblem drinking, and problem drinking, as well as intermittent periods of psychological and psychosocial functioning difficulties. Further, it is not clear to what extent changes in drinking behavior are associated with changes in other areas of functioning (e.g., marital, psychological) or how these distinct domains of functioning are related temporally.

Purpose of This Dissertation

This dissertation research centers on an examination of alcohol related problems as a potential mediator of the association between alcohol use post AUD treatment initiation and subsequent psychosocial functioning. To investigate the proposed mediation hypotheses, data from the outpatient study arm of the Matching Alcohol Treatment and Client Heterogeneity Project (Project MATCH) will be used. Furthermore, to gain a more in-depth understanding of the associations between alcohol use post AUD treatment initiation and subsequent psychosocial functioning, analyses will be conducted to ascertain the potential moderation effects of the study participant's significant other attending treatment as well as the participant's age and gender on the association between alcohol use and alcohol related problems (i.e., proposed mediator variable). Specific research questions and related study hypotheses are presented below:

Research Questions and Related Hypotheses:

1. What is the relationship between alcohol use and subsequent psychosocial functioning?

    Hypothesis 1: Greater alcohol use post AUD treatment initiation will be negatively associated with subsequent psychosocial functioning (i.e., mediation model c path; see Figure 1).

2. What is the relationship between alcohol use post AUD treatment initiation and alcohol related problems?

    Hypothesis 2*:* Greater alcohol use post AUD treatment initiation will be positively associated with alcohol related problems (i.e., mediation model alpha path; see Figure 1).

3. What is the relationship between alcohol related problems and subsequent psychosocial functioning?

Hypothesis 3: Alcohol related problems will be negatively associated with subsequent psychosocial functioning (i.e., mediation model beta path; see Figure 1).

4. Do alcohol related problems explain the relationship between alcohol use post AUD treatment initiation and subsequent psychosocial functioning?

Hypothesis 4: Alcohol related problems mediate the relationship between post AUD treatment initiation alcohol use and subsequent psychosocial functioning (i.e., mediation model c' path, not reflected in the Figure 1).

5. What are the moderating effects of the participant's significant other's treatment involvement, participant's age, and participant's gender on the relationship between post AUD treatment initiation alcohol use and alcohol related problems?

Hypothesis 5A: Participant's significant other treatment participation will moderate the association between participant post AUD treatment initiation alcohol use and alcohol related problems such that participants whose significant other participated in treatment will report fewer alcohol related problems than their counterparts whose significant other did not participate in their AUD treatment (i.e., moderation effect on model alpha path; see Figure 2).

Hypothesis 5B: The participant's age at the time of AUD treatment intake will moderate the association between post AUD treatment alcohol use and related problems such that older age will be associated with more frequent alcohol related problems (i.e., moderation effect on mediation model alpha path; see Figure 2).

Hypothesis 5C: The participant's gender will moderate the association between alcohol use post AUD treatment initiation and alcohol related problems such that

being female will be associated with fewer alcohol related problems (i.e., moderation effect mediation model alpha path; see Figure 2).

6. Do changes in posttreatment initiation alcohol use affect subsequent psychosocial functioning?

Hypothesis 6: Posttreatment psychosocial functioning (i.e., months 13-15) will vary as a function of drinker group transitions during the posttreatment initiation period (i.e., drinker group classification status during months 1-6 and months 13-15) such that individuals who maintain abstinence or light to moderate drinking behavior will report better psychosocial functioning than those who continue to engage in heavy alcohol use or those who transition to heavy alcohol use.

Significance of This Dissertation

The results of this dissertation research may facilitate the development of more successful AUD interventions by identifying important variables for treatment focus (e.g., marital functioning) and significant other's treatment involvement. Little is known about the factors (i.e., mediator and moderator variables) that affect the relationship between alcohol use post AUD treatment initiation and subsequent psychosocial functioning. Therefore, this study will address several gaps in the literature related to alcohol use and its association with alcohol-related problems, and psychosocial functioning among AUD treatment seeking individuals (i.e., clinical samples). This study also may yield important AUD treatment recommendations. In this regard, the majority of AUD treatment programs, at least in the US, have sobriety as a primary focus/goal.

However, if study hypotheses are supported, broadening the treatment platform to include factors related to psychosocial functioning and spousal involvement would be beneficial.

Chapter II: Literature Review

This chapter presents a review of the extant literature on the associations among alcohol use, psychosocial functioning, alcohol related problems, and demographic variables (i.e., age, gender) and significant-other treatment involvement variables included in the proposed moderated mediation-models. Additionally, it provides the theoretical reasoning underlying study research hypotheses.

Alcohol Use and Subsequent Psychosocial Functioning

Heavy or high-risk use of alcohol can lead to impaired work performance and interpersonal functioning, and contribute to psychological burdens for those those who misuse alcohol as well as their families, friends, and coworkers, and society (Gmel, & Rehm, 2003). Nevertheless, in the United States less than 10% of heavy alcohol drinkers or individuals diagnosed AUD within a past year receive any AUD treatment (Grant, Goldstein, Saha, Chou, Jung, Zhang, ... & Hasin, 2015). Treatment helps improve an individual's chances of recovery success. Furthermore, previous research has shown that alcohol use during the first year following AUD treatment predicted longer-term functioning (Maisto, Clifford, Longabaugh, & Beattie, 2002; Maisto, Clifford, Stout, & Davis, 2006). In this regard, Maisto and colleagues has shown that a 180-day post-treatment initiation period of either sustained abstinence or moderate alcohol use (i.e., avoidance of heavy alcohol use) was associated with significantly fewer alcohol related problems compared with those who engaged in heavy alcohol use, and that improvements in alcohol use among individuals treated for AUD was associated with better functioning (Maisto, McKay, & O'Farrell, 1998).

McKay and Weiss' (2001) indicated that posttreatment factors associated with longer-term outcomes have been similar to the variables that have been shown to be related to relapse. These constructs include self-efficacy, social support (i.e., both general and abstinence specific), coping skills, and negative affect (Connors, Maisto, & Donovan, 1996; Laws, 1996).

To date, most AUD treatment outcomes research has focused on before the treatment initiation and during treatment predictors of relatively short-term functioning (i.e., less than 24 months; Humphreys et al., 1997). The results of these studies have been ranged from no relationship between predictor and outcome variables of interest to, at best, weak to moderate associations. There has been relatively little research on the relationship of behaviors occurring during or initially following an episode of alcohol treatment and later functioning. Further, it is not clear to what extent changes in drinking behavior are associated with changes in other areas of functioning (e.g., marital, occupational, psychological) or how these distinct domains of functioning are related temporally.

Alcohol use and interpersonal functioning

Among AUD clinical samples, the association between alcohol use and psychosocial functioning may be reciprocal such that frequent heavy alcohol use can lead to poorer relationship functioning, which in turn can contribute to increased alcohol consumption. Longitudinal research evaluating the temporal sequence of marital dissatisfaction and alcohol use disorders, however, is necessary to determine to what extent marital functioning is an antecedent to alcohol problems and vice versa. There is some evidence, in both community and clinical samples, that alcohol use predicts

subsequent marital dissatisfaction (Locke & Newcomb, 2003; Zweben, 1986). Alternatively, marital functioning has predicted the probability of relapse and time to relapse among individuals with AUD in treatment (Maisto et al., 1998). Furthermore, Epstein and McCrady (1998) discussed number of ways in which interpersonal relationship dissatisfaction could increase the risk of alcohol problems. Relationship issues or a partners' attempt to control their partners' alcohol consumption can be a preceding stimuli or cues to subsequent alcohol use.

Existing research demonstrates that there is a cross-sectional association between marital dissatisfaction and problematic alcohol use in both treatment-seeking and non-treatment seeking samples (Marshal, 2003). For example, in a group of couples seeking marital treatment, more than 33% of males reported significant alcohol problems, and a greater number of these couples reported that a source of conflict was caused by alcohol use (Halford & Osgarby, 1993). Furthermore, epidemiologic research study conducted in representative community samples in the United States (Whisman, 1999) and Canada (Goering, Lin, Campbell, Boyle, & Offord, 1996) has demonstrated that there is a cross-sectional association between marital dissatisfaction and problematic alcohol use.

Alcohol use and psychopathology

There is a increasing interest in the prevalence of mental illness among alcohol abusers and in the impact of psychopathology in the incidence and consequences of alcohol use disorder. AUDs are associated with many physical and psychiatric comorbidities and highly incapacitating (Hesselbrock, Meyer, & Keener, 1985; Grant et al., 2015). AUD has been associated with other substance use disorders, major depressive and bipolar I disorders, and antisocial and borderline personality disorders past 12-month

and lifetime prevalences and levels of severity. AUD was also positively associated with 12-month specific phobia, but negatively associated with past-year social anxiety disorder. Lifetime AUD was associated with persistent depression (except moderate severity), panic disorder (except mild severity), specific phobia, and generalized anxiety disorder (except moderate severity). And any severe lifetime AUD were associated with posttraumatic stress disorder (Grant et al., 2015).

A number of researchers have reported a high prevalence of mental disorders such as depression, antisocial personality disorder, and substance use disorders among those meeting diagnostic criteria for an AUD (Hesselbrock et al., 1985; Brooner, King, Kidorf, Schmidt, & Bigelow, 1997). It was reported that among a sample of alcoholics who were hospitalized, males had antisocial personality as the most prevalent additional psychopathology co-morbidity, followed by substance abuse and major depression. Among the females, major depression was the most prevalent disorder followed by phobia, substance abuse and antisocial personality (Hesselbrock et al., 1985).

A number of studies based on clinical samples have documented high incidences of comorbid mood, anxiety and substance use disorders (Swendson & Merikangas, 2000; Verheul, Kranzler, Poling, Tennen, Ball, & Rounsaville, 2000). A study by Grant et al. (2004) found that individuals with alcohol abuse or dependence had risks of mood and anxiety disorders that were 2.6 and 1.7 times higher, respectively, than those for individuals without an AUD. Furthermore, among individuals with alcohol dependence the risks for a mood or anxiety disorder was 4.1 and 2.6 times higher, respectively, compared to those without an AUD. There were also significant relationships between AUDs and major depression, dysthymia, mania, hypomania, panic disorder with and

without agoraphobia, specific and social phobia and generalized anxiety (Dawson, Grant, Stinson, & Chou, 1996).

Alcohol Use and Alcohol Related Problems

The psychosocial and physical outcomes of AUD are extensive. Heavy or high-risk consumption of alcohol has been associated with more frequent alcohol-related negative consequences. Maisto and colleagues (2007), for example, conducted secondary data analyses using Project MATCH outpatient sample data. They classified participants as "abstainers", "moderate", or "heavy" drinkers based on their self-reported drinking behavior during the first 12-months of study participation. Individuals who were classified as "abstainers" did not consume alcohol during the 12-month post-treatment initiation period. Individuals who were classified as "moderate" drinkers consumed alcohol but did not exceed five heavy drinking days (i.e., six or more drinks in a day for males and four or more drinks in a day for females) during the 12-month post-treatment initiation period. "Heavy" drinkers reported six or more heavy drinking days during the 12-month post-treatment initiation period. They found that the first-year heavy drinkers reported significantly higher frequency of alcohol-related problems than either the abstainers or moderate drinkers, who did not differ from each other at the time of the three-year follow-up point.

Furthermore, research suggests that alcohol-related consequences differ across groups of varying alcohol use involvement. Heavy drinkers (i.e., defined as consuming 5 or more drinks for males and 4 more or drinks for females within a two hour period), for example, were more likely to start drinking at an earlier age and experience significantly more negative consequences associated with drinking than non-heavy drinkers (Abar,

2012). Heavy drinkers also have reported higher scores on aggression measures as compared to low and moderate drinkers (Beseler, Tayor, Kraemer, & Leeman, 2012). It was also found that moderate and heavy drinkers did not consume significantly different amount of alcohol, although significant individual differences existed between heavy drinkers and non-heavy drinkers. Beserler et al. (2012) reported that heavy drinkers met more AUD criteria and experienced more alcohol related problems.

Alcohol induced problems have been found to differ by gender. A study investigating the reasons of alcohol use found that women were more likely to have experienced family and interpersonal difficulties, that the death of someone close and emotional distress that may be significant repercussions of alcohol abuse, while men were more likely to have experienced workplace problems among the community sample comprising problem and nonproblem drinkers. Women with drinking problems report more depression and psychiatric problems such that they are more likely to drink to relieve negative affect. Problems in interpersonal relationships can lead to frustration in interactions, to psychological distress and to a lower life satisfaction, which in turn can enhance the aforementioned negative social consequences and lead to maintained substance use, which then sustains interpersonal problems (Lemke, Schutte, Brennan, & Moos, 2008).

Heavy alcohol use can lead to devastating negative effects on the body as it can affect the brain by slowing the pace of communication between neurotransmitters, weaken the heart muscle, and lead to scarring of the liver and pancreas among other debilitating illnesses (National Institute on Alcohol Abuse and Alcoholism [NIAAA], 2010) all of which can develop other alcohol related problems.

Alcohol Related Problems and Psychosocial Functioning

There is a large and growing literature on the negative consequences of alcohol use/misuse (i.e., binge drinking, heavy drinking), spanning a number of areas of personal and psychosocial functioning. These areas include: crime, family violence, sexual risk-taking, mental health, as well as range of other outcomes (Boden & Fergusson, 2011b; Cook & Clark, 2005; Gmel & Rehm, 2003; Jane-Llopis & Matytsina, 2006; Marshal, 2003; Parker & Auerhahn, 1998; Rehm et al., 2003). In all cases, it can be suggested that alcohol misuse has both physiological and behavioral consequences that lead to increased risks in many areas of personal functioning.

While the risks of alcohol use are well-documented, less attention has been given to the cumulative effects of alcohol misuse on overall levels of psychosocial functioning and general well-being in the general population.

Regarding the relationship between excessive alcohol use and marital functioning, it has been hypothesized that excessive alcohol consumption acts as a chronic stressor, and has a detrimental effect on marriage (Halford, Bouma, Kelly, & Young, 1999; O'Farrell & Rotunda, 1997). In fact, social exchange theory assumes that alcohol use bring on stress-causing family interactions, whose negative effects are reduced by subsequent alcohol use, thereby acting as a negative reinforcer. As alcohol consumption increases, then, so do alcohol related interpersonal problems such as negative family interactions, marital violence, and dissatisfaction in marriage, all of which play a role in perpetuating the dissolution process (Gottman, 1994).

Alcohol and Self-regulation Theory

A number of studies have empirically supported the relationships of self-regulation theory with alcohol use and subsequent psychosocial functioning. Vohs et al. (2008) define self-regulation as "The self-exerting control to override a prepotent response with the assumption that replacing one response with another is done to attain a goal and conform to standard" (p. 884). Both behavioral and emotional self-regulation have been effectively used as behavior predictors (Carver & Scheier, 1981). These forms of self-regulation have been associated with substance use and substance related problems (Wills, Walker, Mendoza, & Ainette, 2006).

Self-regulation can be viewed as the ability to adapt one's behavior in response to a changing environment and is achieved through the integration processes through comparison (Carver & Scheier, 1981; Miller & Brown; 1991). Furthermore, the process of self-regulation is reinforced significantly when attention is directed toward an abstract conception of self (Scheier & Carver, 1988).

Brown (1998) and Miller & Brown (1991) have extended Kanfer's (1970, 1971) work that provides a three-phase (i.e., self-monitoring, self-evaluation, and self-reinforcement) model of self-regulated behavior. According to Miller & Brown (1991), successful self-regulatory behaviors are contingent upon the processes of information input, self-evaluation, an instigation to change, a search for alternative behaviors, and planning and implementation. In brief, this model holds that information input (i.e., self-monitoring or focused attention) is essential for individuals to recognize the need for change (Bandura & Cervone, 1983). With such recognition, a self-evaluation process is initiated in which a comparative analysis is performed involving a standard of behavior

(e.g., a goal such as abstinence) and current behavior (e.g., problem drinking). This self-evaluative process must result in a discrepancy if behavior change is to be initiated. A perceived discrepancy sufficient to cause an instigation to change behavior triggers a response to search for alternatives in an attempt to reduce the discrepancy. The identification of a feasible and efficacious alternative (i.e., high self-efficacy) leads to the planning phase, in which the best course of action is decided upon and then implemented (Bandura, 1986). The process is considered cyclical and ongoing in that the individual repeatedly receives feedback (i.e., information input) and makes comparisons regarding current behaviors and a standard of behavior in order to assess his/her progress.

Empirical evidence by numerous studies supports the relevance of self-regulation theory to alcohol use. For example, Carey, Carey, Carnrike, & Meisler (1990) found a significant association ($p < .001$) between drinking status (i.e., abstainer, light/moderate drinkers and heavy drinkers) and a measure of self-control in a sample of young adults such that those individuals who were drinking heavily had lower score of self-control scores ($M = 17.0$) compared to those who were light/moderate drinkers ($M = 24.8$) who, in turn, were lower than the infrequent drinkers and abstainers drinkers ($M = 28.0$). Similarly, Brown, Miller, and Lewandowski (1999) reported the results of several studies that demonstrated the negative relationship between self-regulation and alcohol use and alcohol related problems. Nagoshi (1999) also reported that impaired ability to control alcohol consumption predicted alcohol-related problems but not consumption itself. In addition, Simons and Carey (2002) observed relationships between affect regulation and marijuana-related problems, but not with marijuana use. Taken together, this pattern of

findings suggests that self-regulation capacity may not directly influence the quantity of alcohol use, but rather the situations in which individuals choose to drink.

Someone characterized as low in self-regulatory processes or positive control systems often experiences periods of inattention, impulsivity, hyperactivity, and aggression when facing daily goal obstacles (Dawes, Tarter, & Kirisci, 1997). Failures of positive self-control have also been linked to more serious conditions, such as antisocial behavior, psychopathology, and primary alcoholism in adults (Gorenstein and Newman, 1980). Self-regulation requires attentional, effortful control and the ability to act in accordance with an internal self-directed plan without any external support or reward (Brown et al., 1999). This self-directedness is indispensable for identifying, monitoring, and modifying pertinent behaviors as circumstances change in the environment (Donovan and O'Leary, 1979). The process of positive self-regulation is filled with a feelings of control and the ability to change outcomes that have a wide range of implications.

