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# Toward a Model of 12-Step Engagement: Predicting Recovery Involvement in Narcotics Anonymous

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**TOWARD A MODEL OF STRESS AND 12-STEP ENGAGEMENT:  
PREDICTING RECOVERY INVOLVEMENT IN NARCOTICS ANONYMOUS**

**by**

**Hillary Howrey, M.S.**

A Dissertation Presented to the College of Psychology  
of Nova Southeastern University  
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This dissertation was submitted by Hillary Howrey under the direction of the Chairperson of the dissertation committee listed below. It was submitted to the School of Psychology and approved in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Clinical Psychology at Nova Southeastern University.

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Date of Final Approval

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**ABSTRACT**

Substance use disorders (SUDs) affect a significant portion of the population and are noteworthy public health concerns. Mutual help organizations (MHOs) such as Alcoholics Anonymous and Narcotics Anonymous are considered evidence-based practices for SUDs. Despite a growing body of research examining mechanisms of change in MHOs, relatively few investigations of 12-step organizations have been theory-driven. Theory-based models of recovery provide a more comprehensive view of the range of individual factors affecting individuals in recovery and how and why they might engage in recovery-related behaviors. Stress and coping theory fills a gap in explaining how improvements occur as a result of MHO recovery engagement from a bio-psycho-social perspective. Although some recovery program-related mechanisms of change in MHOs have proven to be important factors in promoting long-term recovery from SUDs, fewer studies have examined what factors may influence participation in recovery practices. Using a sample of community-based Narcotics Anonymous members from 26 U.S. states, the relationships between stress and engagement in various recovery practices are examined from the perspective of a psychobiological, SUD-specific stress and coping



framework. It is hypothesized that the relationship between stress and recovery practice engagement is moderated by abstinence duration, such that individuals at lower levels of abstinence duration would have fewer coping resources to mitigate stress and therefore would evidence a greater association between stress and engagement in higher levels of recovery practices. Results indicated the stress-recovery practice involvement relationship was not moderated by abstinence duration, and stress was not significantly associated with any recovery practices. However, helpfulness of social support received from individuals in recovery, abstinence duration, neuroticism, and substance use severity all significantly predicted recovery practice involvement. Gaining additional understanding of mechanisms that influence recovery involvement will allow clinicians and researchers to enhance interventions and facilitate involvement in beneficial aspects of recovery programs.

*Keywords:* Narcotics Anonymous, 12-step recovery, stress, coping, mutual help, recovery involvement

## **CHAPTER 1**

### **Review of the Literature and Problem**

Substance use disorders (SUDs) are a noteworthy public health issue, with lifetime prevalence rates of between 9.9% (drug use disorders) and 29.1% (alcohol use disorders) (Grant, Goldstein, et al., 2015; Grant, Saha, et al., 2015), economic costs of more than \$400 billion, and half a million deaths annually (Horgan, Skwara, & Strickler, 2001). Twelve-step mutual help organizations (MHOs) such as Alcoholics Anonymous (AA) and Narcotics Anonymous (NA) are flexible, community-based recovery management resources with strong empirical support; they have been shown to lessen the burden of SUDs in a variety of ways and are a commonly utilized option for individuals with SUDs (E. Cohen, Feinn, Arias, & Kranzler, 2007; Ferri, Amato, & Davoli, 2006; Humphreys, 2004; Kelly & Yeterian, 2012; Weisner, Greenfield, & Room, 1995).

Since their beginnings in the 1930s (AA) and 1950s (NA), 12-step-based MHOs have grown substantially. Alcoholics Anonymous currently offers over 100,000 groups worldwide, with over one million U.S. members (Humphreys, 2004); Narcotics Anonymous currently supports over 25,000 groups worldwide, with nearly 200,000 U.S. members (Humphreys, 2004; Narcotics Anonymous World Services, 2013). Substance-focused MHOs share several qualities that make them attractive options for individuals with SUDs and also set them apart from professional treatment programs. These include a lack of fees, voluntary association, self-governance, reciprocal helping, and shared personal change goals (Humphreys, 2004). Although there is a burgeoning body of research examining AA and AA-related outcomes, limitations of this literature include a

focus on short-term abstinence-related outcomes (less than one year), and a relative paucity of studies examining other MHOs such as NA (Humphreys et al., 2004).

### **Effectiveness of Mutual Help Organizations**

A number of studies have concluded that MHOs offer a variety of beneficial outcomes and correlates, including long-term abstinence (Humphreys & Moos, 2007; Pagano, White, Kelly, Stout, & Tonigan, 2012), improvements in social networks (Groh, Jason, & Keys, 2008), psychopathology symptoms (Kelly, Stout, Magill, Tonigan, & Pagano, 2010; Wilcox, Pearson, & Tonigan, 2015) life satisfaction and quality of life (Laudet, Morgen, & White, 2006; Laudet & White, 2008), and coping resources (Humphreys, Finney, & Moos, 1994; Humphreys, Mankowski, Moos, & Finney, 1999). In addition, referral to 12-step programs has been shown to reduce health care costs over non-12-step-based professional treatment (Humphreys & Moos, 2001). Furthermore, research on what types of individuals benefit the most from AA involvement has indicated that for individuals with social networks supportive of drinking, those with less severe psychiatric symptoms and with more severe substance use problems benefit more from a 12-step facilitation (TSF) and subsequent AA attendance than from cognitive-behavioral therapy (Cooney, Babor, DiClemente, & Del Boca, 2003; Project MATCH Research Group, 1997).

Additional research found that involvement in prescribed 12-step practices (e.g., having a sponsor, service work) yielded abstinence and psychosocial benefits over and above simply attending 12-step meetings (Gomes & Hart, 2009; Weiss et al., 2005; Zemore, Subbaraman, & Tonigan, 2013). Several types of variables that play a role in producing AA-related change have been described in empirical literature and include:

general mechanisms of change (e.g., changes in self-efficacy and coping), AA-specific practices (e.g., 12-step meeting attendance, reading organization literature, step work), and social-spiritual factors (e.g., fellowship, changes in spirituality and spiritual practices; Kelly, Magill, & Stout, 2009). Due to their relevance in professional treatment, many studies have examined the common factors that may serve as mechanisms of change in AA. However, far fewer studies have examined AA/NA-specific recovery practices and social-spiritual mechanisms of change.