Particularly relevant to self-regulated behavior is the construct of self-awareness (Carver, 1979; Scheier and Carver, 1988). Hull & Levy (1979) have stated that "self-awareness corresponds to the encoding of information in terms of its relevance to the self and as such directly entails a greater responsivity to the self-relevant aspects of the environment" (p. 757). Hull & Levy defined self-awareness as "a heightend sensitivity to particular forms of available information: specifically, the self-relevant contingencies associated with present activity and the self-definitional qualities of information feedback" (p. 766). Therefore, self-regulated behavior is dependent to a degree on adequate self-awareness.

Alcohol and Self-awareness

Self-awareness theory had been applied to alcohol use, both as an explanation of that use and for its relevance in treatment. Hull (1981) examined alcohol consumption in terms of his model of self-awareness as an explanation for both the causes and effects of alcohol consumption. According to this model, alcohol served to reduce self-awareness, including the self-awareness that led to the self-evaluation state. Alcohol interfered with the cognitive encoding process, thereby lessening the individual's ability to perceive information from the environment about socially inappropriate behavior that was self-relevant. In addition, it decreased the individual's ability to perform self-evaluative reflection. This decrease in self-evaluation of past and current behavior enabled the alcoholic to avoid the negative impact of the discrepancy between his behavior and social norms, or between his behaviors and his beliefs and attitudes about appropriate behavior and himself. Thus, alcohol served a purpose to the alcoholic in providing relief from the psychological distress that he would have to suffer by becoming self-aware. With increased alcohol consumption, and increased discrepant behavior, self-awareness became less desirable and more painful, tending toward an increase in alcohol use to block any opening to objective self-awareness.

Hull, Levenson, Young, & Sher, (1983) further examined the direct effects of alcohol consumption on self-awareness via three separate experiments and reported that each experiment provided support for hypotheses that alcohol consumption reduced the individual's ability to encode self-relevant information and reduced self-awareness. It was further noted that alcohol consumption eliminated differences between high-private and low-private self-conscious subjects in self-relevant recall. In their discussion of the

results, the intent was to determine the ways in which this information could be applied to alcohol treatment to lessen the negative behavior consequences of alcohol use.

Hull's (1981) model holds that alcohol decreases self-awareness by interfering with pertinent information encoding processes. Alcohol consumption is presumed to cause a reduction in self-relevant encoding processes, thereby leading to a diminished sensitivity regarding self-relevant information and contributing to decreased self-awareness. Reduction in self-awareness corresponds with decreased self-regulation. Hull argued that alcohol intoxication reduces the likelihood that the individual will engage in higher-order cognitive encoding strategies, although the model does not imply that one's ability to engage in such processes is necessarily diminished (Hull & Reilly, 1983). Thus, individuals experiencing alcohol-related problems are likely to continue to ingest alcohol in an effort to disrupt higher-order information conceding processes, thereby avoiding self-awareness regarding the negative consequences associated with their drinking behaviors (e.g., depressed mood, marital arguments, difficulties at work). When such self-awareness can no longer be avoided, changes in drinking behavior would be likely to occur. Alternatively, Hull's model predicts that reduced alcohol consumption would have just the opposite effects: there would be improved self-relevant encoding processes, heightened sensitivity regarding self-relevant information, increased self-awareness and improved self-regulation. In addition, it is recognized that individuals sometimes regulate their consumption in order to control their level of self-awareness (Hull, 1981). For example, Individuals suffering from AUDs may continue to consume alcohol in order to interrupt higher-order encoding processes and avoid self-awareness regarding their alcohol related problems and subsequent psychosocial functioning.

Study moderators

Significant-other treatment involvement

Involving the patient's spouse/partner in AUD treatment is an adjunctive therapeutic strategy that has been examined in numerous areas of problem behavior, including obsessive-compulsive disorder, agoraphobia, depression, sexual dysfunctions, and schizophrenia as well as alcoholism (Baucom, Shoham, Mueser, Daiuto, & Stickle, 1998). Baucome et al. (1998) identified three primary forms of spouse involved interventions: involving the spouse as a surrogate therapist or coach in the behavior change process, working with the couple to address disorder-specific relationship issues (e.g., enabling behavior on the part of an alcoholic's spouse), and providing general couples therapy to improve relationship function and address marital discord. A primary rationale for including spouses in alcohol treatment is to teach the spouse constructive responses to alcohol-related situations (e.g., see McCrady, Stout, Noel, Abrams, & Nelson, 1991). In practice, two or three of these approaches to involving the spouse in treatment often are used together. Alcohol-focused spouse involvement provides treatment strategies that focus on using the spouse as a coach and addressing dyadic interactions that may maintain heavy or problem drinking (McCrady et al., 1991).

Sobell, Sobell, and Leo (2000) examined the effect of two sessions of alcohol-focused spouse involvement as part of a four-session program for married, lower severity problem drinkers. During the two sessions, spouses received either educational readings that did not specifically encourage active support or readings that emphasized the active role the spouse could play in aftercare with regard to high-risk situations and dealing with relapse. During the 12 months post-treatment follow-up period, clients in both groups

reduced drinking significantly, although the two groups did not differ significantly from one another. However, there may have been the active alcohol-focused spouse support in both groups due to a ceiling effect resulting from the presence of high levels of support at baseline.

Spouse-involved therapy can remain focused on the presenting problems and the spouse's appropriate role in assisting behavior change, or it can include direct attempts at improving marital functioning through marital therapy. Behavioral couples therapy (BCT) is a well-researched and effective technique for alleviating marital distress (e.g., Hahlweg & Markman, 1988) and has been incorporated into treatments for mental health disorders, including depression (e.g., O'Leary & Beach, 1990) and alcohol and drug dependence (Fals-Stewart, Birchler, & O' Farrell, 1996). Behavioral Couples Therapy usually includes two major therapeutic components: (1) increasing positive joint activities and behavioral exchanges, and (2) enhancing communication skills. Reviews of efficacy studies with alcoholics (see O'Farrell & Fals-Stewart, 2000, 2003) have indicated that relative to individual-based treatment, a combination of alcohol-focused spouse involvement and BCT reliably produces better drinking and marital functioning outcomes. Studies have indicated also that this combination, relative to individual-based treatments, reduces domestic violence and improves the psychosocial functioning of the couple's children (Kelly & Fals-Steward, 2002). In addition, treatment retention was found to be higher when the spouse is involved and having a supportive spouse during the course of alcohol treatment has been associated with better treatment outcomes. The theoretical underpinnings of model of behavioral couples therapy (BCT) posits that the relationship between alcohol use disorders and relationship distress is reciprocal: drinking

behavior influences the quality and nature of the relationship and the relationship similarly impacts upon alcohol use. Alcohol abuse serves as a chronic stressor and has a deleterious effect on relationship functioning; at the same time continued alcohol use is negatively reinforced because it 'helps' to shield the patient from the negative effects of stressful family functioning. The primary aims of BCT is to teach the partner more effective ways to deal with alcohol related situations, to encourage the partner to reinforce sobriety and to decrease overall marital distress in both partners. Behavioral Couples Therapy for alcohol use disorders combines standard cognitive-behavioral interventions for changing drinking behavior with interventions that address disorder-specific relationship issues (e.g., enabling behaviors of the spouse) and more general behavioral marital therapy strategies directed at decreasing relationship distress. Behavioral Couples Therapy for alcohol dependence, studied as an adjunct to individuals outpatient counseling, has been shown to be effective in decreasing alcohol consumption and enhancing marital functioning. Few studies, however, have investigated BCT for alcohol dependence in a stand-alone treatment format (Vedel, Emmelkamp, & Schippers, 2008; Walitzer, & Dermen, 2004).

Age

A review of the literature regarding the relationship between alcohol use and age among clinical samples revealed alcohol use differs across the age span. Rates of binge drinking (defined as more than five drinks on one occasion) were shown to differ by age. Binge drinking has been shown to be more common among males and in individuals between the ages of 18 and 25 years, and it was found to occur most often in small group settings (Courtney & Polich, 2009). Binge drinking, among college students has led to

individuals engaging in more risky behaviors (e.g., having unprotected sex, missing classes, regretting their actions, and physical consequences; Bonnie, 2004).

Early onset of alcohol use has been closely associated with numerous adverse short-term and long-term alcohol related consequence. Among adolescents and young adults, early onset of alcohol use has been associated with motor vehicle crashes (Millstein & Irwin, 1988), tobacco and other drug use (Schuckit & Russel, 1983), sexual intercourse, infrequent condom use and pregnancy (DiClemente, 1992), sexually transmitted diseases, violence, depression and suicide and alcohol abuse and dependence symptomatology (Grant, & Dawson, 1997; Hingson, & Zha, 2009). It is likely that the adverse consequences vary with age, with young adults being at greatest risk of most of the adverse outcomes including crime, family violence, sexual risk-taking, and mental health (Grossberg, Brown, & Fleming, 2004).

Among adults, drinking patterns differ by age. Diagnoses of abuse and dependence peak at approximately 16.8% for individuals between the ages of 18 and 25 years. Prevalence rates for AUDs decrease with age, with 6.2% of adults aged 26 years or older and only 1.3% of those over age 64 meeting criteria for abuse or dependence (SAMHSA, 2015). Many purports that this rise in problematic use during early adulthood is related to increased autonomy and fewer environmental restrictions (Chen & Kandel, 1995). Further, the decline in problematic drinking observed by the mid-20s is largely attributed to increased responsibilities due to life transitions, such as regular employment, marriage, and parenthood (Schulte, Ramo, & Brown, 2009).

With respect to the alcohol related problems, older individuals with AUDs tend to have more severe problems associated with their drinking and higher levels of alcohol

use than their younger counterparts. A study by Davis and Clifford (2016) examining whether the trajectories of alcohol-related problems vary by gender and age, older age has been associated with significantly fewer physical alcohol-related problems related to drinking. In this regard, older individuals with lower initial levels of physical alcohol-related problems reported fewer drinks per drinking day and fewer heavy drinking days (Davis and Clifford, 2016). These findings suggest that individuals who are older and have experienced fewer occurrences of physical alcohol-related problems during the treatment period, may have reduced their drinking quantities during that time and continued to drink less (i.e., fewer drinks per dinking day and fewer heavy drinking days) during that critical first year post-treatment initiation. Furthermore, older age was not associated with a slower improvement rate regarding interpersonal alcohol-related problems in relation to the percentage of abstinence days. This may suggest that older individuals who have resolved interpersonal problems within the 12 months post-treatment initiation period have maintained their success at 15-months as denoted by a greater percentage of abstinent days (Davis & Clifford, 2016).

Gender

Gender differences in alcohol use and associated problems have been the focus of much prior research. It has been consistently shown that adult males consume more alcohol and have more alcohol-related problems than females (SAMHSA, 2015). Nolen-Hoeksema and colleagues suggested that although the same risk factors may be in place vulnerabilities and exogenous risks that increase their likelihood of meeting criteria for an AUD may differ. Specifically, this study points to women's physiological sensitivity to lower doses of alcohol, greater social sanctions against drinking, and increased risk for

physical and sexual assault resulting from alcohol consumption as factors which serve to prevent female drinkers from engaging in heavier alcohol use (Nolen-Hoeksema, & Hilt, 2006; Nolen-Hoeksema, 2004).

Males use alcohol more frequently and more heavily than females such that 37.8% of males versus 21.2% of females reported heavy drinking, defined as five or more drinks in a row, in the prior two-week period (Wilsnack, Vogeltanz, Wilsnack, & Harris, 2000). In addition, Newcomb and Bentler (1988) reported that males experienced significantly more problems with alcohol than females as your adults.

Overall men are more likely to suffer from alcohol use disorders, however, relapse rates and time to relapse are similar across the genders. In a study by Ross and colleagues, alcohol dependent men reported drinking a greater absolute amount of alcohol, with earlier onset of heavy drinking than women. However, there were no gender differences with respect to the frequency of binge drinking or in indicators of tolerance (Ross, 1989; Walitzer & Dearing, 2006). In other findings, women reported more abstinent days and fewer drinks per day than men during the 3-month baseline period. However, it appears that alcohol dependent women may be heavier drinkers than their male counterparts with respect to the index of drinking to intoxication when gender and weight are taken into account (Rubin, Stout, & Longabaugh, 1996).

Another significant gender difference is family stutus. Alcohol dependent men are more frequently single or unmarried compared to alcohol-dependent women. Women are more likely than men to have a spouse/partner who drinks even more than they do. It may be that alcohol-dependent women perceived more marital or family stress and more conflicts in the family, which aggravated interpersonal problems. This could explain the

higher burden of interpersonal problems among alcohol-dependent women. Mueller, Degen, Petitjean, Wiesbeck, and Walter (2009) found that gender could account for significant differences in alcohol related problems (i.e., interpersonal problems) among AUD samples. Specifically, interpersonal problems among alcohol-dependent men differed significantly in one out of eight dimensions from controls; alcohol-dependent men perceived themselves as colder than male controls. On the other hand, women with alcohol problems reported a higher burden of being too vindictive, too socially avoidant, too self-sacrificing and too intrusive compared to the female controls (Mueller et al., 2009).

Summary

Examining the relationships between alcohol use, alcohol related problems, and each mediator/moderator variable is a critical component of understanding the association between alcohol use and subsequent psychosocial functioning. This dissertation study has important public health implications such that it can provide greater understanding regarding the relationships between alcohol use, alcohol related problems, significant other's treatment involvement, age, gender and psychosocial functioning. Such information is important for AUD treatment programs and may help to improve AUD treatment outcomes. Additionally, this study may help to identify target populations that might be at greater risk for poorer psychosocial functioning based on their alcohol use, alcohol related problems, age and gender.

Chapter III. Methods

Parent Study

This dissertation research is a secondary data analysis that uses data from Project MATCH, which, to date, is the largest psychosocial AUD treatment trial funded by the National Institute on Alcohol Abuse and Alcoholism (NIAAA). The primary goal of Project MATCH was to examine hypotheses specific to the matching of client characteristics with one of three types of AUD treatment: cognitive behavioral therapy (CBT); Twelve-step facilitation (TSF); and motivational enhancement therapy (MET; Project MATCH, 1993). Participants (n=1,726) were recruited from nine different sites across the United States and participated in one of two study arms: (1) outpatient (n = 952, recruited from outpatient treatment programs) and (2) aftercare (n = 774, recruited from inpatient or day hospital treatment programs). Study eligibility criteria included having a current diagnosis of alcohol abuse or dependence based on the Diagnostic and Statistical Manual of Mental Disorders, Third Edition, Revised (DSM-III-R; American Psychiatric Association, 1987), active drinking during the 3 month period preceding study entrance, being at least 18 years of age, and having at least a 6th grade reading level. Participants were excluded from the project MATCH if they: 1) failed to complete the baseline assessment; 2) had a substance use disorder (SUD) that was more severe than their AUD; or 3) had a severe, uncontrolled psychiatric disorder requiring medical attention (e.g., experiencing hallucinations).

After an extensive baseline assessment, eligible participants were randomized into one of the three study treatment conditions (i.e., CBT, TSF, MET). These three treatments were delivered during the first 3 months of study participation and consisted

of four sessions of MET or 12 sessions of either CBT or TSF. Follow-up assessments were conducted immediately posttreatment (3-month follow-up) and every three months thereafter for 12 months (i.e., 15-months post study intake). The current study will use data only from the outpatient arm of Project MATCH because: 1) most AUD treatment takes place in outpatient settings; 2) the overwhelming majority of research reports based on Project MATCH data, have been limited to the outpatient arm; and 3) Project MATCH study findings from both study arms were not dissimilar.

Participants

For this dissertation research, 710 of the 952 participants in the outpatient arm of Project MATCH provided requisite data. Table 1 displays the socio-demographic and baseline characteristics of the current study subsample.

The majority of study participants included in the outpatient arm of Project MATCH were male (72.3 %) and white (79.9 %) with a mean age of 38.6 years and, on average, had completed 13.4 years of education. During the 90 days prior to study enrollment they reported, on average, 34 (SD = 29.8) percent abstinence days, drinking 14 drinks (SD = 8.8) per drinking day, and 58 (SD = 30.8) percent heavy drinking days. The subsample of participants in this dissertation research does not differ significantly from the full outpatient arm study sample with respect to any baseline characteristic or socio-demographic variable measured (see table 1).

More detailed information regarding comparisons between the full outpatient Project MATCH sample and the subsample used for this dissertation research will be presented in the Data Analysis section.

Table 1. Study subsample baseline alcohol use and socio-demographic characteristics

Characteristics	Outpatient (N=952)	Subsample (N=710)
Gender, male, n (%)	688 (72.3)	524 (73.8)
Age, mean (SD)	38.60 (12.4)	38.9 (10.7)
Ethnicity, White, %	761 (79.9)	591 (83.2)
Marital, married/remarried, %	35.4	37.5
DSM4, current alcohol dependence, %	90.3	88.3
Years of Education, mean (SD)	13.4 (2.1)	13.5 (2.1)
MATCH treatment assignment, n (%)		
CBT	301 (31.6)	222 (31.3)
MET	316 (33.2)	233 (32.8)
TSF	335 (35.2)	255. (35.9)
Significant Others Treatment attendance, n (%)		
Yes	235 (24.7)	168 (23.7)
No	671 (70.5)	507 (71.4)
missing	46 (4.8)	35 (4.9)
Percentage of days abstinent, mean (SD)	34.3 (29.8)	34.0 (29.7)
No. of drinks/drinking days, mean (SD)	13.6 (8.8)	13.3 (8.1)
Percentage of heavy drinking days, mean (SD)	58.3 (30.8)	58.9 (30.8)

Measures

Alcohol consumption

Alcohol consumption in Project MATCH was assessed using the Form 90, which was developed by the Project MATCH research group (1993). The Form 90 is a structured 90-day calendar used for collecting retrospective self-report daily alcohol consumption data. It combines the Timeline Follow-Back (TLFB) for collecting continuous alcohol drinking data with average consumption grids for capturing consistent drinking patterns (Miller & Del Boca, 1994). Other behaviors of interest also can be collected using these instruments (i.e., TLFB, Form 90), such as drug use, residential status, religious participation, and days of employment or school (Miller & Del Boca,

1994). A study by Tonigan et al. (1997) found that the Form 90 yielded test-retest reliability coefficients in the *r* = .91 to .98 range and Intraclass correlations (ICC) ranged from .60 to .97 for three measures of alcohol consumption (i.e., total alcohol use, percent days abstinent, percent heavy drinking days). With respect to drinks per drinking day, the Form 90 yielded test-retest reliability coefficients in the *r* = .88 to .95 range and ICC ranged from .55 to .89. In summary, the Form 90 provided reliable estimates of alcohol consumption.