### **Factors Influencing MHO Affiliation and Involvement**

Studies have demonstrated that active involvement in MHOs is more beneficial than simple meeting attendance (e.g., Montgomery, Miller, & Tonigan, 1995; Weiss et al., 2005). As a result, measures of affiliation rather than attendance alone are typically more predictive of outcomes in statistical models (Bogenschutz, 2008), but relatively few studies have examined what factors may predict involvement in specific recovery practices or activities. Instead, many studies have examined characteristics of individuals who attend MHOs. While this information is clinically useful (e.g., for making post-treatment recommendations or referrals), there is little information to demonstrate how certain types of individuals may use components of the recovery program (e.g., engagement in sponsorship relationships, helping/service). For instance, it may be that individuals with high levels of stress engage in a number of prescribed recovery practices with regularity. The most common characteristics that have been examined in relationship to recovery engagement are demographic factors (e.g., age, race), substance-related factors (e.g., substance use severity, treatment history), and individual factors known to affect affiliation with MHOs more generally (e.g., spirituality). The following

section will review information currently available regarding factors and characteristics that influence MHO affiliation with additional focus on predicting involvement in specific recovery practices when possible. Selected characteristics included in the present study are presented first, followed by an overview of other factors and characteristics which will not be examined in the present study but are important to consider nonetheless.

**Age.** While MHOs are attended by individuals from a wide range of ages, the vast majority of empirical literature has focused on adults relative to adolescents and young adults. Therefore, there is little research examining age as a predictor of MHO participation. However, it seems likely that some of the mechanisms driving 12-step affiliation and the resulting outcomes among young people are similar to those found in adults (Bogenschutz, 2008), although there are likely additional, unique, pathways through which these outcomes are achieved in young adults (Hoepfner, Hoepfner, & Kelly, 2014). For example, in a study of adolescents ( $N = 74$ ) higher levels of substance misuse were associated with higher levels of AA attendance three months post-treatment; there was also a positive association between AA attendance and abstinence for this group (Kelly, Myers, & Brown, 2002).

**Gender.** The effect of gender on 12-step group attendance and outcomes has been of empirical interest due to the perception that 12-step groups may often subscribe to sexist ideas and traditional gender stereotypes (Wilke, 1994). No standard pattern of results has emerged in this area of research; rather, some studies have found that men derive more benefit from 12-step attendance than women (e.g., Moos, Schutte, Brennan, & Moos, 2004), while others have observed no gender effect on attendance or benefit

(e.g., Slaymaker & Owen, 2006; Kelly & Hoepfner, 2013), and yet others have found that women attend and benefit from 12-step attendance more than men (e.g., Moos, Moos, & Timko, 2006; Timko, Moos, Finney, & Connell, 2002). However, a large seven-year longitudinal study of individuals seeking treatment for alcohol misuse ( $N = 926$ ) found that there were no substantial differences between men ( $n = 566$ ) and women ( $n = 360$ ) on attendance or 12-step participation, but there were some individual differences that appeared to influence how men and women engaged in recovery (Witbrodt & Delucchi, 2011). For instance, women with higher psychiatric severity scores were more involved with AA, but had lower levels of AA involvement at higher levels of drug severity relative to men. Women were also more likely to remain abstinent over time. In contrast to women, men with higher baseline religiosity scores had greater levels of AA participation. In a moderated mediation analysis using Project MATCH data, men and women were both found to benefit from changes in social networks, but men benefitted more relative to women with regard to percent of days abstinent and drinks per drinking day (Kelly & Hoepfner, 2013). Collectively, there appear to be more similarities than differences in how men and women participate in AA. Given that the aforementioned studies involve a variety of sample types (i.e., post-treatment, community-based), it is possible that selection variables inherent in each sample type have limited the consistency of these findings. For example, a community-based study of late middle-aged participants ( $N = 1,291$ ; Moos et al., 2004) found that men appeared to benefit more from AA affiliation than women. Conversely, a study using a post-treatment sample ( $N = 212$ ; Slaymaker & Owen, 2006) indicated no gender differences in the rate of AA attendance, or in the likelihood of having or being a sponsor. More research is

needed on how gender may impact MHO involvement across a variety of contexts (i.e., post-treatment, community-based, and MHO-specific samples).

**Substance use severity.** Across a variety of studies, results have consistently indicated that individuals who affiliate with 12-step organizations typically have higher levels of substance use severity and a more extensive substance use history relative to those who do not attend 12-step organizations (Bogenschutz, 2008; Emrick, Tonigan, Montgomery, & Little, 1993). In a meta-analysis (Emrick et al., 1993), daily alcohol consumption, physical alcohol dependence, severity of physical dependence, obsessive-compulsive drinking style, and perceived loss of control all were correlated with AA affiliation. Although these factors may all be related to substance use severity, it is probable they are also highly intercorrelated with other factors (e.g., psychological and biological stress load). Given that higher substance use severity among 12-step members relative to treatment-seeking non-members is one of the most consistent results across all studies of MHO affiliation, it is important to investigate if severity predicts different patterns of involvement beyond basic MHO affiliation.

**Other factors influencing MHO affiliation and involvement.**

*Dual SUD diagnosis and psychiatric comorbidity.* Concurrently experiencing more than one SUD or the combination of an SUD and another psychiatric disorder often complicates both treatment and MHO involvement. Although co-occurring SUDs may present significant challenges to recovery, evidence suggests that individuals with multiple SUD diagnoses may engage in a greater number of, and in different patterns of recovery practices relative to individuals with only one SUD diagnosis (Bogenschutz,

2008; Witbrodt & Kaskutas, 2005). Thus, substance-related diagnosis may be one indicator of recovery practice engagement.

Other research has investigated the influence of psychiatric comorbidity on MHO involvement among individuals with SUDs. Individuals with a psychiatric dual diagnosis had more symptom burden despite receiving professional treatment (Timko, Sutkowi, & Moos, 2010) and are likely to have had fewer abstinent days relative to individuals who did not have a comorbid disorder (Bergman, Greene, Hoepfner, Slaymaker, & Kelly, 2014). Some studies have found that individuals with psychiatric comorbidities participated in MHOs at about the same rate as individuals with only a SUD (Timko, Cronkite, McKellar, Zmore, & Moos, 2013; Timko et al., 2010), while other studies have demonstrated that people with psychosis or severe major depressive disorder participated less relative to those without comorbidities (Bogenschutz, Geppert, & George, 2006; Kelly, McKellar, & Moos, 2003). Although it is clear that individuals with dual diagnoses who engage in 12-step recovery tend to benefit more than those who do not participate, the nuances of this effect seem to vary by the type of study and the specific psychiatric comorbidity, making it difficult to draw general conclusions.

***Treatment history.*** Because MHOs are often viewed as a post-treatment referral option, it is important to understand how various types of treatment may be related to subsequent MHO attendance, involvement, and abstinence outcomes. Approximately two-thirds of AA members surveyed by the organization indicated that they had received professional treatment before attending AA, although only about one-third identified treatment as the reason that they had decided to start attending AA (Alcoholics Anonymous World Services, 1990). The beneficial effects of professional treatment on



both post-treatment engagement in MHOs and abstinence have been demonstrated consistently across a variety of studies (Humphreys, Kaskutas, & Weisner, 1998; Owen et al., 2003; Tonigan, Toscova, & Miller, 1996). Overall, results indicate that inpatient treatment and interventions involving twelve-step facilitation generally resulted in higher levels of post-treatment MHO involvement relative to other treatments (e.g., cognitive-behavior therapy; Carroll et al., 1998; Kelly et al., 2010; Owen et al., 2003).