Percent days abstinent (PDA). Percent days abstinent was derived from the Form 90 instrument and was operationalized as the number of days during a given assessment period that a participant reported no alcohol consumption divided by the number of days in the observation period, multiplied by 100. PDA is a measure of drinking frequency and was one of the primary outcome measures used in Project MATCH. Due to the non-normal distribution of PDA, an arc sine transformation was applied to the PDA variable for all analyses performed as part of Project MATCH and the transformed PDA variable will be used for all analyses in this dissertation research as well.

Mean number of drinks per drinking day (DDD). Mean number of drinks per drinking day (DDD) was also derived from the Form 90 instrument and was operationalized as the total number of drinks reported during an assessment period divided by the total number of days in the assessment period that the participant reported any drinking. Drinks per dinking day (DDD) was a primary outcome variable used in Project MATCH and represents a measure of drinking intensity. To improve the distributional characteristics of the DDD measure, a square root transformation was

applied to the data. The square root transformed DDD variable will be used for all analyses in this dissertation research.

Percent heavy drinking days (PHD). Percent heavy drinking days was not included as an outcome variable for Project MATCH as it tends to be correlated with both PDA and DDD. However, a measure of heavy drinking is clinically important as it provides a measure of high-risk alcohol use (Longabaugh & Clifford, 1992). Typically, the operationalization of heavy drinking differs by gender (i.e., five or more drinks per day for males and four or more drinks per day for females). For the current study, PHD was operationalized as the number of heavy drinking days reported in an assessment period divided by the total number of days in the assessment period, multiplied by 100. In order to improve the distributional characteristics of the variable, a square root transformation was applied to this variable (see Clifford et al., 2008).

Alcohol related problems

The Drinker Inventory of Consequences (DrInC) was developed by Miller, Tonigan, and Longabaugh (1995) for Project MATCH to assess alcohol-related problems. It is a 50-item self-administered instrument and the items are categorized into five subscales of alcohol related problems – physical, intrapersonal, interpersonal, impulse control, and social responsibility (see Appendix I). The DrInC in Project MATCH was administered at the baseline assessment where participants were asked to report the occurrence of alcohol related problems during their lifetime (“ever happened”) and in the past 90 days. At each follow-up assessment participants were asked to report the frequency of alcohol-related problems during the prior 3-month period (e.g., During the past 3 months, about how often have you had a hangover after drinking). Responses are

based on a 4-point Likert type scale (0 = never/not at all to 3 = daily, almost every day/very much). Higher values on the DrInC, both total score and subscale scores, indicate a greater frequency of alcohol related problems.

Research has shown that the DrInC is a reliable and valid instrument for assessing alcohol related problems in both clinical and research settings (Miller et al., 1995; Forcehimes, Tonigan, Miller, Kenna, & Baer, 2007). A study by Miller et al. (1995) found that the DrInC yielded internal consistency reliability estimates that ranged from 0.70 to 0.80 regarding reported lifetime problems across the combined Project MATCH outpatient and inpatient sample arms (N= 1389). The internal consistency reliability of the DrInC has a Cronbach's α of 0.91, test-retest correlation (i.e., Pearson) coefficient of 0.93, and intraclass correlation (ICC) coefficient of 0.89.

Psychosocial functioning

The Psychosocial Functioning Inventory (PFI) was developed to provide a brief but comprehensive measure of the clients' self-reported functioning and well-being (Feragne et al., 1983). The PFI originally consisted of 10 primary scales (i.e., Positive Affect, Negative Affect, Life Satisfaction, Spouse Role, Parent Role, Housemate Role, Subjective Role Performance, Stressful Events, Treatment/Care/Aid, and Consumer Satisfaction) as well as two overall composite scales: Subjective Well-Being and Domestic Role Functioning. The PFI has been shown to have good internal consistency reliability (Cronbach's alpha) and to be sensitive to change. It also has been shown to have validity as a treatment outcome measure among AUD (Longabaugh, McCrady, Fink, Stout, McAuley, Doyle, …, & McNeill, 1983) and psychiatric (Feragne et al., 1983) samples. For example, internal consistency reliability estimates for the PFI primary

scales among psychiatric patients at the time of hospital admission ranged from .75 to .88, except for the Spouse and Housemate role scales (α = .40 and .17, respectively). However, when patients were administered the PFI at hospital discharge, the reliability estimates for all primary scales were considerably higher (i.e., α ranged from .66 to .96).

Due to time constraints, the PFI was modified for use in Project MATCH. More specifically, Project MATCH used only 9 of the original 81 items of the PFI, and 10 of the 11 Social Behavior Scale items (see Appendix II), which was developed and added to the PFI subsequent to its original publication. The original items used in the Project MATCH assessment battery were the 5 items of the Subjective Role Performance subscale and 4 items of the Housemate Role subscale. As part of Project MATCH's assessment protocol, the PFI was administered at the baseline, 9-month, and 15-month, (as well as the 39-month) follow-up interviews. For this dissertation research, the Social Behavior and Overall Social Performance scales will be used because the Housemate/Roommate Role subscale has low internal consistency reliability (Cronbach's α = 0.57) and contributed to substantial data loss as 323 participants reported that they did not have a housemate/roommate.

Social behavior (Socbeh). The Social Behavior scale consists of 10 items measured on a 4-point Likert type scale. Subscale items measure the relative frequency (i.e., almost daily, at least once a week, less than once a week, not at all) of potentially problematic social behaviors within the prior month. The items are summed to provide a single social-behavior score. Higher scores reflect better social behavior functioning. This variable had been used in prior studies with psychiatric (Longabaugh et al., 1983) and AUD (Cooney, Kadden, Litt, & Getter, 1991; Kadden, Cooney, Getter, & Litt, 1989)

samples, where social behavior was found to significantly improve during the pre to post treatment assessment periods. The internal consistency reliability of the social behavior scale has a Cronbach's coefficient α of 0.83.

Overall social role performance (Socper). The Overall Social Role Performance scale (originally referred to as Subjective Role Performance) is a composite scale made up of five items that were extracted from five separate role scales all of which, except the Housemate Role, were part of earlier versions of the PFI. Respondents were asked to rate the quality of their performance in various social roles (e.g., as a spouse or mate, a parent/guardian, a friend, leisure/social activities, and housemate/roommate). The response scale for four of the five items was (1) very good, (2) good, (3) fair, (4) poorly, (5) very poorly, and (8) not applicable. Responses were reverse scored so that higher scores reflect a positive subjective evaluation of a respondents' role performance. The remaining item on this scale, regarding one's evaluation of satisfaction with leisure/social activities was scored (1) very satisfied, (2) somewhat satisfied, (3) somewhat dissatisfied, (4) dissatisfied. This item was also reverse scored so that a higher score reflected greater satisfaction with leisure or social activities. The internal consistency reliability of the social behavior scale has a Cronbach's coefficient α of 0.82 and intraclass correlation (ICC) coefficient of 0.89.

Depression. The Beck Depression Inventory (BDI) was developed by Beck et al. in 1961 and was derived from the theory of negative cognitive distortions viewed as essential to depression. The 21-item questionnaire was developed from clinical observations of attitudes and symptoms occurring frequently among depressed psychiatric patients and infrequently in non-depressed psychiatric patients. The BDI

measures symptom severity on a 4-point scale ranging from 0 (symptom absent) to 3 (severe symptoms). Higher scores indicate greater symptom severity. The BDI is commonly self-administered, although initially designed to be administered by trained interviewers (Beck et al., 1961). The cut-off scores with patients diagnosed as having an affective disorder vary depending on the characteristics of sample and purpose of use: no or minimal depression < 10; mild to moderate depression 10-18; moderate to severe depression 19-29; and severe depression 30-63. High BDI total scores may represent diffuse maladaptive functioning in subclinical samples as the BDI is highly correlated with other self-report measures of psychopathology (Beck, Steer, & Carbin, 1988). The internal consistency reliability of the BDI, based on 25 studies involving psychiatric and nonpsychiatric samples, ranged from 0.76 to 0.95 (mean coefficient alpha was 0.81) among psychiatric samples and ranged from 0.73 to 0.92 (mean coefficient alpha was 0.81) among non-psychiatric samples (Beck et al., 1988).

Psychiatric status (Asipsy). The Addiction Severity Index (ASI) was developed to measure multiple problems typically seen in alcohol- and drug-dependent people seeking treatment (McLellan, Luborsky, Woody, & O'Brien, 1980; McLellan et al., 1992). The ASI is a structured, 40-minute, clinical research interview designed to assess problem severity in seven areas commonly affected among substance abusers: medical status, employment/support status, alcohol use, drug use, legal status, family-social relationships, and psychiatric status. Within each of the areas, objective questions measure the number, extent, and duration of problem symptoms in the patient's lifetime and in the past 30 days. The patient also supplies a subjective report of the recent (i.e., past 30 days) severity and the importance of each problem area. The ASI provides a more

comprehensive and effective method for analyzing the total complex of problems commonly found among the substance-abusing patients. The interview yields two sets of summary scores for each problem area; Interviewer severity ratings (ISRs) and composite scores (CSs). For this dissertation research, the area of psychiatric status is used as one measure of psychosocial functioning. The internal consistency reliability of the ASI psychiatric status scale (i.e., Cronbach's α) is 0.70 and the intraclass correlation (ICC) is 0.98 for the composite scores.

Significant other treatment involvement

This variable was assessed via a dichotomously scored item from the Therapist Contact Sheet: "Did the client's spouse/significant other attend the treatment session," where =No and 1=Yes." The Therapist Contact Sheet was completed after each treatment session by the therapist. Project MATCH permitted participants to invite their spouse/partner to attend up to two treatment sessions, although there were significant others who attended three treatment sessions with the participant (i.e., 12 of the 952 outpatient arm participants). Given that there were no significant differences between one-time attendance and two or three session attendance and participant DrInC scores, this variable was collapsed into two categories: (1) No attendance and (2) Yes, attended.

Drinker group classification

To determine drinker group stability, study participants were classified into one of three groups using the classification procedures reported by Maisto and colleagues (Maisto et al., 2006; Maisto et al., 2007). More specifically, participants initially were classified as abstainers, moderate drinkers, or heavy drinkers based on their self-reported alcohol use during study months one through six, and reclassified into one of the same

three drinker groups (i.e., abstainers, moderate drinkers, and heavy drinkers) based on their self-reported alcohol use during study months 10 through 15.

Individuals classified within the abstainers group reported no alcohol use during the self-reported alcohol use observation periods. Individuals classified within the moderate drinkers group reported drinking at least one standard drink (i.e., 5 ounces of wine, 12 ounces of beer, or 1.5 ounces of hard liquor) and fewer than 4 heavy drinking occasions (i.e., five or more standard drinks for men and four or more standard drinks for women) during the alcohol use observation periods. Individuals reporting four or more heavy drinking days, during the alcohol use observation periods, were classified within the heavy drinkers group. The decision to include some heavy drinking days in the operationalization of the moderate drinker group was based on prior research (Maisto et al., 2006, Maisto et al., 2007) showing that a few heavy drinking days during the one year period following study recruitment was not indicative of poorer psychosocial functioning.

Data Analysis Plan

Descriptive statistics

Analyses were conducted to compare select baseline and socio-demographic characteristics across the full outpatient Project MATCH sample and the subsample used in this dissertation research. For example, t-tests were conducted for continuous variables and χ^2 tests were conducted for categorical variables.

Mediation model

The simple mediation model represented in the form of a statistical diagram is presented in Figure 3.

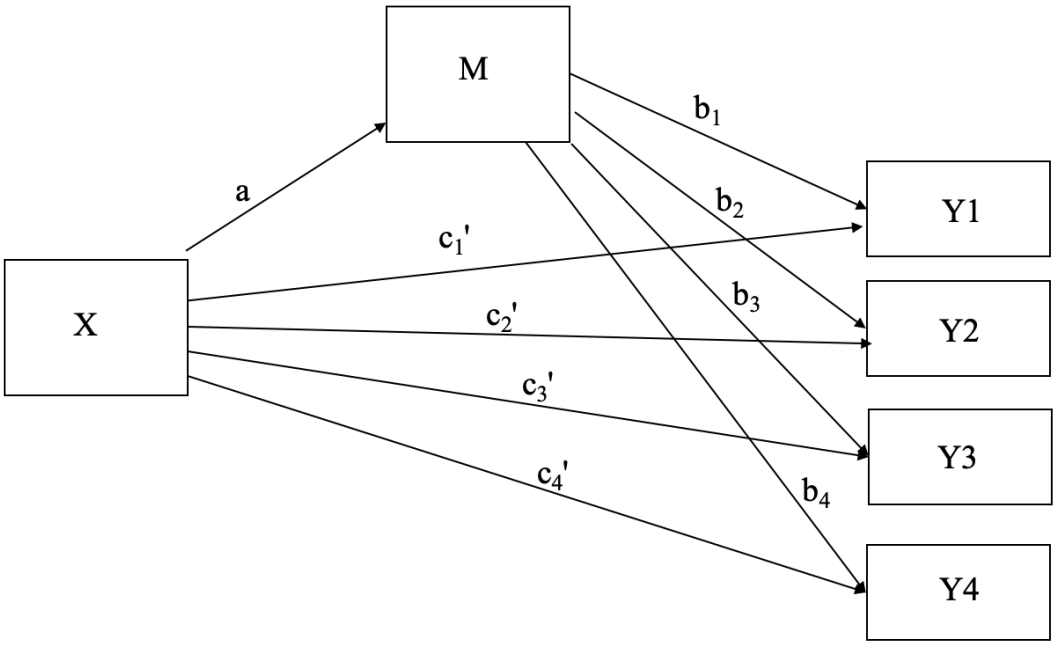

Figure 1. A simple mediation model with 4 consequent outcome variables. X: alcohol use variable (PDA, DDD, PHD), M: alcohol related problem, Y1: Socbeh, Y2: Socper, Y3: Depression, Y4: Psychiatric Status

This statistical diagram represents two equations:

$$M = i_1 + aX + e_M \quad (1.1)$$

$$Y = i_2 + (c_1' + c_2' + c_3' + c_4')\,X + (b_1 + b_2 + b_3 + b_4)\,M + e_Y \quad (1.2)$$

In equation 1.2, c' estimates the direct effect of alcohol use on psychosocial functioning. A generic interpretation of the direct effect is that two cases that differ by one unit of alcohol use but are equal on alcohol related problems are estimated to differ by c' units on psychosocial functioning.

Furthermore, it is necessary to discuss what a and b estimate. In this model, a quantifies how much two cases that differ by one unit on X are estimated to differ on M, with the sign determining whether the case higher on X is estimated to be higher (+) or lower (-) on M. Therefore, the indirect effect of X on Y through M is the product of a and b, which indicates that two cases that differ by one unit on X are estimated to differ by ab units on Y as a result of the effect of X on M which, in turn, affects Y. The indirect effect quantifies how much two cases that differ by a unit on X are estimated to differ on Y as a result of X/s influence on M, which in turn influences Y.

A simple mediation model divides the total variable association effect into its component parts (i.e., direct and indirect effects). For this dissertation research, this model will address study hypotheses 1-4, in which alcohol related problems, as measured by the DrInC at the 9-month follow-up, is expected to mediate the relationship between months 1-6 alcohol consumption and 15-month psychosocial functioning. In Figure 1, Path α represents the effect of alcohol consumption months 1-6 on alcohol related problems, and the subsequent effect of alcohol related problems on 15-month psychosocial functioning is represented by β path. Path c refers to the total effect of months 1-6 alcohol use on later psychosocial functioning without accounting for the alcohol related problems, while c' path controlling for the mediator variable 'alcohol related problems' refers to the direct effect of month 1-6 alcohol use on later psychosocial functioning (c' is not reflected in the figure 1; Hayes & Rockwood, 2017). In the regression analytic model, the direct and indirect effects perfectly partition how differences in alcohol use map onto differences in psychosocial functioning, the so-called total effect of alcohol use, denoted here as c. The total effect of alcohol use is the sum of

the direct and indirect effects, such that the indirect effect ($\alpha\beta$) is the difference between the total effect of alcohol use on psychosocial functioning (i.e., c path) and the effect of alcohol use on psychosocial functioning controlling for alcohol related problems, the direct effect (i.e., c' path).

Three mediation analyses were conducted using the Tests of Joint Significance to test the mediation effect of alcohol related problems on the association between three alcohol consumption measures (i.e., PDA, DDD, and PHD) and subsequent psychosocial functioning (Mackinnon, Taborga, & Morgan-Lopez, 2002; MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002). MacKinnon et al. (2002) discuss the Baron and Kenny (1986) causal steps approach to mediation analysis and recommend the Tests of Joint Significance because it has been shown to have greater statistical power, and a more accurate Type I error rate when compared to other methods.

The hypothesized model to be tested was presented in Figure 1. The drinking variables used for this dissertation research are highly correlated (i.e., correlations between PDA DDD, and PHD, are - 0.77, - 0.86, and 0.86, respectively, see table 2), which contributes to an increased standard error and problems associated with multicollinearity. The problem is that, as the predictor variables become more highly correlated, it becomes more and more difficult to determine which predictor variable is actually producing the effect on the outcome variable(s). The reciprocal of the tolerance is known as the Variance Inflation Factor (VIF), which indicates how much the variance of the coefficient estimate is being inflated by multicollinearity. A common rule of thumb is that VIFs of 10 or higher (or equivalently, tolerances of .10 or less) may be reason for concern. Allison (2012) advised that one should be concerned when the VIF is over 2.5

and the tolerance is under .40. The correlations among drinking variables used in this dissertation research and VIF are presented in table 2.