***Race and ethnicity.*** Given that 12-step organizations (i.e., AA) were founded within the context of white Protestant culture and the vast majority of AA and NA members are white (87% and 76%, respectively; Alcoholics Anonymous World Services, 2011; Narcotics Anonymous World Services, 2013), it is possible that racial/ethnic variables influence patterns of MHO affiliation and involvement. Existing research suggests that race may play a role in either increasing or decreasing the frequency and type of 12-step engagement (Bogenschutz, 2008; Timko, 2008). Furthermore, prior treatment attendance appeared to influence 12-step attendance differentially across racial groups (Bogenschutz, 2008; Roland & Kaskutas, 2002). A large study (Roland & Kaskutas, 2002) of the effects of race on AA involvement among whites ( $n = 538$ ), African Americans ( $n = 253$ ), and Hispanics ( $n = 60$ ) indicated that professional treatment may have influenced patterns of AA attendance across the three groups, as African Americans attended AA at the highest rate pre-treatment, while Hispanics attended AA at the highest rate post-treatment (Roland & Kaskutas, 2002). Various studies have found conflicting evidence about the patterns of engagement across different racial groups; however, it is clear that variables such as prior professional treatment and demographic composition of local MHO groups likely interact with race/ethnicity to

influence engagement in specific recovery practices (Kaskutas, Weisner, Lee, & Humphreys, 1999; Tonigan, Connors, & Miller, 1998). Overall, it remains unclear exactly how racial/ethnic status influences MHO affiliation and involvement, particularly for groups who have not often been studied (e.g., Asian Americans, Native Americans).

***Spirituality.*** Although spirituality is an important aspect of 12-step programs, research regarding spirituality as a predictor of MHO affiliation and involvement has yielded somewhat mixed results (e.g., Bogenschutz, 2008; Kelly et al., 2009). Several studies supported the notion that although initial contact with 12-step organizations is influenced by spirituality (with individuals higher on spirituality more likely to affiliate), individuals who are not religiously oriented may benefit just as much, if not more, than individuals who are more religious when they do affiliate (Kelly & Moos, 2003; Timko, Billow, & DeBenedetti, 2006; Tonigan, Miller, & Schermer, 2002; Winzelberg & Humphreys, 1999). It is possible that spirituality influences MHO outcomes by exerting a selection effect on the retention of new members; that is, individuals who are more spiritual may be more likely to initially attend and continue attending meetings. Long-term members of 12-step groups who endorse higher levels of spirituality have been found to have better outcomes (Tonigan, 2007)—but this effect may be accounted for by spirituality’s selection effects on 12-step organizations.

### **Building Recovery Capital is a Life-Long Process**

There are many competing definitions of what it means to be “in recovery,” but most of these definitions acknowledge that recovery is a process, rather than an endpoint (Betty Ford Institute Consensus Panel, 2007; Kaskutas et al., 2014; Laudet & White, 2008). For example, Kelly and Hoepfner (2014), synthesized several existing definitions

to define recovery as, “a dynamic process characterized by increasingly stable remission resulting in and supported by increased recovery capital and enhanced quality of life” (p. 5). This definition implies that even when an individual has achieved SUD remission, they have not necessarily achieved recovery. Rather, recovery involves ongoing, active effort on the part of the individual to gain necessary resources to enhance their own environment and well-being. Recovery capital is a multidimensional construct that captures the sum total of both internal and external social, personal, and community resources that can be mobilized to facilitate positive functioning in recovery (Best & Laudet, 2010; Granfield & Cloud, 1999). Historically, recovery capital has been measured by examining positive social relationships, spirituality/religiosity, quality of life, goals, citizenship, helping others, and 12-step affiliation. More recently, researchers have moved towards quantifying recovery capital (e.g., Groshkova, Best, & White, 2012) and including constructs such as social support, coping, community involvement, and psychological health, among others. In fact, these constructs may act as a buffer against high stress levels while promoting quality of life (Laudet et al., 2006). Particularly for individuals very early in recovery (within the first six months), increased recovery capital appears to be protective against stress. (Laudet & White, 2008). Over time, accrued recovery capital can amount to significant benefits in the form of reduced risk of relapse and increased quality of life. These benefits appear to be cumulative over time, indicating that individuals in long-term recovery are likely to accrue greater benefit relative to those in early recovery (Best, McKitterick, Beswick, & Savic, 2015).

**Home groups.** One key area from which recovery capital may be developed is through the home group. While MHO members are free to attend meetings in any

location they prefer, most long-term members choose to have a home group, or a specific group where they know most of the members and attend regularly (Alcoholics Anonymous World Services, 2011; Zemore et al., 2013). A number of studies have considered home group membership an important aspect of recovery involvement and found that the majority of members identify with a particular home group (Young, 2012; Zemore et al., 2013). For instance, an examination of sponsor characteristics found that 95.8% of AA sponsors ( $n = 146$ ) have a home group compared to 73% of non-sponsors ( $n = 117$ ; Young, 2012), indicating that home group membership may be a key marker of overall involvement with a particular MHO. Home group membership creates a recovery base from which a member eventually becomes more comfortable with a particular group of individuals. This context might allow them to share freely and have a group of trusted individuals in recovery they may defer to when dealing with a challenging situation, or when they need instrumental or emotional support. In this way, home group membership creates a recovery-supportive social network and may act as a coping mechanism for established members.

**Service.** By definition, MHOs have norms of reciprocal helping; this help-giving can take a variety of forms, but in the context of twelve-step recovery, helping other members (either directly or indirectly) is called service (Zemore & Pagano, 2008). This service is one of the core tenets of AA and NA and can include anything from setting up for meetings to sharing recovery experiences in support of another member. Research examining the benefits of performing MHO service has demonstrated a variety of benefits to help-givers, including increased well-being, lower rates of criminality and depression, and higher rates of abstinence (see Zemore & Pagano, 2008, for a review;

Pagano, Zemore, Onder, & Stout, 2009). Studies examining patterns of engagement in service have demonstrated that consistent involvement in service work (i.e., six and 12 months post-treatment) creates a greater likelihood of remaining abstinent at 12 months post-treatment (Zemore et al., 2013). One study of individuals with a dual diagnosis found that positive attitudes towards MHO-related helping led to greater abstinence outcomes, even when controlling for a variety of individual characteristics, including coping, demographics, self-efficacy for recovery, and social support, among others (Magura et al., 2003). Because of the strong relationship between engagement in MHO service and better abstinence-related outcomes, it is possible that consistent MHO service serves to enhance the helper's positive coping. For example, if a helper assists another member in creating and following through with a specific plan for navigating a challenging social situation like a family wedding where substance use triggers may be present, the helper may then also utilize the problem-focused coping strategies that they have helped the other member to develop.