Table 2. Corrrelations between alcohol use variables and collinearity test

	Pearson Correlations			Collinearity statistics	
	1. PDA	2. DDD	3.PHD	VIF	Tolerance
1. PDA	1			3.82	.26
2. DDD	- .77**	1		4.07	.25
3. PHD	- .87**	.86**	1	2.45	.41

**. Correlations is significant at the 0.01 level (2-tailed).

Statistical significance of the mediation effect can be best measured by the point estimate for the product term αβ in order to assess whether the estimate is significantly different from zero. Furthermore, confidence intervals can be constructed to estimate the precision range of the mediation effect (Hayes, 2009; Hayes & Scharkow, 2013).

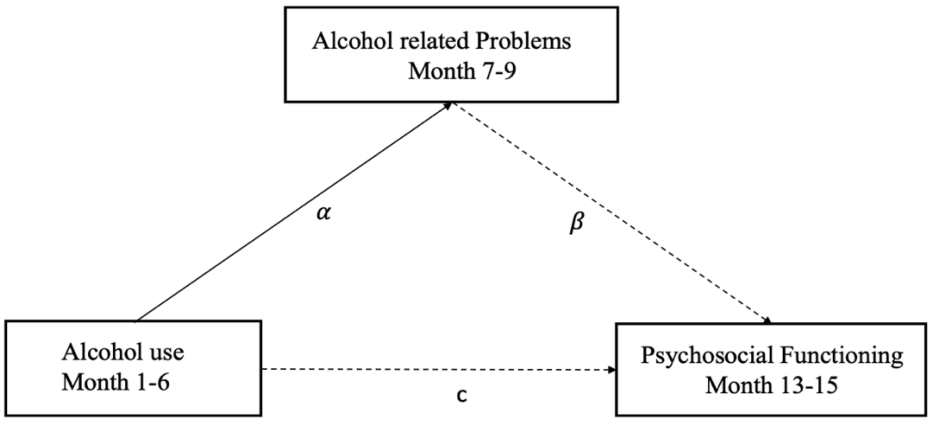

Figure 2. Hypothesized mediation model regarding alcohol use, alcohol related problems, and psychosocial functioning. Solid line indicates a positive association and dashed lines indicate a negative association.

Moderated-mediation model

A moderated-mediation model incorporates both mediation and moderation into a single analysis. Moderated-mediation can be defined as an effect in which the magnitude of an indirect effect varies as a function of a moderator variable. Thus, the linear relationship between predictor and outcome variable via a mediator variable is contingent on the values of the moderator variable.

A moderated mediation is the product of its components. In Figure 4, the conditional mediation effect is the product of the conditional effect of X on M given W (a_1+a_3W) and the effect of M on Y (b): (a_1+a_3W) b.

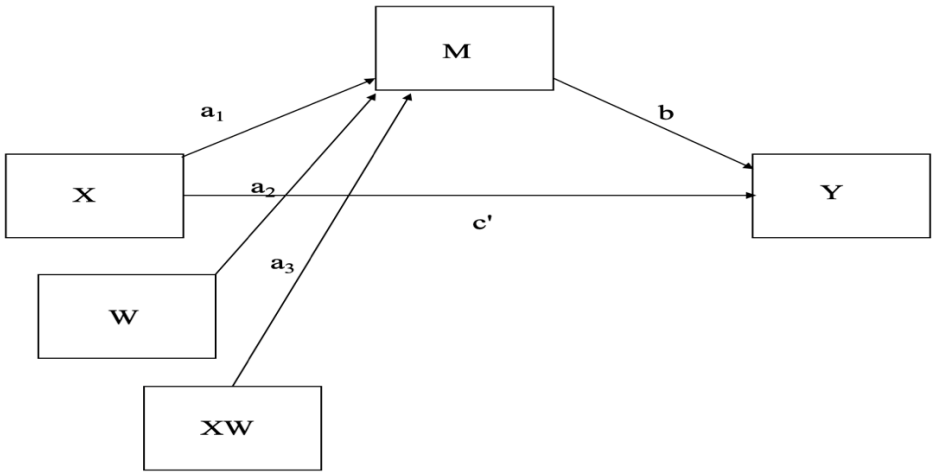

Figure 3. A statistical diagram representing moderated mediation

For this dissertation research, moderated-mediation tests were conducted to address potential interactions between the predictor variables (i.e., alcohol use months 1-6 posttreatment initiation) and select moderator variables (i.e., significant others' treatment attendance (hypothesis 5A), participant's age (hypothesis 5B) and gender

(hypothesis 5C) on the mediator variable (i.e., alcohol related problems). The hypothesized moderated-mediation model to be tested is presented in Figure 2. To test the moderated mediation between each alcohol use (i.e., PDA, DDD, PHD) measure, alcohol related problems, and each psychosocial functioning variable (i.e., Socbeh, Socper, depression, Asipsy) with each moderator variable, PROCESS was utilized which is a conditional process modeling program that uses an ordinary least squares based path analytical framework. Regarding the determination of statistical significance of the conditional indirect effect, 95-percentile bias corrected confidence intervals (CIs) were estimated with bootstrap analyses of 5,000 samples.

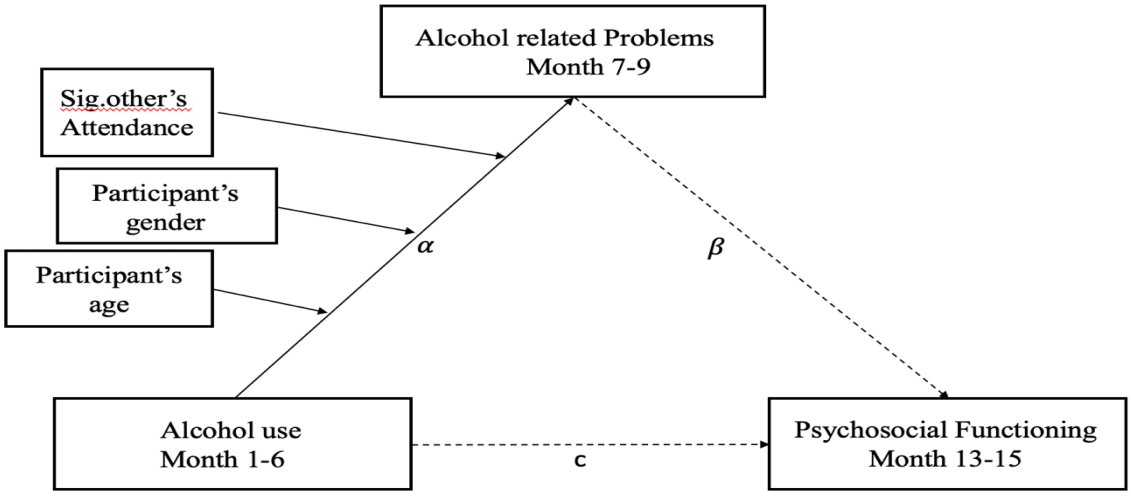

Figure 4. Hypothesized conceptual moderated-mediation model regarding alcohol use, alcohol related problems, and psychosocial functioning. Solid line indicates a positive association and dashed lines indicate a negative association.

Multivariate analysis of covariance (MANCOVA)

Multivariate analysis of covariance was used to examine the relationships between drinker group classification (i.e., abstainers, moderate drinkers, and heavy drinkers) stability and later psychosocial functioning (hypothesis 6). To evaluate the

effect of drinker group stability on psychosocial functioning, the two drinker classification groups (i.e., one based on study months one through six and the other on study months, 10 thought 15) were crossed to yield nine drinker stability/transitioning groups: 1) abstainer to abstainer; 2) abstainer to moderate drinker; 3) abstainer to heavy drinker; 4) moderate drinker to moderate drinker; 5) moderate drinker to abstainer; 6) moderate drinker to heavy drinker; 7) heavy drinker to heavy drinker; 8) heavy drinker to moderate drinker; and 9) heavy drinker to abstainer. Given prior research by Maisto et al (2007) indicating that abstainers and moderate drinkers did not differ with respect to psychosocial functioning, the abstainer and moderate drinker group were combined yielding four drinker groups: 1) stable abstainer/moderate drinkers; 2) abstainer/moderate drinkers who transition to the heavy drinkers group; 3) heavy drinkers who transitioned to the abstainer/moderate drinkers group; and 4) stable heavy drinkers. The MANCOVAs were conducted using this drinker stability/transition group variable as the independent variable, the psychosocial functioning variables (i.e., social behavior, overall social role performance, psychiatric status, and depression) during study months 10 through 15, as the dependent variables, and the baseline value of each psychosocial functioning variable as covariates.

All data analyses for this dissertation research were conducted using SPSS version 26, and Mplus version 7.4.

Chapter IV: Results

Descriptive Statistics

Mean, standard deviation, variance, skewness, and kurtosis estimates specific to study predictor, mediator, and outcome variables are presented in Table 3.

Table 3. Descriptive statistics for study variables

Variables	Mean	S.D.	Variance	Skewness	Kurtosis
PDA M 1-6	1.19	0.40	0.16	-1.21	0.64
DDD M 1-6	1.44	1.16	1.35	0.57	-0.32
PHD M 1-6	0.29	0.27	0.08	0.80	-0.32
Total Score-DrInC 9 Month	19.80	23.17	537.07	1.23	0.92
Social Behavior Scale-15 Month	3.44	0.44	0.19	-1.16	1.64
Overall Social Role Performance Scale-15 Month	3.95	0.70	0.49	-0.58	0.34
ASI Psychiatric Severity Score-15 Month	0.10	0.16	0.03	1.56	1.52
Beck Depression Inventory-15 Month	6.87	7.37	54.36	1.56	2.67

Correlation between all study variables

Bivariate correlation analyses were conducted, and the results are presented in Table 4. Alcohol use was correlated with alcohol related problems and subsequent psychosocial functioning in the hypothesized directions. However, PDA and ASI psychiatric status and DDD and ASI psychiatric status were not correlated with each other.

Table 4. Bivariate correlations for study variables

	1	2	3	4	5	6	7	8	9	10	11
1. PDA M1-6		-0.771 **	-0.869 **	-0.380 **	0.122 **	0.186 **	-0.210 **	-0.020	0.039	-0.029	-0.003
2. DDD M1-6			0.860 **	0.474 **	-0.164 **	-0.189 **	0.191 **	0.069	-0.050	-0.108 **	-0.042
3. PHD M1-6				0.472 **	-0.213 **	-0.240 **	0.281 **	0.089 *	-0.023	-0.032	0.033
4. Alcohol related problems					-0.339 **	-0.344 **	0.427 **	0.216 **	-0.027	0.012	0.005
5. Social behavior, M 15						0.556 **	-0.605 **	-0.435 **	0.008	0.057	-0.060
6. Overall social role performance, M 15							-0.628 **	-0.363 **	-0.018	0.010	0.012
7. BDI scores, M15								0.578 **	0.036	0.089*	0.084*
8. ASI psychiatric status, M 15									0.014	0.032	0.132**
9. Significant Others' Tx involvement										0.021	0.039
10. Age											0.039
11. Gender											

**: Correlation is significant at the 0.01 level (2-tailed), *: correlation is significant at the 0.05 level (2-tailed). Each baseline variable is controlled.

Mediation Model

Three separate regression models were used to test each path of the hypothesized mediation model paths.

Alcohol use and psychosocial functioning (c path)

Hypothesis 1 proposed that greater alcohol use post AUD treatment initiation would be negatively associated with subsequent psychosocial functioning (i.e., poorer performance of social role, greater depressive symptoms severity, and greater impairment of psychiatric status). To test hypothesis 1, a multivariate general linear model (GLM) was conducted with each alcohol use variable and the four outcome variables while controlling the effect of covariates (i.e., each outcome variable's baseline assessment counterpart). The results of these analyses are presented in the Table 5. The overall test effect of PDA, DDD and PHD was significant.

Table 5. Multivariate Tests with each alcohol drinking variable and psychosocial functioning variables

Predictor variable	value	F	Hypothesis df	Error df	Sig.
PDA	0.002	1.333	2152.000	778.964	0.000
DDD	0.000	1.627	2472.000	458.975	0.000
PHD	0.357	1.232	564.000	2366.251	0.001

To further investigate these findings, univariate linear models were computed. The results of these univariate linear regressions are presented in Table 6.

Table 6. Linear regression model for alcohol use and psychosocial functioning (c path)

Variable		Estimate	S.E.	t	Sig.	C.I.	
						Lower 5%	Upper 5%
PDA	Social Behavior	0.14	0.04	3.88	0.00	0.07	0.22
	Social Role Performance	0.35	0.06	5.71	0.00	0.23	0.47
	Depression	-2.77	0.63	-4.43	0.00	-4.00	-1.54
	Psychiatric Status	-0.02	0.01	-1.60	0.11	-0.05	0.01
DDD	Social Behavior	-0.06	0.01	-4.52	0.00	-0.08	-0.03
	Social Role Performance	-0.11	0.02	-5.49	0.00	-0.15	-0.07
	Depression	0.96	0.21	4.63	0.00	0.55	1.37
	Psychiatric Status	0.01	0.01	2.66	0.01	0.00	0.02
PHD	Social Behavior	-0.31	0.05	-5.81	0.00	-0.41	-0.21
	Social Role Performance	-0.60	0.09	-6.81	0.00	-0.77	-0.43
	Depression	5.76	0.89	6.44	0.00	4.00	7.51
	Psychiatric Status	0.07	0.02	3.23	0.00	0.03	0.11

As hypothesized, alcohol use measures generally were associated significantly with psychosocial functioning ($p < .05$); the exception being the association between PDA and ASI psychiatric status (Asipsy). PDA was positively associated with Socbeh and Socper and negatively associated with BDI scores. Both DDD and PHD were negatively associated with Socbeh and Socper and positively associated with BDI scores and Asipsy. Based on the results obtained from these multivariate GLM and univariate linear regression models, hypothesis 1 was supported accounting for proportions of variance (R^2) ranging from 0.082 to 0.283. The proportion of variance accounted for between these relationships were significant and thus, retained for further evaluation in the mediation and moderated mediation models.

Alcohol use and alcohol related problems (α path)

To test hypothesis 2, which proposed that greater alcohol use would be positively associated with greater alcohol related problems, three linear regression models were computed. Specifically, the 9-month DrInC total scores were regressed on PDA, DDD, and PHD, controlling for the baseline value of each alcohol use variable and DrInC total scores. Each month 1-6 alcohol use variable was significantly associated with the 9-month DrInC total scores, and in the expected directions and R^2 ranged from 0.237 to 0.302. The results of these regression are presented in Table 7.

Table 7. Linear regression for alcohol use and DrInC total scores (α path)

Variable		Estimate	S.E.	t	sig.	C.I.	
						Lower 5%	Upper 5%
PDA	DrInC total score	-24.59	2.04	-12.06	0.00	-28.60	-20.59
DDD		9.92	0.66	15.13	0.00	8.63	11.21
PHD		40.89	2.82	14.48	0.00	35.35	46.44

Alcohol related problems and psychosocial functioning (β path)

Hypothesis 3 proposed that greater alcohol related problems would be associated with poorer psychosocial functioning (i.e., lower scores on the Socbeh and Socper, and higher BDI and Asipsy scores). To test this hypothesis, linear regressions were computed.

The 9-month DrInC total scores was a significant predictor of the psychosocial functioning variables at 15M. Specifically, alcohol related problems (as measured by the DrInC) were negatively associated with Socbeh and Socper and positively associated with bdi scores and Asipsy. The variance (R^2) accounted for by these models ranged from 0.116 to 0.340. The results are presented in Table 8.

Table 8. *Linear regression for DrInC total scores and psychosocial functioning (β path)*

Variable		Estimate	S.E.	t	Sig.	C.I.	
						Lower 5%	Upper 5%
Alcohol related problems	Social Behavioral	-0.01	0.00	-7.67	0.00	-0.01	0.00
	Social Role Performance	-0.01	0.00	-9.15	0.00	-0.01	-0.01
	Depression	0.11	0.01	9.90	0.00	0.09	0.13
	Psychiatric Status	0.00	0.00	5.23	0.00	0.00	0.00

Mediation Analysis

Research hypothesis 4 proposes that alcohol related problems will mediate the relationship between alcohol use and later psychosocial functioning such that greater alcohol use will be associated with a great frequency of alcohol related problems, which in turn will be associated with poorer psychosocial functioning. To test the indirect effect between alcohol use (i.e., PDA, DDD, PHD), alcohol related problems (DrInC total scores), and subsequent psychosocial functioning (i.e., Socbeh, Socper, bdi scores, Asipsy), a series of mediation models were assessed using MacKinnon's "the Tests of Joint Significance." The three mediation models were conducted using all four psychosocial functioning variables but only one alcohol use variable per model because the alcohol use variables for this research study are highly correlated each other (see Table 2), which causes increased standard error and problems related to multicollinearity.

Measures of model fit

Chi-square tests of model fit were all significant, which likely was due to the sensitivity of chi-square tests to large sample sizes. Therefore, relative chi-squares were calculated (i.e., chi-square fit index divided by the degrees of freedom) so that the obtained chi-square value would be less dependent on sample size. Recommendations

regarding relative chi-square values indicative of good model fit are variable and range from less than 2.0 to as high as 5.0 (Garson, 1998). The resulting relative chi-square values associated with the three mediation models ranged from 3.30 to 3.79, indicating an acceptable model fit.

The Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI) for each model, were all around .90, indicating good model fits. Furthermore, the root mean square errors of approximation (RMSEA) were all about 0.06, indicating good model fit. As noted by MacCallum, Browne, & Sugawara, 1996, a RMSEA value of 0.08 or less is indicative of a good model fit. Furthermore, more recently, a cut-off value close to 0.06 (Hu & Bentler, 1999) or a stringent upper limit of 0.07 (Steiger, 2007) has been determined to be indicative of a good model fit. In regard to a RMSEA confidence interval, it has been reported that a lower limit close to 0 and an upper limit less than 0.08 indicates a well-fitting model. Model fit statistics for the three mediation models are presented in Table 9.

Table 9 . Model fit statistics for the simple mediation models

	Chi-square, df, p value	relative Chi-squre chi-square fit / df	CFI	TLI	RMSEA C.I.
PDA model	113.59, 30, 0.000	3.79	0.94	0.89	0.06 0.051, 0.075
DDD model	98.98, 30, 0.000	3.30	0.95	0.91	0.06 0.045, 0.070
PHD model	113.75, 30, 0.000	3.79	0.94	0.90	0.06 0.051, 0.075

PDA effect on social behavior functioning

The test results of this mediation analysis, conducted to test for the direct, indirect and total effects of the association between PDA and psychosocial functioning via alcohol related problems are presented in Table 10. The indirect effect of PDA on Socbeh functioning was estimated at 0.132, meaning that one unit difference in PDA is

associated with a 0.132 unit change in Socbeh functioning. Furthermore, individuals reporting a greater PDA tended to have lower DrInC scores (i.e., the model alpha path is negative). This indirect effect is statistically significant (i.e., $p < 0.001$; 95% confidence interval ranged from 0.090 to 0.174).

The direct effect of PDA, c' = -0.007, was the estimated difference in Socbeh functioning of those individuals experiencing the same level of alcohol related problems but who differ by one unit of in their reported PDA. The estimate is negative indicating that the individuals reporting a greater PDA and similar frequency of alcohol related problems are estimated to be 0.007 units lower in their reported Socbeh functioning. However, as can be seen in the table 10, this direct effect is not statistically significant (i.e., $p = 0.855$; 95% confidence interval ranged from -0.075 to 0.060).

The total effect of PDA on Socbeh functioning is derived by summing the model's direct and indirect effects; yielding a model c path (i.e., total effect) coefficient of 0.125. Individuals differing by one unit in reported PDA are estimated to differ by 0.125 units in their reported Socbeh functioning. The positive sign indicates that the individuals reporting a greater PDA also report better Socbeh functioning. This effect is statistically significant (i.e., $p = 0.001$; 95% confidence interval ranged from 0.063 to 0.186).

PDA and overall social role performance

The indirect effect of PDA on Socper was estimated at 0.222, meaning that one unit difference in PDA is associated with a 0.222 unit change in Socper functioning. Furthermore, individuals reporting a greater PDA tended to have lower DrInC scores

(i.e., the model alpha path is negative). This indirect effect is statistically significant (i.e., $p < 0.001$; 95% confidence interval ranged from 0.157 to 0.288).

The direct effect of PDA, c' = 0.086, was the estimated difference in Socper functioning of those individuals experiencing the same level of alcohol related problems but who differ by one unit of in their reported PDA. The estimate is positive, indicating that individuals reporting a greater PDA and similar frequency of alcohol related problems are estimated to be 0.007 units greater in their reported Socper functioning. However, as can be seen in the table 10, this direct effect is not statistically significant (i.e., $p = 0.206$; 95% confidence interval ranged from -0.026 to 0.197).

The total effect of PDA on Socper functioning is derived by summing the model's direct and indirect effects; yielding a model c path (i.e., total effect) coefficient of 0.308. Individuals differing by one unit in reported PDA are estimated to differ by 0.308 units in reported Socper functioning. The positive sign indicates that individuals reporting a greater PDA also reports better Socper functioning. This effect is statistically significant (i.e., $p = 0.000$; 95% confidence interval ranged from 0.205 to 0.411).

PDA and depression

The indirect effect of PDA on depression was estimated at -2.794, meaning that one unit difference in PDA is associated with a 2.794 unit change in depression scores. Furthermore, individuals reporting a greater PDA tended to have lower DrInC scores (i.e., the model alpha path is negative). This indirect effect is statistically significant (i.e., $p < 0.001$; 95% confidence interval ranged from -3.501 to -2.088).

The direct effect of PDA, c' = -0.465, was the estimated difference in depression of those individuals experiencing the same level of alcohol related problems but who

differ by one unit of in their reported PDA. The estimate is positive indicating that the individuals reporting a greater PDA and similar frequency of alcohol related problems are estimated to be 0.465 units lower in their reported depression scores. However, as can be seen in the table 10, this direct effect is not statistically significant (i.e., p = 0.493; 95% confidence interval ranged from 1.581 to 0.651).

The total effect of PDA on depression is derived by summing the model's direct and indirect effects; yielding a model c path (i.e., total effect) coefficient of -3.259. Individuals differing by one unit in reported PDA are estimated to differ by 3.259 units in their reported depression. The negative sign indicates that individuals reporting a greater PDA also report less depression symptoms. This effect is statistically significant (i.e., p = 0.000; 95% confidence interval ranged from -4.328 to -2.191).

PDA and psychiatric symptom status

The indirect effect of PDA on Asipsy was estimated at -0.041, meaning that one unit difference in PDA is associated with a 0.041 unit change in Asipsy. Furthermore, individuals reporting a greater PDA tended to have lower DrInC scores (i.e., the model alpha path is negative). This indirect effect is statistically significant (i.e., p < 0.001; 95% confidence interval ranged from -0.057 to -0.025).

The direct effect of PDA, c' = 0.031, was the estimated difference in Asipsy of those individuals experiencing the same level of alcohol related problems but who differ by one unit of in their reported PDA. The estimate is positive indicating that the individuals reporting a greater PDA and similar frequency of alcohol related problems are estimated to be 0.031 units greater in their reported psychiatric symptoms. However, as

can be seen in the table 10, this direct effect is not statistically significant (i.e., p = 0.081; 95% confidence interval ranged from -0.035 to 0.015).

The total effect of PDA on Asipsy is derived by summing the model's direct and indirect effects; yielding a model c path (i.e., total effect) coefficient of -0.010. Individuals differing by one unit in reported PDA are estimated to differ by 0.010 units in their reported psychiatric symptom status. The negative sign indicates that individuals reporting a greater PDA also report poorer psychiatric symptom status. This effect is not statistically significant (i.e., p = 0.518; 95% confidence interval ranged from 0.205 to 0.411).

Table 10. Direct and indirect effect of PDA on psychosocial functioning via DrInC total scores

Variable		Effect	Estimate	S.E.	Est./S.E.	P	C.I.	
							Lower 5%	Upper 5%
PDA	Social Behavioral Role	Indirect	0.13	0.03	5.20	0.00	0.09	0.17
		direct	-0.01	0.04	-0.18	0.86	-0.08	0.06
		total	0.13	0.04	3.33	0.00	0.06	0.19
	Social Role Performance	Indirect	0.22	0.04	5.60	0.00	0.16	0.29
		direct	0.09	0.07	1.26	0.21	-0.03	0.20
		total	0.31	0.06	4.91	0.00	0.21	0.41
	Depression	Indirect	-2.79	0.43	-6.51	0.00	-3.50	-2.09
		direct	-0.47	0.68	-0.69	0.49	-1.58	0.65
		total	-3.26	0.65	-5.02	0.00	-4.33	-2.19
	Psychiatric Status	Indirect	-0.04	0.01	-4.15	0.00	-0.06	-0.03
		direct	0.03	0.02	1.74	0.08	0.00	0.06
		total	-0.01	0.02	-0.65	0.52	-0.04	0.02

DDD and social behavior

The results of this mediation analysis, conducted to test for the direct, indirect, and total effects of the association between DDD and psychosocial functioning via alcohol related problems, are presented in Table 11.

The indirect effect of DDD on Socbeh functioning was estimated at -0.051, meaning that one unit difference in DDD is associated with a 0.051unit change in Socbeh functioning. Furthermore, individuals reporting a greater DDD tended to have higher DrInC scores (i.e., the model alpha path is positive). This indirect effect is statistically significant (i.e., $p < 0.001$; 95% confidence interval ranged from -0.068 to -0.034).

The direct effect of DDD, $c' = 0.002$, was the estimated difference in Socbeh functioning of those individuals experiencing the same level of alcohol related problems but who differ by one unit of in their reported DDD. The estimate is positive indicating that the individuals reporting a greater DDD and similar frequency of alcohol related problems are estimated to be 0.002 units higher in his or her reported Socbeh functioning. However, as can be seen in the table 11, this direct effect is not statistically significant (i.e., $p = 0.895$; 95% confidence interval ranged from -0.024 to 0.028).

The total effect of DDD on Socbeh functioning derived by summing the model's direct and indirect effect; yielding a model c path (i.e., total effect) coefficient of -0.049. Individuals differing by one unit in reported DDD are estimated to differ by 0.049 units in their reported Socbeh functioning. The negative sign individuals reporting a greater DDD also report poorer Socbeh functioning. This effect is statistically significant (i.e., $p = 0.000$; 95% confidence interval ranged from -0.071 to -0.027).

DDD and overall social role performance

The indirect effect of DDD on Socper is estimated at -0.091, meaning that one unit difference in DDD is associated with a 0.091 unit change in Socper. Furthermore, individuals reporting a greater DDD tended to have higher DrInC scores (i.e., the model

alpha path is positive). This indirect effect is statistically significant (i.e., $p < 0.001$; 95% confidence interval ranged from -0.117 to -0.064).

The direct effect of DDD, c' = -0.009, was the estimated difference in Socper of those individuals experiencing the same level of alcohol related problems but who differ by one unit of in their reported DDD. The estimate is negative indicating that the individuals reporting a greater PDA and similar frequency of alcohol related problems are estimated to be 0.086 units poorer in their reported Socper. However, as can be seen in the table 11, this direct effect is not statistically significant (i.e., $p = 0.711$; 95% confidence interval ranged from -0.051 to 0.032).

The total effect of DDD on Socper is derived by summing the model's direct and indirect effects; yielding a model c path (i.e., total effect) coefficient of -0.100. Individuals differing by one unit in reported DDD are estimated to differ by 0.100 units in their reported Socper. The negative indicates that individuals reporting greater DDD also report poorer Socper. This effect is statistically significant (i.e, $p = 0.000$; 95% confidence interval ranged from -0.138 and -0.062).

DDD and depression

The indirect effect of DDD on depression was estimated at 1.175, meaning that one unit difference in DDD is associated with a 1.175 unit change in depression scores. Furthermore, individuals reporting a greater DDD tended to have higher DrInC scores (i.e., the model alpha path is positive). This indirect effect is statistically significant (i.e., $p < 0.001$; 95% confidence interval ranged from 0.878 to 1.472).

The direct effect of DDD, c' = -0.173, was the estimated difference in depression of those individuals experiencing the same level of alcohol related problems but who

differ by one unit of in their reported DDD. The estimate is negative indicating that the individuals reporting a greater DDD and similar frequency of alcohol related problems are estimated to be 0.173 units lower in their reported depression scores. However, as can be seen in the table 11, this direct effect is not statistically significant (i.e., $p = 0.504$; 95% confidence interval ranged from -0.598 to 0.252).

The total effect of DDD on depression is derived by summing the model's direct and indirect effects; yielding a model c path (i.e., total effect) coefficient of 1.002. Individuals differing by one unit in reported DDD are estimated to differ by 1.002 units in their reported depression. The positive sign indicates that the individuals reporting a greater DDD also report more depression symptoms. This effect is statistically significant (i.e., $p = 0.000$; 95% confidence interval ranged from 0.625 and 1.379).

DDD and psychiatric symptom status

The indirect effect of DDD on Asipsy was estimated at 0.015, meaning that one unit difference in DDD is associated with a 0.015 unit change in Asipsy. Furthermore, individuals reporting a greater DDD tended to have higher DrInC scores (i.e., the model alpha path is positive). This indirect effect is statistically significant (i.e., $p < 0.001$; 95% confidence interval ranged from 0.009 to 0.022).

The direct effect of DDD, $c' = -0.006$, is the estimated difference in Asipsy of those individuals experiencing the same level of alcohol related problems but who differ by one unit of in their reported DDD. The estimate is negative indicating that the individuals reporting a greater PDA and similar frequency of alcohol related problems are estimated to be 0.006 units less in thier reported psychiatric symptoms. However, as can

be seen in the table 11, this direct effect is not statistically significant (i.e, p = 0.420; 95% confidence interval ranged from -0.017 to 0.006).

The total effect of DDD on psychiatric symptom status is derived by summing the model's direct and indirect effect; yielding a model c path (i.e., total effect) coefficient of 0.010. Individuals differing by one unit in reported PDA are estimated to differ by 0.010 units in their reported psychiatric symptom status. The positive sign indicates that individuals reporting a greater DDD also report greater psychiatric symptom status. This effect is not statistically significant (i.e, p = 0.084; 95% confidence interval ranged from 0.000 and 0.019).

Table 11. Direct and indirect effect of DDD on psychosocial functioning via DrInC total scores

Variable		Effect	Estimate	S.E.	Est./S.E.	P	C.I.	
							Lower 5%	Upper 5%
DDD	Social Behavioral Role	Indirect	-0.05	0.01	-4.96	0.00	-0.07	-0.03
		direct	0.00	0.02	0.13	0.90	-0.02	0.03
		total	-0.05	0.01	-3.72	0.00	-0.07	-0.03
	Social Role Performance	Indirect	-0.09	0.02	-5.64	0.00	-0.12	-0.06
		direct	-0.01	0.03	-0.37	0.71	-0.05	0.03
		total	-0.10	0.02	-4.36	0.00	-0.14	-0.06
	Depression	Indirect	1.18	0.18	6.50	0.00	0.88	1.47
		direct	-0.17	0.26	-0.67	0.50	-0.60	0.25
		total	1.00	0.23	4.38	0.00	0.63	1.38
	Psychiatric Status	Indirect	0.02	0.00	3.78	0.00	0.01	0.02
		direct	-0.01	0.01	-0.81	0.42	-0.02	0.01
		total	0.01	0.01	1.73	0.08	0.00	0.02

PHD and social behavior

The results of this mediation analysis, conducted to test for the direct, indirect, and total effects of the association between PHD and psychosocial functioning via alcohol related problems, are presented in Table 12. The indirect effect of PHD on

Socbeh functioning was estimated at -0.197, meaning that one unit difference in PHD is associated with a 0.197 unit change in Socbeh functioning. Furthermore, individuals reporting a greater PHD tended to have higher DrInC scores (i.e., the model alpha path is positive). This indirect effect is statistically significant (i.e., $p < 0.001$; 95% confidence interval ranged from -0.265 to -0.129).

The direct effect of PHD, c' = -0.082, was the estimated difference in Socbeh functioning of those individuals experiencing the same level of alcohol related problems but who differ by one unit of in their reported PHD. The estimate is indicating that the individuals reporting a greater PHD and similar frequency of alcohol related problems are estimated to be 0.082 units poorer in their reported Socbeh functioning. However, as can be seen in the Table 12, this direct effect is not statistically significant (i.e., $p = 191$; 95% confidence interval ranged from -0.185 to 0.021).

The total effect of PHD on Socbeh functioning is derived by summing the model's direct and indirect effect; yielding a model c path (i.e., total effect) coefficient of -0.279. Individuals differing by one unit in reported PHD are estimated to differ by 0.279 units in their reported Socbeh functioning. The negative sign indicates that individuals reporting a greater PHD also report poorer Socbeh functioning. This effect is statistically significant (i.e., $p = 0.000$; 95% confidence interval ranged from -.372 and -0.187).

PHD and overall social role performance

The indirect effect of PHD on Socper was estimated at -0.353, meaning that one unit difference in PHD is associated with a 0.353 unit change in Socper. Furthermore, individuals reporting a greater PHD tended to have higher DrInC scores (i.e., the model

alpha path is positive). This indirect effect is statistically significant (i.e., $p < 0.001$; 95% confidence interval ranged from -0.462 to -0.245).

The direct effect of PHD, c' = -0.179, was the estimated difference in Socper of those individuals experiencing the same level of alcohol related problems but who differ by one unit of in their reported PHD. The estimate is negative indicating that the individuals reporting a greater and similar frequency of alcohol related problems are estimated to be 0.086 units poorer in their Socper. However, as can be seen in the table 12, this direct effect is not statistically significant (i.e., $p = 0.083$; 95%confidence interval ranged from -0.349 to -0.009).

The total effect of PHD on Socper is derived by summing the model's direct and indirect effects; yielding a model c path (i.e., total effect) coefficient of -0.533. Individuals differing by one unit in reported PHD are estimated to differ by 0.533 units in their reported Socper. The negative sign indicates that individuals reporting a greater PHD also report poorer Socper. This effect is statistically significant (i.e., $p = 0.000$; 95% confidence interval ranged from -0.683 and -0.383).

PHD and depression

The indirect effect of PHD on depression was estimated at 4.358, meaning that one unit difference in PHD is associated with a 4.358 unit change in depression scores. Furthermore, individuals reporting a greater PHD tended to have higher DrInC scores (i.e., the model alpha path is positive). This indirect effect is statistically significant (i.e., $p < 0.001$; 95% confidence interval ranged from 3.191 to 5.525).

The direct effect of PHD, c' = 1.804, was the estimated difference in depression of those individuals experiencing the same level of alcohol related problems but who differ

by one unit of in their reported PHD. The estimate is positive indicating that the individuals reporting a greater PHD and similar frequency of alcohol related problems are estimated to be 0.173 units higher in their reported depression scores. However, as can be seen in the table 12, this direct effect is not statistically significant (i.e., p = 0.083; 95% confidence interval ranged from 0.091 to 3.518).

The total effect of PHD on depression is derived by summing the model's direct and indirect effects; yielding a model c path (i.e., total effect) coefficient of 6.162. Individuals differing by one unit in reported PHD are estimated to differ by 6.162 units in their reported depression. The positive sign indicates that individuals reporting a greater PHD also report more depression symptoms. This effect is statistically significant (i.e., p = 0.000; 95% confidence interval ranged from4.660 and 7.665).