### **Applying Stress and Coping Theory to MHO Involvement**

The relationship of psychological stress to other mental health and behavioral outcomes has been examined in a variety of contexts in order to develop overarching theories and create empirically sound interventions. However, in the context of MHOs, there have been few theory-guided quantitative studies (Humphreys et al., 1994; Kelly & Hoepfner, 2014). The Transactional Model of Stress and Coping (Lazarus & Folkman, 1984) provides a possible conceptual framework through which recovery involvement may be examined, as there is evidence that MHOs such as AA and NA may transform how members cope with stressful events (Kennedy & Humphreys, 1994). This is a

logical extension of the purpose of the groups in that MHOs seek to provide an accepting social environment in which members help other members cope with difficult or stressful life events and experiences in a healthier manner. Research on MHO affiliation has also demonstrated that relative to other help-seeking drinkers, highly-involved AA members often have a greater degree of psychological stress, fewer coping resources, and a greater degree of psychosocial problems prior to attending a 12-step program (Humphreys et al., 1994). One study using a sample of treatment-naïve participants with alcohol use disorders ( $N = 515$ ) used a stress and coping framework to examine predictors of treatment entry (any type of help, including AA, was considered treatment) and found that stress in multiple life domains was associated with treatment entry (Finney & Moos, 1995). However, coping style was not correlated with treatment entry in this sample. This is one of only a few quantitative studies to examine recovery-related processes through a stress and coping framework. Given the multitude of biological, psychological, and social factors that influence and maintain substance use, further examination of these factors and their possible influence on MHO members' experiences in recovery is warranted. The following sections will examine applications of stress and coping theory to SUDs and recovery in MHOs.

**Stress.** The stress-coping model hypothesizes that there are two levels of appraisal. When first encountering a situation, a *primary appraisal* is made about whether the situation is perceived as stressful, positive, controllable, challenging, or irrelevant. If the individual appraises the circumstances as stressful, a *secondary appraisal* is made to assess the level of control that is possible as well as what coping resources are available to be mobilized (Kelly & Hoepfner, 2014). There are several categories of stressors

which are differentiated by the type of situation in which the stress arises. For each type of stress encountered, an individual generally has unique behavioral and psychological responses. The first type of stress is a psychological reaction to an event that has already occurred (e.g., the death of a friend); this is called *harm* stress and it generally evokes a powerful reaction in the affected individual. *Threat* stress is a response to a perceived imminent danger that has not yet occurred but may be impending (e.g., learning that a hurricane is approaching). Lastly, *challenge* stress is the most adaptive form of stress and it occurs when there are difficult demands placed upon an individual that propel the individual to effectively mobilize and utilize coping strategies (e.g., studying for an exam that is perceived to be difficult). Each type of stress is brought about by different circumstances and may elicit individualized coping responses. Within the context of stress-coping theory, the emphasis is on the combination of the environment and the individualized nature of responding to a particular situation (Lazarus, 1993).

**Coping.** The process of changing one's circumstances or perception of one's circumstances to allow for a more favorable perception is referred to as coping (Folkman & Lazarus, 1988). Coping appraisals are an active process that allow an individual to negotiate between the reality of a situation, their own individual goals, and their personal beliefs. The coping process is highly context-dependent, as coping processes must be flexible to work across different situations and in response to different types and sources of stress. The interaction between coping processes and stress reactions may occur on two different fronts; that is, *problem-focused coping* is defined by an individual's attempt to overcome the source of stress in order to prevent future stressors from arising (Lazarus, 1993). For example, an individual who has decided to stop using substances may move

out of an apartment where roommates are supportive of substance use and provide access to substances. Another coping approach relies on an individual changing their interpretation or appraisal of what is happening in a way that renders that potential threat innocuous. This strategy is called *emotion-focused coping*, and it generally leads to a reduction in the experience of stress due to various behavioral and psychological coping techniques, such as emotional distancing or accepting responsibility (Folkman & Lazarus, 1988; Lazarus, 1993).

At least eight different coping techniques have been identified, and each of these is classified as problem- or emotion-focused. Problem-focused strategies include confrontive coping (e.g., “I stood up for what I believe or wanted.”) and planful problem-solving (e.g., “After seeing what needed to be done, I doubled my effort and carried through with my plan to realize my goal.”). Other strategies that are classified as emotion-focused coping include: distancing (e.g., “I pretended this was not happening to me.”), self-control (e.g., “I did not tell anyone how bad things were.”), accepting responsibility (e.g., “I beat myself up for bringing this on myself.”), and positive reappraisal (e.g., “The experience made me a better person.”). Another form of coping particularly relevant to MHO members is seeking social support. This typically involves accepting empathy and understanding from another person, or connecting with someone who may be able to help solve the problem at hand. Seeking social support can be either problem- or emotion-focused, depending on the person and the context. Lastly, escape-avoidance is a coping mechanism based on fear of a stressful situation, and it does not fall neatly into either category because the focus is complete avoidance of a particular situation, rather than making an active appraisal (Folkman & Lazarus, 1988).



Through its emphasis on the Serenity Prayer, Alcoholics Anonymous seemingly paves the path for both problem- and emotion- focused coping strategies in that it encourages members to change the stressful or less-than-optimal life situations they are able to change (problem-focused coping) while accepting those that they cannot (e.g., the behaviors and responses of other people; emotion-focused coping; Humphreys et al., 1994; Lazarus, 1993). In fact, stress-coping research has found that problem-focused coping prevails in situations where an individual has the power to change their circumstances while emotion-focused coping prevails in unchangeable situations (Folkman & Lazarus, 1988; Lazarus, 1993). Moreover, when coping is conceptualized as a mediator in the relationship between stress and an emotion (outcome), some demographic variables such as age and personality/temperament may determine the type and strength of emotional response as a result of an individual's chosen coping strategy. Conceptually, this may be thought of as moderated mediation, given that these stress-coping pathways are conditional on the presence (or absence) of certain characteristics. For example, in a working-age sample, healthy coping styles (i.e., planful problem solving and positive reappraisal) significantly predicted positive emotional reactions (i.e., confidence, happiness) and negatively predicted negative emotional reactions (i.e., disgust and anger). Less healthy coping styles (i.e., distancing and confrontive coping) showed the exact opposite effect; that is, distancing and confrontive coping negatively predicted confidence and happiness and positively predicted disgust and anger. In a sample of older adults, positive reappraisal was associated only with worry/fear (positively), distancing was associated only with happiness (negatively), and confrontive coping was not associated with any of the emotions. Therefore, the relationship between

type of coping and emotional response was less consistent in older adults, indicating that demographic variables are likely an important consideration when examining this relationship.