PHD and psychiatric symptom status

The indirect effect of PHD on psychiatric symptom status was estimated at 0.061, meaning that one unit difference in PHD is associated with a 0.061 unit change in Asipsy. Furthermore, individuals reporting a greater PHD tended to have higher DrInC scores (i.e., the model alpha path is positive). This indirect effect is statistically significant (i.e., p < 0.001; 95% confidence interval ranged from 0.033 to 0.089).

The direct effect of PHD, c' = -0.009, is the estimated difference in Asipsy of those individuals experiencing the same level of alcohol related problems but who differ by one unit of in their reported PHD. The estimate is negative indicating that the individuals reporting a greater PDA and similar frequency of alcohol related problems are estimated to be 0.009 units less in their reported psychiatric symptoms. However, as can

be seen in the table 12, this direct effect is not statistically significant (i.e., p = 0.758; 95% confidence interval ranged from -0.056 to 0.039).

The total effect of PHD on psychiatric symptom status is derived by summing the model's direct and indirect effects; yielding a model c path (i.e., total effect) coefficient of 0.052. Individuals differing by one unit in reported PHD are estimated to differ by 0.052 units in their reported psychiatric symptom status. The positive sign indicates that individuals reporting a greater PHD also report greater psychiatric symptom status. This effect is not statistically significant (i.e., p = 0.025; 95% confidence interval ranged from 0.014 and 0.090).

Table 12. Direct and Indirect effect of PHD on psychosocial functioning via DrInC total scores

Variable		Effect	Estimate	S.E.	Est./S.E.	P	C.I.	
							Lower 5%	Upper 5%
PHD	Social Behavioral Role	Indirect	-0.20	0.04	-4.72	0.00	-0.27	-0.13
		direct	-0.08	0.06	-1.31	0.19	-0.19	0.02
		total	-0.28	0.06	-4.95	0.00	-0.37	-0.19
	Social Role Performance	Indirect	-0.35	0.07	-5.35	0.00	-0.46	-0.25
		direct	-0.18	0.10	-1.74	0.08	-0.35	-0.01
		total	-0.53	0.09	-5.84	0.00	-0.68	-0.38
	Depression	Indirect	4.36	0.71	6.15	0.00	3.19	5.53
		direct	1.80	1.04	1.73	0.08	0.09	3.52
		total	6.16	0.91	6.75	0.00	4.66	7.67
	Psychiatric Status	Indirect	0.06	0.02	3.61	0.00	0.03	0.09
		direct	-0.01	0.03	-0.31	0.76	-0.06	0.04
		total	0.05	0.02	2.24	0.03	0.01	0.09

Mediation Model with DrInC Subcales as multiple mediators

To further explore the mediating effects of alcohol problems (i.e., DrInC scores) on the association between alcohol use and psychosocial functioning, three parallel

multiple mediator models (i.e., one for each alcohol use variable: PDA, DDD, PHD) were conducted. Each parallel multiple mediator model contained the five DrInC subscale scores measured at the 9-month follow-up point, an alcohol use measure obtained at the 6-month follow-up point, the five DrInC subscale baseline scores, and relevant baseline alcohol use variable (i.e., PDA, DDD, PHD). This analytical approach (i.e., parallel multiple mediator analyses) afforded an opportunity to investigate the relative contribution of each DrInC subscale measure on the association between alcohol use and subsequent psychosocial functioning. More detailed information regarding the results obtained from each of the three parallel multiple mediator models are presented Tables 13, 14 and 15.

With the analytical framework of a parallel multiple mediator model, one can investigate the indirect effect of alcohol use variables on psychosocial functioning summed across all mediator variables. With respect to PDA alcohol use measure and all psychosocial functioning variables, the summed indirect effects are all statistically significant based on that the 95% C.I does not contain zero. In particular, the Socbeh functioning outcome variable total indirect effect (i.e., summed across the five DrInC subscales) was 0.123 indicating that a one unit increase in PDA was associated with 0.123 unit increase in their Socbeh functioning. In addition, the PDA model yielded significant specific indirect effects specific to the interpersonal consequences subscale for Socbeh functioning and the physical consequences subscale for depression.

The total indirect effect estimate generated by the multiple mediator model, however, is rarely of much interest because the derived estimate may not be statistically significantly different than zero even when one or more of the specific indirect effects are

significant. Therefore, this dissertation study reports all possible pairwise comparisons between specific indirect effects. In this regard, the specific indirect effect of PDA via the DrInC's interpersonal consequences subscale is statistically different than the specific indirect effect associated with the DrInC's impulse control subscale (difference= 0.100; 95% CI = 0.003, 0.199) on Socbeh functioning and the specific indirect effect of PDA via the DrInC's physical consequences subscale is statistically different than the specific indirect effect associated with the social responsibility subscale (difference= -2.497; 95% CI = -4.621 to -0.336) on depression.

Table 13. The effects of the DrInC subscales as mediators of the relationship between PDA and psychosocial functioning

Variable			Effect	Effect	S.E.	t (Effect/S.E)	P	C.I.	
								Lower 5%	Upper 5%
Predictor	Outcome	Mediators							
PDA	Social behavior		direct (X on Y)	0.009	0.046	0.196	0.844	-0.081	0.099
			total (X on Y)	0.132	0.043	3.097	0.002	0.048	0.216
			total indirect	0.123	0.028	4.393		0.071	0.181
		Physical	indirect	0.067	0.052	1.288		-0.038	0.169
		Social responsibility	indirect	0.002	0.04	0.050		-0.078	0.079
		Intrapersonal	indirect	0.022	0.04	0.550		-0.053	0.104
		Interpersonal	indirect	0.066	0.031	2.129		0.007	0.13
		Impulse control	indirect	-0.034	0.032	-1.063		-0.096	0.031
	Overall Social Role Performance		direct (X on Y)	0.111	0.076	1.461	0.146	-0.039	0.262
			total (X on Y)	0.324	0.071	4.563	0.000	0.185	0.463
			total indirect	0.212	0.046	4.609		0.126	0.306
		Physical	indirect	0.043	0.086	0.500		-0.131	0.206
		Social responsibility	indirect	-0.047	0.064	-0.734		-0.168	0.085
		Intrapersonal	indirect	0.092	0.077	1.195		-0.054	0.247
		Interpersonal	indirect	0.109	0.059	1.847		-0.003	0.234
		Impulse control	indirect	0.015	0.056	0.268		-0.092	0.133
	Depression		direct (X on Y)	0.228	0.71	0.321	0.749	-1.166	1.621
			total (X on Y)	-2.527	0.68	-3.716	0.000	-3.863	-1.191
			total indirect	-2.755	0.432	-6.377		-3.663	-1.973
		Physical	indirect	-2.103	0.774	-2.717		-3.657	-0.602
		Social responsibility	indirect	0.394	0.583	0.676		-0.727	1.566
		Intrapersonal	indirect	-0.419	0.716	-0.585		-1.88	0.931
		Interpersonal	indirect	-0.391	0.552	-0.708		-1.546	0.643
		Impulse control	indirect	-0.235	0.521	-0.451		-1.273	0.807
	Psychiatric status		direct (X on Y)	0.028	0.018	1.556	0.124	-0.008	0.063
			total (X on Y)	-0.008	0.016	-0.500	0.607	-0.04	0.024
			total indirect	-0.036	0.011	-3.273		-0.058	-0.015
		Physical	indirect	-0.02	0.018	-1.111		-0.057	0.016
		Social responsibility	indirect	0.01	0.015	0.667		-0.019	0.04
		Intrapersonal	indirect	-0.001	0.016	-0.063		-0.034	0.031
		Interpersonal	indirect	-0.015	0.015	-1.000		-0.044	0.014
		Impulse control	indirect	-0.09	0.013	-6.923		-0.036	0.017

The DDD alcohol use model yielded significant specific indirect effects for the DrInC's interpersonal consequences subscale specific to Socbeh functioning and the physical consequences subscale for depression. Among all possible pairwise comparisons of specific indirect effects, the indirect effect of the DDD measure via the interpersonal consequences subscale on Socbeh functioning was statistically different than the specific indirect effect associated with the impulse control subscale (difference= -0.045; 95% CI = -0.085, -0.004). Furthermore, the specific indirect effect of the DDD measure via the DrInC's physical consequences subscale was statistically different than the specific indirect effect obtained via the social responsibility subscale (difference= 1.043; 95% CI = 0.191, 1.908), and the specific indirect effect obtained via the interpersonal consequences subscale (difference= 0.745; 95% CI = 0.002, 1.491), and impulse control subscale (difference= 0.781; 95% CI = 0.001, 1.596) on depression.

Table 14. The effects of the DrInC subscales as mediators of the relationship between DDD and psychosocial functioning

Variable			Effect	Effect	S.E.	t (Effect/S.E)	P	C.I.	
								Lower 5%	Upper 5%
Predictor	Outcome	Mediators							
DDD	Social behavior		direct (X on Y)	-0.002	0.016	-0.103	0.918	-0.033	0.03
			total (X on Y)	-0.049	0.014	-3.448	0.001	-0.077	-0.021
			total indirect	-0.047	0.011	-6.793		-0.071	-0.027
		Physical	indirect	-0.026	0.019	-10.138		-0.064	0.013
		Social responsibility	indirect	-0.002	0.016	-13.483		-0.032	0.03
		Intrapersonal	indirect	-0.005	0.016	-16.828		-0.038	0.024
		Interpersonal	indirect	-0.029	0.013	-20.173		-0.055	-0.006
		Impulse control	indirect	0.015	0.014	-23.518		-0.011	0.043
	Overall Social Role Performance		direct (X on Y)	-0.004	0.027	-0.147	0.883	-0.056	0.048
			total (X on Y)	-0.096	0.024	-4.033	0.000	-0.142	-0.049
			total indirect	-0.092	0.018	-7.919		-0.128	-0.058
		Physical	indirect	-0.026	0.032	-11.805		-0.086	0.04
		Social responsibility	indirect	0.018	0.026	-15.691		-0.034	0.068
		Intrapersonal	indirect	-0.035	0.028	-19.577		-0.093	0.02
		Interpersonal	indirect	-0.043	0.024	-23.463		-0.093	0.002
		Impulse control	indirect	-0.005	0.024	-27.349		-0.053	0.04
	Depression		direct (X on Y)	-0.377	0.243	-1.553	0.121	-0.854	0.1
			total (X on Y)	0.767	0.225	3.412	0.001	0.326	1.209
			total indirect	1.145	0.178	8.377		0.82	1.521
		Physical	indirect	0.885	0.306	13.342		0.288	1.492
		Social responsibility	indirect	-0.159	0.231	18.307		-0.620	0.294
		Intrapersonal	indirect	0.175	0.275	23.272		-0.338	0.747
		Interpersonal	indirect	0.14	0.222	28.237		-0.288	0.586
		Impulse control	indirect	0.104	0.224	33.202		-0.334	0.554
	Psychiatric status		direct (X on Y)	-0.007	0.006	-1.074	0.283	-0.019	0.006
			total (X on Y)	0.007	0.005	1.305	0.192	-0.004	0.018
			total indirect	0.014	0.004	3.684		0.005	0.023
		Physical	indirect	0.007	0.007	6.063		-0.007	0.021
		Social responsibility	indirect	-0.004	0.006	8.442		-0.015	0.008
		Intrapersonal	indirect	0	0.006	10.821		-0.013	0.012
		Interpersonal	indirect	0.007	0.006	13.2		-0.005	0.019
		Impulse control	indirect	0.004	0.006	15.579		-0.007	0.015

The PHD model yielded significant specific indirect effects specific to the DrInC's interpersonal consequence subscale for Socbeh functioning and social performance (i.e., Socper) as well as for the DrInC's physical consequences subscale and depression. Among all possible pairwise comparisons, the specific indirect effects of the PHD alcohol use measure via DrInC's interpersonal consequences subscale was statistically different than the specific indirect effect obtained via the impulse control subscale (difference= -0.183; 95% CI = -0.348, -0.024) regarding Socbeh functioning. In addition, the specific indirect effect specific to the PHD measure and depression obtained

via DrInC's physical consequences subscale was statistically different than the specific indirect effect obtained via the social responsibility subscale (difference= 3.901; 95% CI = 0.181, 7.502).

Table 15. The effects of the DrInC subscales as mediators of the relationship between PHD and psychosocial functioning

Variable			Effect	Effect	S.E.	t (Effect/S.E)	P	C.I.	
								Lower 5%	Upper 5%
Predictor	Outcome	Mediators							
PHD	Social behavior		direct (X on Y)	-0.095	0.068	-1.381	0.168	-0.229	0.04
			total (X on Y)	-0.273	0.061	-4.492	0	-0.393	-0.154
			total indirect	-0.179	0.043	-7.603		-0.269	-0.1
		Physical	indirect	-0.089	0.083	-10.714		-0.247	0.078
		Social responsibility	indirect	0.001	0.066	-13.825		-0.130	0.131
		Intrapersonal	indirect	-0.031	0.065	-16.936		-0.167	0.091
		Interpersonal	indirect	-0.121	0.052	-20.047		-0.227	-0.021
		Impulse control	indirect	0.062	0.053	-23.158		-0.042	0.168
	Overall Social Role Performance		direct (X on Y)	-0.209	0.114	-1.839	0.066	-0.433	0.014
			total (X on Y)	-0.542	0.101	-5.377	0.000	-0.74	-0.344
			total indirect	-0.333	0.075	-8.915		-0.488	-0.192
		Physical	indirect	-0.05	0.138	-12.453		-0.319	0.232
		Social responsibility	indirect	0.083	0.107	-15.991		-0.13	0.291
		Intrapersonal	indirect	-0.152	0.123	-19.529		-0.41	0.078
		Interpersonal	indirect	-0.192	0.1	-23.067		-0.397	-0.004
		Impulse control	indirect	-0.021	0.093	-26.605		-0.197	0.167
	Depression		direct (X on Y)	0.861	1.048	0.821	0.421	-1.198	2.919
			total (X on Y)	5.05	0.956	5.283	0.000	3.173	6.928
			total indirect	4.19	0.707	9.745		2.941	5.707
		Physical	indirect	3.194	1.301	14.207		0.613	5.784
		Social responsibility	indirect	-0.707	0.989	18.669		-2.7	1.162
		Intrapersonal	indirect	0.579	1.158	23.131		-1.561	2.999
		Interpersonal	indirect	0.764	0.916	27.593		-0.992	2.634
		Impulse control	indirect	0.359	0.893	32.055		-1.359	2.13
	Psychiatric status		direct (X on Y)	-0.005	0.027	-0.18	0.857	-0.057	0.047
			total (X on Y)	0.046	0.023	1.998	0.046	0.001	0.092
			total indirect	0.051	0.018	4.176		0.015	0.087
		Physical	indirect	0.025	0.031	6.354		-0.036	0.086
		Social responsibility	indirect	-0.017	0.024	8.532		-0.065	0.029
		Intrapersonal	indirect	-0.001	0.027	10.71		-0.054	0.051
		Interpersonal	indirect	0.03	0.024	12.888		-0.017	0.077
		Impulse control	indirect	0.014	0.023	15.066		-0.03	0.059

Moderated Mediation

It was hypothesized (Research hypothesis 5) that participant significant other treatment participation as well as the participant's age at the time of treatment initiation and gender would moderate the associations between alcohol use and alcohol related

problems. More specifically, it was hypothesized that: participants's whose significant other participated in their AUD treatment would report fewer alcohol related problems post treatment that their counterparts whose significant other did not participate in their treatment (hypothesis 5A); that older age would be associated with more frequent alcohol related problems (hypothesis 5B); and that being female would be associated with fewer alcohol related problems (hypothesis 5C). To investigate the conditional indirect effects associated with each measure of alcohol use (i.e., PDA, DDD, PHD), DrInC total scores, and each psychosocial functioning variable (i.e., Socbeh, Socper, bdi scores, and Asipsy) with each moderator variable, conditional process analyses were conducted.

Significant others' treatment involvement

The test of moderation of the effect of alcohol use on DrInC total scores by significant others' treatment involvement yields a non-significant result presented Table 16. That is because the 95% confidence interval for the regression coefficient of the product of predictor variables (i.e., PDA, DDD, and PHD) and moderator variable (significant others; treatment involvement) includes zero, one cannot definitely claim that significant others' treatment involvement is moderating any mediation of the effect of alcohol use on the subsequent psychosocial functioning by the DrInC total scores.

However, a non-significant interaction in this analysis (i.e., a confidence interval for the interaction between alcohol use variables and significant others' treatment involvement that includes zero) does not imply the indirect effect is not moderated by significant others' treatment involvement because a_3 (see Figure 3) does not quantify the relationship between the moderator and the indirect effect but estimates only moderation effect of alcohol use and DrInC total scores by significant others' treatment involvement.

To be specific, moderated mediation analyses would yield the conclusion that the indirect effect of alcohol use on the subsequent psychosocial functioning through DrInC total scores is not moderated by significant others' treatment involvement although the indirect effects were all statistically significant (95% C.I does not contain zero) irrespective of the significant others' treatment involvement presented in Table 17.

Table 16. Conditional indirect effect (Moderator: Significant others' tx involvement)

moderated mediation (W: Significant others' tx attendance)					
Predictor	Outcome variable	index	BootSE	BootLLCI	BootULCI
PDA	Social Behavior	-0.03	0.03	-0.08	0.02
	overall social role performance	-0.03	0.05	-0.12	0.06
	depression	0.60	0.59	-0.55	1.81
	psychiatric status	0.01	0.01	-0.01	0.02
DDD	Social Behavior	0.00	0.01	-0.02	0.02
	overall social role performance	-0.01	0.02	-0.05	0.03
	depression	-0.05	0.24	-0.52	0.43
	psychiatric status	0.00	0.00	-0.01	0.01
PHD	Social Behavior	0.05	0.04	-0.03	0.12
	overall social role performance	0.06	0.07	-0.08	0.20
	depression	-0.98	0.83	-2.67	0.58
	psychiatric status	-0.01	0.01	-0.04	0.01

Table 17. Conditional direct and indirect effects for the conditional process model (W: Significant Others' tx involvement)

Variables	Indirect Effect					Direct Effect	
	a1 + a3W	b	(a1 + a3W)b	LLCI	ULCI	c'	p
W: Significant Others attendance (=0)							
PDA:socbeh	-24.33	-0.01	0.15	0.09	0.20	0.01	0.86
socper	-25.80	-0.01	0.26	0.17	0.35	0.10	0.19
bdi	-25.33	0.11	-2.76	-3.75	-1.91	-0.13	0.86
asi	-22.00	0.00	-0.04	-0.07	-0.02	0.02	0.29
DDD:socbeh	10.00	-0.01	-0.05	-0.07	-0.03	0.00	0.81
socper	9.70	-0.01	-0.10	-0.13	-0.07	-0.01	0.83
bdi	9.21	0.12	1.08	0.75	1.48	-0.26	0.29
asi	7.50	0.00	0.02	0.01	0.03	-0.01	0.47
PHD:socbeh	41.80	-0.01	-0.21	-0.30	-0.13	-0.10	0.15
socper	41.00	-0.01	-0.41	-0.56	-0.27	-0.17	0.13
bdi	41.47	0.10	4.23	2.85	5.82	1.20	0.26
asi	33.00	0.00	0.07	0.03	0.11	0.00	0.93
W: Significant Others attendance (=1)							
PDA: socbeh		-0.01	0.11	0.06	0.19	0.01	0.86
socper	-22.90	-0.01	0.23	0.13	0.35	0.10	0.19
bdi	-19.84	0.11	-2.16	-3.38	-1.10	-0.13	0.86
asi	-19.50	0.00	-0.04	-0.06	-0.02	0.02	0.29
DDD:socbeh	10.00	-0.01	-0.05	-0.08	-0.03	0.00	0.81
socper	10.50	-0.01	-0.11	-0.15	-0.07	-0.01	0.83
bdi	8.79	0.12	1.03	0.58	1.58	-0.26	0.29
asi	8.00	0.00	0.02	0.01	0.03	-0.01	0.47
PHD:socbeh	33.00	-0.01	-0.17	-0.28	-0.08	-0.10	0.15
socper	35.50	-0.01	-0.36	-0.53	-0.21	-0.17	0.13
bdi	31.90	0.10	3.25	1.72	5.13	1.20	0.26
asi	28.00	0.00	0.06	0.03	0.09	0.00	0.93

Age

The test of moderation of the effect of alcohol use on DrInC total scores by participants' age yields a non-significant result presented Table 18. That is because the 95% confidence interval for the regression coefficient of the product of predictor variables (i.e., PDA, DDD, and PHD) and moderator variable (participants' age) includes zero, one cannot definitely claim that age of participants is moderating any mediation of the effect of alcohol use on the subsequent psychosocial functioning by the DrInC total scores.

However, a non-significant interaction in this analysis (i.e., a confidence interval for the interaction between alcohol use variables and participants' age that includes zero) does not imply the indirect effect is not moderated by participants' age because a_3 (see Figure 3) does not quantify the relationship between the moderator and the indirect effect but estimates only moderation effect of alcohol use and DrInC total scores by participants' age. To be specific, moderated mediation analyses would yield the conclusion that the indirect effect of alcohol use on the subsequent psychosocial functioning through DrInC total scores is not moderated by participants' age although the indirect effects were all statistically significant (95% C.I does not contain zero) irrespective of the participants' age presented in Table 19.

Table 18. Conditional indirect effect (Moderator: age)

moderated mediation (W: age)					
Predictor	Outcome variable	index	BootSE	BootLLCI	BootULCI
PDA	Social Behavior	0.00	0.00	0.00	0.00
	overall social role performance	0.00	0.00	-0.01	0.00
	depression	0.03	0.02	-0.02	0.07
	psychiatric status	0.00	0.00	0.00	0.00
DDD	Social Behavior	0.00	0.00	0.00	0.00
	overall social role performance	0.00	0.00	0.00	0.00
	depression	0.01	0.24	-0.52	0.43
	psychiatric status	0.00	0.00	0.00	0.00
PHD	Social Behavior	0.00	0.00	0.00	0.00
	overall social role performance	0.00	0.00	-0.01	0.00
	depression	0.00	0.03	-0.05	0.06
	psychiatric status	0.00	0.00	0.00	0.00

Table 19. Conditional direct and indirect effects for the conditional process model (W: Age)

Variables	Indirect Effect					Direct Effect	
	a1 + a3W	b	(a1 + a3W)b	LLCI	ULCI	c'	p
W: Age (28 yrs old)							
PDA: socbeh	-29.8	0.0	0.1	0.1	0.2	0.0	0.9
socper	-26.7	0.0	0.3	0.2	0.4	0.1	0.2
bdi	-26.6	0.1	-2.8	-3.9	-1.9	-0.2	0.8
asi	-22.0	0.0	0.0	-0.1	0.0	0.0	0.4
DDD: socbeh	9.0	0.0	0.0	-0.1	0.0	0.0	0.8
socper	8.8	0.0	-0.1	-0.1	-0.1	0.0	0.8
bdi	8.6	0.1	1.0	0.7	1.3	-0.3	0.3
asi	7.0	0.0	0.0	0.0	0.0	0.0	0.5
PHD: socbeh	39.0	0.0	-0.2	-0.3	-0.1	0.1	0.1
socper	42.8	0.0	-0.4	-0.5	-0.2	-0.2	0.1
bdi	39.6	0.1	3.9	2.6	5.5	1.4	0.2
asi	58.0	0.0	0.1	0.0	0.1	0.0	0.8
W: Age (37 yrs old)							
PDA:socbeh	-27.40	-0.01	0.14	0.09	0.20	0.01	0.88
socper	-24.90	-0.01	0.25	0.17	0.34	0.10	0.17
bdi	-24.24	0.11	-2.57	-3.48	-1.81	-0.20	0.77
asi	-20.00	0.00	-0.04	-0.06	-0.02	0.01	0.41
DDD: socbeh	10.20	-0.01	-0.05	-0.07	-0.03	0.00	0.79
socper	10.10	-0.01	-0.10	-0.14	-0.07	-0.01	0.79
bdi	9.57	0.11	1.08	0.77	1.45	-0.26	0.30
asi	7.50	0.00	0.02	0.01	0.02	0.00	0.54
PHD: socbeh	39.40	-0.01	-0.20	-0.29	-0.12	0.10	0.13
socper	43.67	-0.01	-0.39	-0.53	-0.26	-0.18	0.11
bdi	39.86	0.10	3.91	2.68	5.36	1.36	0.19
asi	59.00	0.00	0.06	0.03	0.09	0.01	0.81
W: Age (50 yrs old)							
PDA: socbeh	-24.00	-0.01	0.12	0.08	0.18	0.01	0.88
socper	-22.30	-0.01	0.22	0.15	0.31	0.10	0.17
bdi	-20.83	0.11	-2.21	-3.13	-1.47	-0.20	0.77
asi	-17.50	0.00	-0.04	-0.06	-0.02	0.01	0.41
DDD: socbeh	12.00	-0.01	-0.06	-0.09	-0.04	0.00	0.79
socper	11.80	-0.01	-0.12	-0.16	-0.08	-0.01	0.79
bdi	10.90	0.11	1.23	0.84	1.71	-0.26	0.30
asi	9.00	0.00	0.02	0.01	0.03	0.00	0.54
PHD: socbeh	39.80	-0.01	-0.20	-0.29	-0.12	0.10	0.13
socper	45.00	-0.01	-0.41	-0.56	-0.27	-0.18	0.11
bdi	40.29	0.10	3.95	2.64	5.52	1.36	0.19
asi	60.00	0.00	0.06	0.03	0.10	0.01	0.81

Gender

The test of moderation of the effect of alcohol use on DrInC total scores by participants' gender yields a non-significant result presented Table 20. That is because the 95% confidence interval for the regression coefficient of the product of predictor variables (i.e., PDA, DDD, and PHD) and moderator variable (participants' gender) includes zero, one cannot definitely claim that gender of participants is moderating any mediation of the effect of alcohol use on the subsequent psychosocial functioning by the DrInC total scores.

However, a non-significant interaction in this analysis (i.e., a confidence interval for the interaction between alcohol use variables and participants' gender that includes zero) does not imply the indirect effect is not moderated by participants' gender because a_3 (see Figure 3) does not quantify the relationship between the moderator and the indirect effect but estimates only moderation effect of alcohol use and DrInC total scores by participants' gender. To be specific, moderated mediation analyses would yield the conclusion that the indirect effect of alcohol use on the subsequent psychosocial functioning through DrInC total scores is not moderated by participants' gender although the indirect effects were all statistically significant (95% C.I does not contain zero) irrespective of the participants' gender presented in Table 21.

Table 20. Conditional indirect effect (Moderator: gender)

moderated mediation (W: gender)					
Predictor	Outcome variable	index	BootSE	BootLLCI	BootULCI
PDA	Social Behavior	0.02	0.03	-0.03	0.08
	overall social role performance	0.05	0.05	-0.04	0.14
	depression	-0.48	0.54	-1.63	0.48
	psychiatric status	-0.01	0.01	-0.02	0.01
DDD	Social Behavior	-0.01	0.01	-0.03	0.01
	overall social role performance	-0.01	0.02	-0.05	0.02
	depression	0.13	0.21	-0.28	0.57
	psychiatric status	0.00	0.00	0.00	0.01
PHD	Social Behavior	-0.01	0.03	-0.08	0.06
	overall social role performance	-0.02	0.07	-0.15	0.11
	depression	0.20	0.71	-1.11	1.70
	psychiatric status	0.00	0.01	-0.02	0.02

Table 21. Conditional direct and indirect effects for the conditional process model (W: gender)

	Indirect Effect					Direct Effect	
Variables	a1 + a3W	b	(a1 + a3W)b	LLCI	ULCI	c'	p
W: Gender (=M)							
PDA:socbeh	-24.80	-0.01	0.12	0.08	0.18	0.01	0.81
socper	-22.60	-0.01	0.23	0.15	0.32	0.10	0.17
bdi	-22.06	0.11	-2.34	-3.18	-1.58	-0.18	0.79
asi	-18.00	0.00	-0.04	-0.06	-0.02	0.01	0.46
DDD: socbeh	9.60	-0.01	-0.05	-0.07	-0.03	-0.01	0.72
socper	9.50	-0.01	-0.10	-0.13	-0.07	-0.01	0.78
bdi	9.04	0.11	1.02	0.71	1.39	-0.26	0.28
asi	14.00	0.00	0.01	0.01	0.02	0.00	0.61
PHD: socbeh	38.00	-0.01	-0.19	-0.28	-0.11	-0.11	0.11
socper	42.78	-0.01	-0.39	-0.54	-0.26	-0.18	0.11
bdi	38.60	0.10	3.82	2.66	5.27	1.33	0.20
asi	57.00	0.00	0.06	0.03	0.09	0.01	0.74
W: Gender (=F)							
PDA:socbeh	-29.40	-0.01	0.15	0.09	0.22	0.01	0.81
socper	-28.00	-0.01	0.28	0.18	0.40	0.10	0.17
bdi	-26.60	0.11	-2.82	-4.17	-1.75	-0.18	0.79
asi	-21.00	0.00	-0.04	-0.07	-0.02	0.01	0.46
DDD: socbeh	10.80	-0.01	-0.05	-0.08	-0.03	-0.01	0.72
socper	10.60	-0.01	-0.11	-0.15	-0.07	-0.01	0.78
bdi	10.19	0.11	1.15	0.74	1.67	-0.26	0.28
asi	15.00	0.00	0.02	0.01	0.03	0.00	0.61
PHD: socbeh	39.40	-0.01	-0.20	-0.30	-0.12	-0.11	0.11
socper	45.00	-0.01	-0.41	-0.58	-0.26	-0.18	0.11
bdi	40.58	0.10	4.02	2.50	5.96	1.33	0.20
asi	57.00	0.00	0.06	0.02	0.10	0.01	0.74

Drinker Group Stability

Overall, the drinker groups were moderately stable across the time periods (i.e., Months 1-6 and Months 10-15), although there also was considerable transitioning across drinker groups. In this regard, of the 710 individuals included in the drinker stability analyses, 430 (61%) remained stable across drinker classification periods (i.e., months 1-6 and months 10-15). More specifically, 61 (57.5 %) participants initially classified in the abstainer group were reclassified within the abstainer during the subsequent follow-up months 10-15, while 24.5 % (n= 26) and 10.4 % (n=11) of the abstainers transitioned to the moderate and heavy drinker groups, respectively. Furthermore, 81 (47.4%) individuals initially classified within the moderate drinker group were reclassified within the moderate drinker group, while 13.5 % (n= 23) and 34 % (n= 58) of the moderate drinkers transitioned to the abstainer and heavy drinker groups, respectively. Among the 433 individuals initially classified within the heavy drinker group, 288 (66.5%) were reclassified within the heavy drinker group, while 8.3 % (n= 36) and 17.3 % (n= 75) were transitioned to the abstainers and moderate drinkers group, respectively. Information specific to drinker group classifications and drinker group transitions are presented in Table 22.

Table 22. Participants' months 1-6 drinker group classification and classification at months 10-15

			Drinking Group (months 10-15)				
			abstainer	Moderate drinker	Heavy drinker	Missing	total
Drinking Group (months 1-6)	abstainer	Count	61	26	11	8	106
		% within Drinking group (m 1-6)	57.5	24.5	10.4	7.6	100.00%
	Moderate drinker	count	23	81	58	9	171
		% within Drinking group (m 1-6)	13.5	47.4	34	5.1	100.00%
	Heavy drinker	Count	36	75	288	34	433
		% within Drinking group (m 1-6)	8.3	17.3	66.5	7.9	100.00%
	total		120	182	357	51	710

Associations between transition of drinking group status and psychosocial functioning

Given the variability in the drinker group transition data (see Table 17), it is of interest to further explore how drinker group transitions affected psychosocial functioning. Overall, 134 individuals transitioned to a lower alcohol consumption drinker group, while 95 individuals transitioned to a greater alcohol consumption drinker group. Based on the drinker group transition data four drinker transition groups were formed: 1) stable abstainer/moderate drinkers; 2) abstainer/moderate drinkers who transition to the heavy drinkers group; 3) heavy drinkers who transitioned to the abstainer/moderate drinkers group; and 4) stable heavy drinkers. Participant psychosocial functioning during follow-up month 13 through 15 post AUD treatment initiation was contrasted across the

four drinker transition groups. Sample sizes associated with each drinker classification transition group is presented in Table 23.

Table 23. Drinker Group Transition

Transition Drinker Groups	Value Label	N
1	ab/ mod → ab/mod	111
2	ab/ mod → heavy	11
3	heavy → ab /mod	69
4	heavy → heavy	377
notes: ab/mode: abstainer / moderate drinkers, heavy: heavy drinkers		

One-way analysis of variance and chi-square procedures were used to test for baseline alcohol use and treatment group assignment differences across drinker transition groups. Baseline alcohol use differed significantly across the drinker transition groups. More specifically, baseline drinks per drinking day was greater among those who transitioned from heavy drinker group to the abstainer/moderate drinker group relative to those classified with the stable abstainer/moderate drinker group (Tukey's test, $p < 0.05$) and percent heavy drinking days was greater among those classified within the stable heavy drinker group relative to those classified within the stable abstainer/moderate drinker group (Tukey's test, $p < 0.05$). A disproportionate number of individuals transitioning from the abstainer/moderate drinker group to the heavy drinker classification group (i.e., Group 2) were assigned to receive the Twelve Step Facilitation (TSF) Project MATCH. An ANCOVA incorporating these variables as well as baseline variables (i.e., Socbeh, Socper, depression, Asipsy) as covariates was conducted on later psychosocial functioning to test for drinker transition group differences.

As expected, psychosocial functioning varied significantly across drinker transition group ($F = 5.85$, 12/1474 df, $p < 0.001$). More specifically, post hoc analyses indicated that stable heavy drinkers reported poorer Socbeh functioning relative to individuals classified within either the stable abstainer/moderate drinker group (Tukey's test, $p < 0.05$) or the heavy to abstainer/moderate drinker transition group (Tukey's test, $p < 0.05$. Alternatively, individuals classified within either the stable abstainer/moderate drinker group or the heavy to abstainer/moderate drinker group reported better social performance relative to those classified within either the abstainer/moderate drinker transition group (Tukey's test, $p < 0.05$). Individuals classified within either the stable abstainer/moderate drinker or the heavy to abstainer/moderate drinker transition group reported significantly fewer depressive symptoms (i.e., lower BDI scores) relative to those individuals classified within either the abstainer/moderate drinker to heavy drinker transition group (Tukey's test, $p < 0.05$) or the stable heavy drinker group (Tukey's test, $p < 0.05$). More detailed post hoc comparison data is presented in Table 24.