Other individual characteristics—such as level of depressive symptomatology—have been shown to influence preferred coping strategies. For example, using the same working-age sample as above ( $N = 170$ ), individuals who were high on depressive symptomatology engaged in more escape-avoidance, self-control, social support, and confrontive coping than did individuals who were low on depressive symptoms. However, there were no differences between the high and low-symptom groups on more coping strategies generally perceived as adaptive, including planful problem solving and positive reappraisal (Folkman & Lazarus, 1986).

Just as coping strategies may vary across individuals, they may also vary across situations. For example, MHO members may engage in *distancing* themselves from their previous behaviors as a coping strategy to view themselves as “in recovery” and to integrate this as part of their self-concept; however, using the same coping strategy (i.e., distancing) in relation to a relapse could be potentially harmful as it would likely prolong a relapse episode and make an individual less likely to stop using substances (Lazarus, 1993). Although the stress-coping model has received significant empirical attention since its inception, there has been little research that examines the model specifically in the context of SUDs (Humphreys et al., 1994).

**The psychobiology of stress and addiction.** In relation to SUDs, stress-coping theory posits that various domains of stressful life events and circumstances (e.g., family, work, friends, finances) create distress, which results in social isolation and alienation,

and eventual use of substances as a coping mechanism (Moos, 2008). For individuals who are predisposed to misuse substances, the accumulation of stressors combined with low self-esteem, self-efficacy, and few coping resources can quickly overwhelm available coping strategies and lead to overreliance on substances and maladaptive coping strategies. This pattern is maintained through negative reinforcement (i.e., the individual's negative emotional experiences are avoided through substance use) thereby perpetuating the stress-substance use cycle. Furthermore, high levels of stress—both from chronic and acute stressors—may lead to a higher propensity for relapse (Sinha, Shaham, & Heilig, 2011). The intertwined nature of substance use disorders and biochemical stress reactions is important to consider when conceptualizing the factors that influence and maintain SUDs, as psychologically and biologically based theories considered in isolation do not elucidate the full context in which SUDs occur. Although psychophysiological factors are not explicitly tested in this study, a broad biopsychosocial model of stress and coping in MHO members would be incomplete without considering the psychobiology of stress and coping.

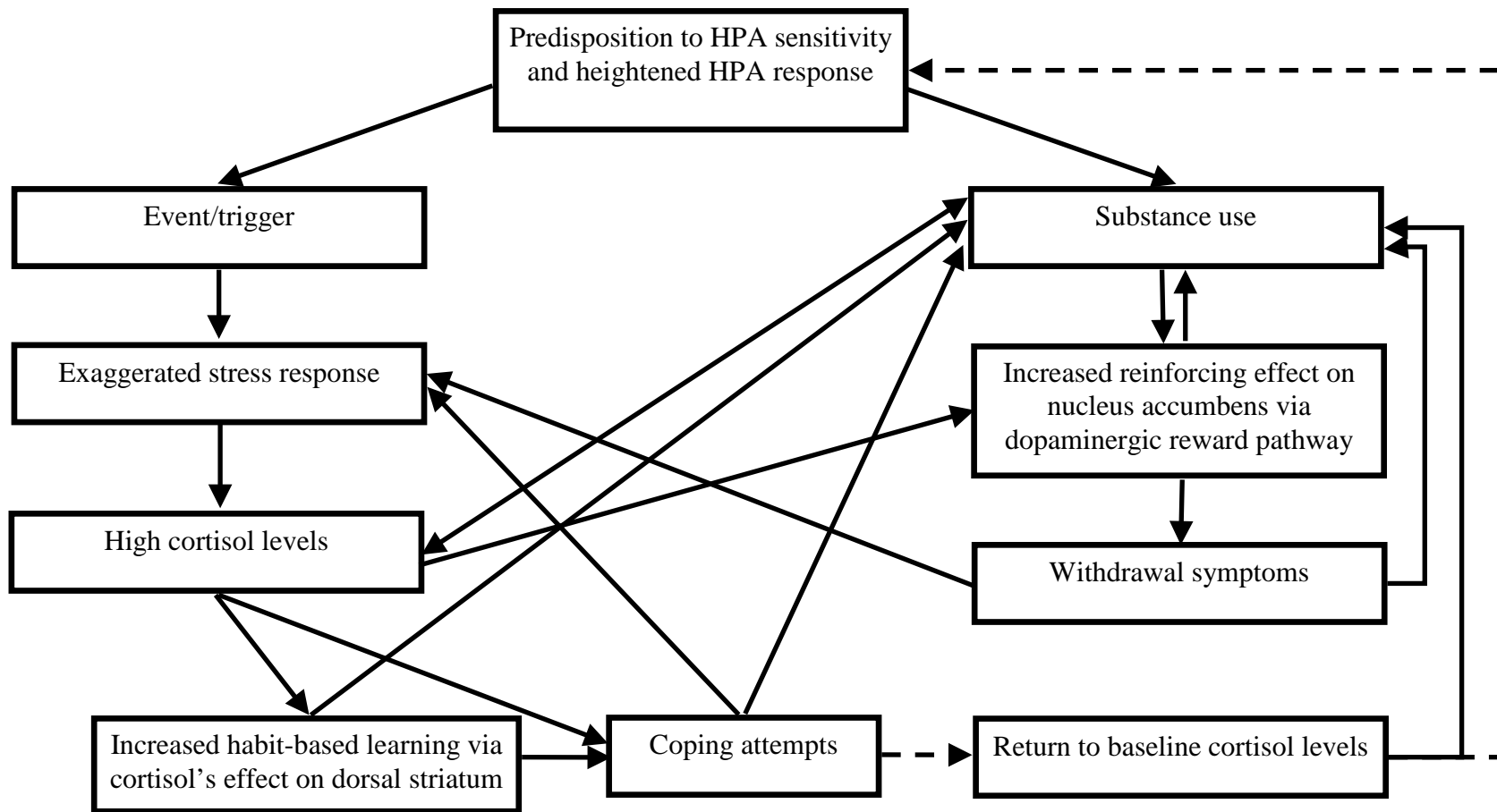
Research examining the role of the stress hormone cortisol in substance use and abstinence has demonstrated that the function of the cortisol-stimulating and secreting hypothalamic-pituitary-adrenal (HPA) axis of individuals with SUDs is more likely to be hypersensitive even before substance use ever occurs (see Stephens & Wand, 2012, for a review). Sensitization of the HPA response can be influenced by a combination of genetics, early childhood experiences (e.g., trauma, stress), and high levels of current stress. In sensitized individuals, cortisol responses to both high- and low-stress situations are strengthened. In addition, heavy substance use further impairs the HPA axis, thereby

creating abnormal stress responses (Stephens & Wand, 2012). Evidence has supported the notion that HPA dysregulation occurs across a variety of clinical presentations, including alcohol use disorder (Junghanns, Horbach, Ehrental, Blank, & Backhaus, 2007), drug use disorder (Wand, 2008), and tobacco use disorder (McKee et al., 2011).

Cortisol plays a unique role in influencing behavior, particularly during periods of stress. In the general population, low baseline levels of cortisol will spike in response to stress; however, cortisol levels are typically well-controlled via an inhibitory feedback loop. That is, high levels of cortisol act as a switch to close the cortisol-releasing pathway, ensuring that excessive amounts of cortisol are not released. This gives individuals with a normative HPA response an opportunity to engage in coping methods in response to high stress/high cortisol levels. For example, an individual who feels their heart beating quickly or their muscles tightening may go for a walk or take a break from a stressful activity, allowing time for cortisol inhibition to occur. There is a parallel inhibitory process among social or light drinkers who do not have impaired HPA function such that moderate drinking raises cortisol levels, but a healthy HPA feedback loop will eventually allow cortisol levels to return to a low, baseline state (Stephens & Wand, 2012).

Among individuals with long-term moderate-to-severe substance use, a complex relationship exists between stress, cortisol, coping, and substance use (Figure 1). These individuals may experience stress more strongly from both psychological and biological perspectives. Therefore, the stress response is typically greater than would be expected given the magnitude of the stressor. This heightened sensitivity leads to chronically elevated cortisol levels with continued substance use (Sinha et al., 2011). Research

examining the impact of cortisol and norepinephrine on learning suggests that learning is impacted by stress, and more specifically, high cortisol levels favor learning habitual behaviors (as opposed to goal-directed learning) via the hormone's effect on the dorsal striatum (Everitt et al., 2008). This type of biochemical priming for habit-based learning may be yet another risk factor for individuals with HPA dysregulation developing chronic substance use. Given the simplicity of habit-based behaviors, more rudimentary coping, such as avoidant coping or substance use is likely to occur when cortisol levels are high. The consequences of poor coping may also lead to additional stress, which again triggers elevated cortisol levels. Conversely, positive coping can lead the individual out of the stress-cortisol-substance use loop (see dashed line in Figure 1), but an individual who is predisposed to a heightened HPA response will likely retain this predisposition despite behavior change (Sinha et al., 2011). Substance use is independently reinforced in the brain by the dopaminergic reward pathway via dopamine's excitatory effect on the nucleus accumbens. Interestingly, cortisol also appears to have an excitatory effect on the nucleus accumbens that is independent of substance use. It is possible this effect may serve the evolutionary purpose of "rewarding" behaviors carried out in reaction to an acute stressor (e.g., an animal running away from a predator versus allowing itself to be injured or killed when no stress response is present; Piazza & Le Moal, 1997). After using substances, some individuals with addictions experience withdrawal symptoms—which may be partially caused by low blood cortisol levels—and this can cause re-entry into the stress and/or substance use cycle. In this way, the relationship between cortisol levels and substance use is bi-directional; that is, substance use both causes and results from changes in cortisol levels (Junghanns et al., 2007).



*Figure 1.* Relationships between selected biopsychological factors contributing to stress, elevated cortisol levels, and substance use among individuals who are moderate-to-heavy substance users. Individuals may be predisposed to having high hypothalamic-pituitary-adrenal (HPA) axis reactivity, and when they encounter a stressful event, it leads to a heightened stress response and/or substance use, and in either case, this leads to high cortisol levels. Both cortisol and substance use stimulate the reward pathway via dopamine while cortisol also increases habit-based learning. Habit-based learning fosters repetitive attempts at ineffective coping (e.g., avoidant coping or substance use) and can yield additional stressors. Negative reinforcement from withdrawal symptoms may lead to repeated substance use and create repetitive substance use behavior. Cortisol can also act as a reinforcing agent that drives individuals to behaviors, such as substance use, which elevate cortisol levels. Effective coping is a possible route out of the loop by returning cortisol levels to normal, however, the predisposition to exaggerated HPA responses remains.

At consistently high levels of substance use, the brain and other endocrine receptors become desensitized to the effects of high cortisol levels. When combined with many repetitions of habit-based behaviors, the relationship between cortisol levels and substance cravings may become reversed, causing high levels of cortisol to correspond with low substance cravings (whereas in non-dependent individuals with normative HPA functioning, high cortisol levels would result in higher substance use). Because a feedback system exists between the brain's reward system and cortisol, individuals with SUDs may actually increase their consumption of substances to raise cortisol levels, as this activates the dopaminergic reward pathway (Stephens & Wand, 2012).

Investigations examining the HPA responses of individuals in early abstinence have shown that the stress response is typically elevated in the first weeks of abstinence, resulting in higher than normal cortisol levels. However, after a short period of time (i.e., several weeks to months), abstinent individuals may experience cortisol levels that are well below normal (Keedwell, Poon, Papadopoulos, Marshall, & Checkley, 2001). Because the nature of the cortisol-craving relationship is bi-directional, this lower-than-normal cortisol level may serve as a trigger for increased substance cravings, as substance use would return cortisol levels to normative (high) levels for that individual. Longer periods of abstinence likely contribute to a wider range of response in cortisol secretion such that the response is no longer as severely blunted as it was during heavy substance use (Stephens & Wand, 2012). Recovery processes that enhance self-efficacy and coping may also play a normalizing role in cortisol levels; that is, individuals who are in situations that they perceive to be controllable have lower cortisol levels than do

individuals who are in situations that they perceive to be out of their control (Frankenhaeuser & Lundberg, 1985). However, this perception of controllability—and the resulting stress response—is based on individualized interpretations of the situation at hand.

**Stress and coping in substance use disorders and recovery.** Using a stress-coping framework to conceptualize involvement in 12-step organizations fits with the general model of stress-coping theory (Lazarus & Folkman, 1984), knowledge about the psychobiological underpinnings of stress and addiction (Stephens & Wand, 2012), as well as the 12-step specific models of stress and coping processes in MHOs (Humphreys et al., 1994; Kelly & Hoepfner, 2014). Twelve-step organizations help members develop more adaptive active coping skills to cope with stress (Humphreys et al., 1994). For example, in a sample of treatment-seeking problem drinkers ( $N = 439$ ), consistent, high frequency AA attendance was predictive of higher use of active cognitive coping skills as well as fewer avoidant coping attempts after three years (Humphreys et al., 1994; Poage, Ketzenberger, & Olson, 2004). The effect remained even when baseline coping, demographic characteristics, and professional treatment episodes were included in the analyses as covariates. Importantly, in this sample, avoidant coping was also a predictor of AA attendance, suggesting individuals who initially use less adaptive coping strategies may be more likely to participate in MHOs over time. Twelve-step practices promote active coping, therefore, it is possible that individuals who are most involved in recovery through MHOs have the most to gain from the organization's practices that emphasize active coping. The coping skills that MHO members develop as a function of their



involvement may also be more substance-specific and problem-focused than coping skills developed elsewhere (Moos, 2008).