Table 24. Pairwise comparison between two transitioned groups for psychosocial functioning

Dependent Variable	(A) Group transition	(B) Group transition	Mean Difference	Std. Error	Sig.	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
Socbeh- 15 Month	Group 1	Group 2	0.12	0.06	0.21	-0.03	0.27
		Group 3	0.02	0.05	1.00	-0.12	0.16
		Group 4	.192*	0.04	0.00	0.09	0.29
	Group 2	Group 1	-0.12	0.06	0.21	-0.27	0.03
		Group 3	-0.10	0.07	0.81	-0.27	0.07
		Gropu 4	0.07	0.05	1.00	-0.07	0.21
	Group 3	Group 1	-0.02	0.05	1.00	-0.16	0.12
		Group 2	0.10	0.07	0.81	-0.07	0.27
		Group 4	.168*	0.05	0.00	0.04	0.30
	Group 4	Group 1	-.192*	0.04	0.00	-0.29	-0.09
		Group 2	-0.07	0.05	1.00	-0.21	0.07
		Group 3	-.168*	0.05	0.00	-0.30	-0.04
Socper- 15Month	Group 1	Group 2	.303*	0.10	0.01	0.05	0.56
		Group 3	-0.04	0.09	1.00	-0.28	0.19
		Group 4	.338*	0.07	0.00	0.17	0.51
	Group 2	Group 1	-.303*	0.10	0.01	-0.56	-0.05
		Group 3	-.344*	0.11	0.01	-0.64	-0.05
		Gropu 4	0.04	0.09	1.00	-0.21	0.28
	Group 3	Group 1	0.04	0.09	1.00	-0.19	0.28
		Group 2	.344*	0.11	0.01	0.05	0.64
		Group 3	.380*	0.08	0.00	0.16	0.60
	Group 4	Group 1	-.338*	0.07	0.00	-0.51	-0.17
		Group 2	-0.04	0.09	1.00	-0.28	0.21
		Group 3	-.380*	0.08	0.00	-0.60	-0.16
BDI scores - 15 Month	Group 1	Group 2	-3.314*	0.93	0.00	-5.78	-0.85
		Group 3	0.91	0.85	1.00	-1.34	3.16
		Group 4	-3.710*	0.63	0.00	-5.37	-2.05
	Group 2	Group 1	3.314*	0.93	0.00	0.85	5.78
		Group 3	4.223*	1.06	0.00	1.43	7.02
		Gropu 4	-0.40	0.88	1.00	-2.72	1.93
	Group 3	Group 1	-0.91	0.85	1.00	-3.16	1.34
		Group 2	-4.223*	1.06	0.00	-7.02	-1.43
		Group 4	-4.619*	0.79	0.00	-6.71	-2.53
	Group 4	Group 1	3.710*	0.63	0.00	2.05	5.37
		Group 2	0.40	0.88	1.00	-1.93	2.72
		Group 3	4.619*	0.79	0.00	2.53	6.71
Asipsy- 15 Month	Group 1	Group 2	-0.05	0.02	0.13	-0.11	0.01
		Group 3	0.00	0.02	1.00	-0.05	0.05
		Group 4	-0.03	0.02	0.45	-0.07	0.01
	Group 2	Group 1	0.05	0.02	0.13	-0.01	0.11
		Group 3	0.05	0.03	0.25	-0.02	0.12
		Gropu 4	0.03	0.02	1.00	-0.03	0.08
	Group 3	Group 1	0.00	0.02	1.00	-0.05	0.05
		Group 2	-0.05	0.03	0.25	-0.12	0.02
		Group 4	-0.03	0.02	0.95	-0.08	0.02
	Group 4	Group 1	0.03	0.02	0.45	-0.01	0.07
		Group 2	-0.03	0.02	1.00	-0.08	0.03
		Group 3	0.03	0.02	0.95	-0.02	0.08

Note: n= 568, Group 1: Abstainer/Moderate drinker - Abstainer/Moderate drinker, Group 2: Abstainer/Moderate drinker – Heavy Drinker, Group, Group 3: Heavy Drinker - Abstainer/Moderate drinker, Group 4: Heavy Drinker - Heavy Drinker, *: The mean difference is significant at the .05 level.

Chapter V: Discussion

Among AUD clinical samples, alcohol use is a significant predictor of subsequent psychosocial functioning. In this regard, this dissertation provides support for a significant inverse association between continued alcohol use posttreatment initiation and subsequent psychosocial functioning (i.e., greater alcohol use was associated with poorer psychosocial functioning). More specifically, continued alcohol use was associated with four measures of psychosocial functioning (i.e., social behavior, overall social role performance, depression, and psychiatric status), although the magnitude (i.e., statistical significance) of these associations varied across outcome measure. For example, only the heavy drinking measure (i.e., PHD) correlated significantly with subsequent psychiatric status. One possible explanation for this pattern of associations is that both frequency and volume of alcohol use can independently contribute to poor social behavior and/or social performance (e.g., frequent alcohol use can lead to marital difficulties and a single drinking occasion can lead legal, marital, and financial difficulties resulting from a DUI/DWI or alcohol related injury), and depression is often co-morbid with AUD; therefore, even moderate amounts of alcohol may exacerbate depressive symptoms. Frequent heavy drinking, on the other hand, has been associated with poorer mental health as well as poorer physical health (Rehm, Baliunas, Borges, Graham, Irving, Kehoe, ..., & Roerecke, 2010).

Greater alcohol use post AUD treatment initiation also was associated with a greater occurrence of alcohol problems, and a greater occurrence of alcohol problems was associated with poorer psychosocial functioning. The hypothesized mediation model depicted in Figure 2, regarding alcohol use, alcohol related problems, and psychosocial

functioning, fit the data well as reflected by the fit indexes and the tests of model paths. Thus, it appears that individuals suffering AUD are likely to experience alcohol related problems that place them at greater risk for poorer psychosocial functioning. These findings are consistent with the earlier work published by Maisto and colleagues (2007a) showing that psychosocial functioning three years post treatment initiation varied across drinker groups (i.e. formed on the basis of self-reported alcohol use during study months one thru six post treatment initiation) such that individuals classified with the abstainer and light/moderate drinker groups reported better psychosocial functioning and fewer alcohol related problems than those individuals classified within the heavy drinker group.

In addition, the significant associations (i.e., total effects) detected between alcohol use (i.e., PDA, DDD, PHD) and subsequent psychosocial functioning (i.e., social behavior, overall social role performance, and depression) were observed indirectly via the effects of alcohol related problems on the associations between alcohol use and subsequent psychosocial functioning. These findings suggest that individuals who drink less frequently experience fewer alcohol related problems, and better subsequent psychosocial functioning. Alternatively, individuals who consume larger amounts of alcohol per drinking occasion are likely to experience a greater number of alcohol related problems and subsequently, poorer psychosocial functioning. Furthermore, individuals who engage in frequent heavy drinking are more likely to experiences more occurrences of alcohol related problems, which in turn contribute to poorer subsequent psychosocial functioning and more severe psychiatric symptomatology.

A major clinical implication of these findings is that a period of abstinence, or at least a period with few heavy drinking episodes, during the first six-months posttreatment

initiation, is important for better longer term psychosocial functioning. Consequently, targeting AUD interventions/treatments to mitigate/resolve alcohol related problems (e.g., provide coping skills training) in addition to providing support for abstinence and the avoidance of heavy drinking episodes during the first six-months post treatment initiation period may contribute to improved psychosocial functioning at later time points.

Moderated-mediation effects

This study's proposed moderated-mediation hypotheses were not supported. In this regard, the indirect effects of alcohol use on subsequent psychosocial functioning via alcohol related problems did not differ with respect to participant significant-other treatment involvement, age, or gender. These results were somewhat surprising, as prior research has shown each of these variables (i.e., participant other treatment involvement, participant age, participant gender) to influence AUD treatment outcomes (McCrady & Epstein, 1991; Sobell et al., 2000; Dauber, Pogarell, Kraus, & Braun, 2018; Greenfield, pettinati, O'Malley, Randall, & Randall, 2010). The failure to detect a moderate effect for significant-other treatment participation may be due to the fact that Project MATCH limited significant-other treatment participation to two treatment session, which may be insufficient for altering clinical outcomes. The lack of a statistically significant moderation effect for participant age may be due to the fact that the DrInC measure captures occurrences of alcohol related problems and does not measure problem severity. Older age is often associated with a longer drinking history and thus, alcohol related problems may become more severe with age (e.g., physical and psychological problems

associated with prolonged chronic alcohol use), and require a greater period of time for resolution. Similarly, women often experience more severe alcohol problems within a shorter timeframe than their male counterparts. Therefore, problem severity may be more associated with both participant age and gender than the occurrence of problems.

Drinker group stability and psychosocial functioning

A majority of study participants were reclassified within the same drinker group. Yet, there was considerable instability across drinker groups as approximately 40% of the sample transitioned from one drinker group to another. Individuals initially classified within the moderate drinker group were more than three times as likely to transition to heavy drinking than those initially classified within the abstainer group, which has significant clinical implications with respect to subsequent psychosocial functioning. Individuals who either remained stable within the heavy drinker group or who transitioned to the heavy drinker group reported poorer psychosocial functioning than those classified within the abstainer or moderate drinker groups, irrespective of whether they remained stable within the abstainer or moderate drinker group or transitioned to one of these two drinker groups. Therefore, it appears that abstinence, or at least the avoidance of frequent heavy drinking, during the first six-months posttreatment initiation is critical for better longer-term psychosocial functioning. These findings are consistent with previous research identifying the first year following AUD treatment as a critical period for relapse (e.g., Connors et al., 1996) as well as the earlier work of Maisto and colleagues (2006) that showed better psychosocial functioning was associated with

abstinence and the avoidance of heavy drinking during the first year following treatment initiation.

Study limitation

Project MATCH was one of the more methodologically rigorous psychosocial based AUD treatment outcomes trials ever conducted and more significant study limitations associated with Project MATCH have been addressed elsewhere (Project MATCH Research Group, 1997). Irrespective of the methodological rigor associated with Project MATCH, a number of methodological limitations are associated with this research and must be taken into consideration when interpreting study results. The more substantial limitations include: the use of self-reported retrospective data; Project MATCH inclusion/exclusion criteria, conducting secondary data analyses; and the operationalization of drinker stability groups based on two time points. With respect to self-reported retrospective data collection, an individual's retrospective, reconstruction of behavior and events is often biased (Bradbrun, Rips, & Shevell, 1987). Project MATCH, however, implemented a number of procedures to ensure the reliability and validity of participant self-report data. For example, collateral informants and laboratory tests were utilized to corroborate self-reported measures. Collaterals were interviewed at baseline, 3, 9, and 15 months, and participant blood and urine samples were taken at the same time points. A test-retest reliability study of self-reported drinking and drug use measures found consistency across and within sites. Lab tests were highly consistent with self-reported drug and/or alcohol use at baseline and follow-up points. These procedures, as noted by Project MATCH investigators, indicated that "a high degree of confidence can

be place in the accuracy of the verbal report data obtained in Project MATCH" (Project MATCH Research Group, 1997, p. 12).

Inclusion/exclusion criteria associated with Project MATCH were such that individuals meeting other substance use dependence criteria (excluding marijuana), intravenous drug use during the 6-month period prior to recruitment intake, experiencing acute psychosis or considered harmful to self or others, could not demonstrate residential stability, or could not provide the name of a contact (i.e., locator) person were excluded from participation. Therefore, the Project MATCH study sample may less severe and/or better prognosis patients than is typically seen in many AUD treatment programs. Consequently, the Project MATCH sample is not representative of the overall AUD treatment seeking population and the generalizability of study results must be limited to similar individuals.

The current research employed secondary data analyses to investigate study hypotheses, which precludes inferences of causation. The use of longitudinal data for mediation analyses, however, provide a stronger approximation to sequences of causal relationships among the constructs, although inferences of causation are precluded due to the secondary data analytic approach used to investigate study hypotheses. The operationalization of drinker stability groups was based on two time points, which is insufficient for capturing all possible alcohol use transitions during the follow-up period. The clinical course of AUD is such that alcohol use and alcohol related problems are highly variable as individuals move in and out of problem drinking behavior (Maisto, Kirouac, & Witkiewitz, 2014). Nevertheless, the two drinker groups afford an

opportunity to view drinking behavior across an extended period and to assess the extent to which transitions in alcohol use affect subsequent psychosocial functioning.

Conclusions

The purpose of this dissertation was to examine the associations among alcohol use, alcohol related problems, and psychosocial functioning, and replicates and extends earlier research on the association between alcohol use and longer-term psychosocial functioning. Study findings showed that the associations between alcohol use post AUD treatment initiation and later psychosocial functioning varied based on the variable measured (e.g., PDA, DDD, PHD, social behavior, psychiatric status). Overall, alcohol use post AUD treatment initiation was negatively associated with subsequent psychosocial functioning. For example, frequent and intense alcohol use (i.e., greater DDD and PHD) was associated with poorer psychosocial functioning (i.e., social behavior, overall social role performance, depression, psychiatric status). Moreover, the mediation model indirect effects were such that greater alcohol consumption contributed to increased alcohol related problems, which in turn contributed to decreased psychosocial functioning. These findings suggest that alcohol use and alcohol related problems are important determinants of psychosocial functioning and highlight the importance of avoiding frequent heavy alcohol use during the early posttreatment initiation period.

The present study focused exclusively on the relationships among alcohol use, alcohol related problems, and psychosocial functioning, but other factors are likely to be equally important predictors/moderators of psychosocial functioning (e.g., coping skills,

stress, self-efficacy, craving, and social support). The assessment of these factors as potential moderators of the mediation models examined in this dissertation could provide a deeper understanding of the factors related to post AUD treatment functioning and the development of more effective AUD treatments.

Given the secondary data analytic approach used in this investigation combined with obtained study results, further research in this area is warranted. Investigations examining AUD clinical course and the factors that influence alcohol use post AUD treatment initiation may provide more in-depth understanding of the factors that affect AUD clinical course and potentially contribute to the development of more effective AUD interventions/treatments. Furthermore, such efforts may contribute to the refinement of AUD treatments and enhanced theoretical reasoning regarding the treatment of AUD.

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Appendix I. DrInC subscales and Items

subscales	Number of items	Items
Physical	8	1. I have had a hangover after drinking 8. After drinking, I have had trouble sleeping, staying asleep, or nightmares. 11. I have been sick and vomited after drinking 13. Because of my drinking, I have not eaten properly 24. My physical health has been harmed by my drinking 29. My physical appearance has been harmed by my drinking 33. My sex life has been suffered because of my drinking 48. While drinking or intoxicated, I have been physically hurt, injured, or burned
Intrapersonal	8	2. I have felt bad about myself because of my drinking. 12. I have been unhappy because of my drinking. 16. I have felt guilty or ashamed because of my drinking. 18. When drinking, my personality has changed for the worse. 34. I have lost interest in activities and hobbies because of my drinking. 36. My spiritual or moral life has been harmed by my drinking. 37. Because of my drinking I have not had the kind of life I want. 38. My drinking has gotten in the way of my growth as a person.
Interpersonal	10	4. My family or friends have worried or complained about my drinking. 7. My ability to be a good parent has been harmed by my drinking. 17. While drinking I have said or done embarrassing things. 21. While drinking, I have said harsh or cruel things to someone. 27. My marriage or love relationship has been harmed by my drinking. 30. My family has been hurt by my drinking. 31. A friendship or close relationship has been damaged by my drinking. 39. My drinking has damaged my social life, popularity, or reputation. 43. I have lost a marriage or a close love relationship because of my drinking. 46. I have lost a friend because of my drinking.

Social responsibility	7	3. I have missed days of work or school because of my drinking. 6. The quality of my work has suffered because of my drinking. 14. I have failed to do what is expected of me because of my drinking. 20. I have gotten into trouble because of drinking. 26. I have had money problems because of my drinking. 40. I have spent too much or lost a lot of money because of my drinking. 44. I have been suspended/fired from or left a job/school because of my drinking.
Impulse Control	12	9. I have driven a motor vehicle after having three drinks or more. 10. My drinking has caused me to use other drugs more. 19. I have taken foolish risks when I have been drinking. 22. When drinking, I have done impulsive things that I regretted later. 23. I have gotten into a physical fight while drinking. 28. I have smoked more when I am drinking. 32. I have been overweight because of my drinking. 41. I have been arrested for driving under the influence of alcohol. 42. I have had trouble with the law (other than DWI) because of my drinking. 47. I have had an accident while drinking or intoxicated. 49. While drinking or intoxicated, I have injured someone else. 50. I have broken things or damaged property while drinking or intoxicated.

Appendix II. Psychosocial Functioning subscales and Items

subscale	Number of items	item
Social Behavior	10	1. Did you avoid talking with family members or friends? 2. Did you have to rely on others to make your decisions for you? 3. Did your family or friends upset you? 4. Did you have heated arguments with other people? 5. How often were you upset, angry, or disappointed with the way people did things? 6. Did you feel your family or your friends did not trust you? 7. Did you feel anxious or afraid when you were with other people? 8. Did you demand that others do things your way? 9. Did you do things that upset your family and friends? 10. Did you do things when you were in public that other people did not like? (belching, spitting, earing inappropriate clothing, etc.)
Overall Social role Performance	5	11. As a spouse or mate, how well have you been doing this past month? 12. As a parent/guardian, how well have you. Being doing this past month? 13. As a friend, how well have you been doing this past month? 14. Did you feel satisfied with leisure, social, or recreational activities? 19. As a housemate/roommate, how well have you been doing this past month?
Housemate/Roommate Role	4	This past month, how often did you: 15. have to rely on the people you lived with to do your share of the household chores or duties (e.g., cleaning, shopping, washing dishes)? 16. and your housemate(s)/roommate(s) argue over spending and household expenses? 17. argue or get very angry with any of the people you live with? 18. Do you have any living habits which sometimes disturb the people you live with (for example, making a lot of noise, using housemate's possessions without asking, untidiness)?

Appendix III. Beck Depression Inventory items

1. Feeling sad
2. Discouraged about future
3. Feeling like a failure
4. Anhedonia
5. Guilt
6. Disappointment with self
7. Self-blame
8. Self-blame
9. Suicidal ideation
10. Crying
11. Irritability
12. Losing interest in others
13. Indecisiveness
14. Physical appearance
15. Ability to work
16. Sleep problems
17. Fatigue
18. Appetite
19. Weight loss
20. Concerns about health
21. Sexual disinterest

Notes: Each item asking the symptom severity scored on a scale of 0 to 3

Appendix IV. Addiction Severity Index Psychiatric Status items

How many times have you been treated for any psychological or emotional problems:	
1.	In a hospital or inpatient setting?
2.	Outpatient/private patient?
3.	Do you receive a pension for a psychiatric disability?
Have you had a significant period of time (that was not a direct result of drug/alcohol use) in which you have:	
4.	Experienced serious depression
5.	Experienced serious anxiety or tension
6.	Experienced hallucinations
7.	Experienced trouble understanding, concentrating or remembering
8.	Experienced trouble controlling violent behavior including episodes or rage or violence
9.	Experienced serious thoughts of suicide
10.	Attempted suicide
11.	Been prescribed medication for any psychological or emotional problems
12.	How many days in the past 30 have you experienced these psychological or emotional problems?