According to the MHO-specific stress-coping hypothesis proposed by Kelly and Hoepfner (2014), individuals in early recovery may experience high levels of biopsychosocial stress as they are forced to abandon avoidant coping (i.e., substance use) in favor of more active coping approaches. Higher levels of stress and cortisol at recovery initiation may propel an individual into recovery and accruing *recovery capital* (Granfield & Cloud, 1999), or additional internal and external resources (e.g., physical/mental health, social networks, education, employment, meaning in life) from which recovery is initiated and sustained. It is likely that 12-step specific recovery practices, such as having a sponsor, contribute to building recovery capital in a meaningful way. Furthermore, as time in recovery increases, HPA dysregulation likely stabilizes as a function of extended abstinence while involvement in recovery practices increases recovery capital and the degree to which the MHO member perceives stressful events as controllable (Kelly & Hoepfner, 2014; Stephens & Wand, 2012). Once HPA dysregulation decreases—likely within the first year of recovery—learning new higher-order coping strategies is no longer impeded by excessive cortisol levels (Kelly & Hoepfner, 2014). In this way, recovery practices may serve as an important building block of the adaptive coping skills built in long-term recovery as well as recovery capital. In turn, the benefits of active recovery involvement may buffer the effects of stress and increase the likelihood of experiencing extended periods of recovery and overall well-being.

## **Integrative Conclusions**

Despite a sizeable body of research on the effectiveness and mechanisms of change in 12-step programs, few studies have examined what factors predict involvement in specific 12-step recovery activities. Furthermore, existing research primarily views recovery involvement from the perspective of individual member characteristics (e.g., race, prior treatment history), rather than as a part of a larger theoretical model. While several individual characteristics have been shown to meaningfully predict recovery practice engagement, there are a variety of correlated variables (e.g., stress, coping skills, substance-supportive social networks) that may help to explain findings.

For example, some studies (e.g., Bergman et al., 2014; Witbrodt & Kaskutas, 2005) have shown that individuals who have comorbidities appear to benefit more from higher levels of active engagement in recovery practices, such as having a sponsor. It is possible that the presence of a dual diagnosis serves as a proxy variable for higher levels of psychosocial stress. Individuals experiencing high levels of stress may also engage in recovery practices as a behavioral strategy to prevent relapse and promote adaptive coping. When viewed from this perspective, the process of recovery involvement adopts a theory-driven stress and coping framework. Rather than viewing various individual characteristics (e.g., diagnosis, treatment history) as factors driving individuals into recovery involvement, adopting a stress and coping framework for recovery allows for more precise hypothesis generation about the multidimensional set of factors driving recovery involvement. Given that stress may be strongly associated with certain individual characteristics, the role of stress in predicting recovery involvement may follow patterns similar to person-level factors identified in existing studies.

Following from research examining the biopsychosocial influences on addictive behaviors, long-term MHO engagement may serve as a social learning environment in which the norm of reciprocal helping and following prescribed recovery practices (Humphreys, 2004) provides an environment for individuals with SUDs to re-learn more adaptive cognitive and behavioral coping strategies. Reinforcement (both positive and negative) from others gained through involvement in recovery practices (e.g., sponsorship, service work) may exert a homeostatic influence on dysregulated psychobiological stress and reward systems, and in turn, reduce the likelihood of cravings and relapse.

Although 12-step recovery practices are typically viewed as distal predictors of an abstinence-related outcome, this study aims to examine the relationship between selected demographic, psychosocial, and SUD-related characteristics (i.e., person-level covariates), stress, abstinence duration, and recovery practice engagement in order to clarify the potential relationships among these variables in the context of a broader stress and coping framework. Moreover, this study examines only one component of an MHO-specific stress-coping theory, but supplements the stress-coping framework discussed above. Recovery practice engagement is likely an intermediary step between stress and changes in coping strategies that have been observed in other studies. Four recovery practices that consistently emerge across 12-step literature will be predicted, these include: meeting attendance, home group comfort, sponsorship involvement, and 12-step related helping.

### **Contribution to the Field**

Consistent with recent efforts to use theory-guided approaches to studying MHO involvement and outcome (e.g., Kelly & Hoepfner, 2014), the present study will conceptualize recovery involvement activities in relationship to NA members' stress levels and length of abstinence. A particularly important contribution of the present study is that it examines these relationships in members of NA, as opposed to AA. To date, there have been very few studies examining the specific experiences of NA members (for an exception, see Galanter, Dermatis, Post, & Santucci, 2013). Furthermore, results may help to elucidate the relationship between stress and recovery in 12-step members beyond the first year of recovery. Another contribution of the present study is examining these issues in individuals who vary substantially in their abstinence durations (from one to over 30 years). Whereas most investigations of 12-step recovery focus on early recovery (i.e., less than 12-18 months), this study will examine whether the relationship between stress and recovery practice engagement varies as a function of abstinence duration in a sample with at least one year in recovery.

Knowledge of MHO members' patterns of recovery engagement beyond the first year of recovery may help to shape future twelve-step facilitation or other clinical interventions in order to equip members with coping skills needed to improve long-term recovery engagement and outcomes. Although most MHO studies use treatment-seeking samples and follow their recovery patterns post-professional treatment, the current sample was recruited from the community; therefore, it is resistant to some selection variables inherent in other MHO studies. While the present sample is not longitudinal, and causal associations among key study variable cannot be established, the

biopsychosocial stress and coping model provides a framework from which temporal precedence may be conceptualized. The present study examines the first half of the proposed framework; that is, the relationship between stress and engagement in recovery practices. Furthermore, the study explores whether the length of time in recovery affects the relationship between stress and recovery practice engagement. Specific hypotheses are elaborated below.

### **Hypotheses and Proposed Analyses**

Given that stress and engagement in recovery practices likely change over the course of extended recovery, it is expected that the relationship between stress and meeting attendance, home group comfort, sponsorship involvement, and NA-related service involvement will be moderated by abstinence duration. That is, the association between stress and the recovery practices will be stronger for individuals earlier in recovery (i.e., those with lower levels of abstinence duration) relative to individuals with more time in recovery. This hypothesis will be tested using a series of regression models in which stress, abstinence duration, and the (stress by abstinence duration) interaction are entered as predictors of a recovery practice. Other person-level covariates entered in the model will include age, sex, marital status, social support from others in recovery, neuroticism, and substance use severity. The functional form of the association between stress and recovery involvement will be examined in a series of post-hoc analyses.

## CHAPTER II

### Method

#### Procedure

This study was approved by the Nova Southeastern University institutional review board. Participants were recruited through two avenues: 1) initial recruit persons, and 2) posting a recruitment flyer to a social networking site dedicated to 12-step recovery. In order to participate, individuals were required to be 18 years or older, have a minimum of one year of abstinence, and consider oneself a member of NA. Participants were directed to an online survey website which included the Informed Consent; an array of measures assessing constructs such as psychological well-being, social support, substance use severity, etc.; and a short demographics questionnaire. Initial entry into the study was stratified by abstinence duration and sex resulting in eight strata: women with 1-5 years of abstinence, women with 6-10 years of abstinence, women with 11-15 years of abstinence, women with 16 or more years of abstinence, men with 1-5 years of abstinence, men with 6 to 10 years of abstinence, men with 11 to 15 years of abstinence, and men with 16 or more years of abstinence. Upon completing the survey, instructions were given to contact the Principal Investigator to receive a \$30 e-gift card.

#### Participants

Participant age ranged from 22 to 64 years old ( $M = 45.65$ ,  $SD = 10.84$ ). The percentage of females was only slightly higher than that of males (53.1% female). The sample predominantly identified as Caucasian (79.5%), with the remaining portion of individuals identifying as African American (12.6%), Latino (2.4%), Asian American

(3.1%) and Other (2.4%). Abstinence duration ranged from one year to more than 30 years in recovery ( $M = 11.77$ ,  $SD = 7.92$ ).

## Measures

**Demographics.** Age, sex, and marital status were included in the initial set of analyses. Individuals who were married or living as married comprised 40.6% of the sample, while the remaining participants identified themselves as divorced (19.5%), separated (6.3%), or single (32.8%) were categorized as non-married for the purposes of the current analyses.

**Neuroticism.** The Big Five Inventory-10 (BFI-10; Rammstedt & John, 2007) Neuroticism subscale consists of two items: “I am relaxed, I handle stress well” (reverse scored) and “I get nervous easily.” The abbreviated Neuroticism subscale is highly correlated with the original 9-item scale ( $r = .85-.88$ ; John, Donahue, & Kentle, 1991). Responses were scored on a 5-point scale from 1 (disagree strongly) to 5 (agree strongly). The two items were moderately correlated,  $r(126) = .467$ ,  $p < .001$ .

**Substance use severity.** A substance use severity composite variable was computed by averaging z-scores of two items: (1) earliest age of use of any one of 12 substances; and (2) the number of substances out of 12 for which participants endorsed problematic use (reverse scored).

**Social support.** Social support from individuals in recovery was measured with the following item: “During the past 3 months, how helpful was the emotional support you received from people in recovery?” Responses were rated on a 5-point scale: I have not received emotional support from people in recovery, not at all helpful, slightly helpful, moderately helpful, or very helpful.

**Abstinence duration.** Length of abstinence duration, in years, was calculated by subtracting the participant's self-reported date of last substance use from the day they completed the survey. On average, participants reported between 11 and 12 years abstinent ( $M = 11.77$ ,  $SD = 7.92$ , minimum = 1.07, maximum = 30.52).

**Perceived stress scale (PSS; Cohen, Kamarck, & Mermelstein, 1983; Appendix A).** The PSS is a 14-item, one-factor scale designed to measure the severity of an individual's current stress appraisals. Participants are given a statement (e.g., "how often have you been upset because of something that happened unexpectedly," "how often have you felt that you were unable to control the important things in your life") and asked to rate their level of agreement based on their stress level in the prior three months. Ratings are made using a five-point Likert scale (1 = never or almost never to 5 = almost always or always). Internal consistency of the measure was acceptable,  $\alpha = .75$  (S. Cohen & Williamson, 1988). In the present study, internal consistency of the PSS was also acceptable,  $\alpha = .87$ .

**Narcotics Anonymous Recovery Involvement Inventory (NARII; DeLucia, Bergman, Formoso, Weinberg, 2014; Appendix B).** The NARII was developed by consulting existing literature for measures of AA or MHO involvement and affiliation. The scales considered included: the Alcoholics Anonymous Involvement (AAI) Scale (AAI; Tonigan, Connors, & Miller, 1996), the Alcoholics Anonymous Affiliation Scale (AAAS; Humphreys, Kaskutas, & Weisner, 1998), the Recovery Interview (RI; Morgenstern, Kahler, Frey, & Labouvie, 1996), and the Weekly Self-Help Activities Questionnaire (WSH; Weiss et al., 1996). The NARII was adapted from the above-listed instruments to assess each of the domains of affiliation measurements suggested by



Cloud, Ziegler, and Blondell (2004). These domains include a) meeting attendance, b) step work, c) 12-step program identification, d) experiencing a spiritual awakening, e) use of program resources or assistance or guidance (e.g., NA readings), and f) involvement in higher-level activities (e.g., interacting with individuals in recovery outside of meetings). In order to gain a better understanding of the relationship of the sponsorship relationship, additional questions pertaining to participants' relationship with their sponsor and their home group were added to the inventory. Furthermore, an in-depth assessment of participants' NA-related helping/service was included in the survey, as focus groups with 12-step members indicated this was an important aspect of extended NA recovery (DeLucia et al., 2014). Although 12-step membership identification is typically included in recovery inventories, this factor was an inclusion requirement for all participants; therefore, it was not included on the NARII. An NA-specific measure of recovery practices was included in order to assess the frequency and relevance of prescribed NA-related behaviors in the present sample. Novel measures of certain constructs (e.g., sponsorship) were developed and included in order to gain a more in-depth assessment of participants' view that have not been part of previous recovery involvement scales (DeLucia et al., 2014).

The resulting inventory consists of a 71-item scale with an additional service activity grid. On items that assess frequency, participants generally respond on their behaviors over the past year using a nine-point scale, ranging from 0 (never) to 8 (six to seven times per week). The NARII includes seven theoretical domains: a) history of 12-step meeting attendance; b) step work; c) sponsorship; d) home group activities; e) recovery-related socialization; f) use of NA resources (e.g., reading 12-step literature);

and e) NA-related service. The service grid divides NA-related service by group, zone/region, area, and world levels. Relevant service levels are checked and the amount of time spent performing at that service level is indicated in years.

While the NARII is a novel measure created for the present study, previous studies have examined the psychometric properties of the established scales that were modified or included on the NARII. Factor or principal components analyses yielded a two-factor solution (i.e., attendance and involvement) for the AAI (Tonigan, Connors, et al., 1996), a one-factor solution for the AAAS (Humphreys et al., 1998) and RI (Morgenstern et al., 1996), and a three-factor solution for the WSH questionnaire (i.e., work performed at meetings, interpersonal work performed outside meetings, work performed alone and outside meetings; Weiss et al., 1996). Internal consistency for each of the measures was generally good (i.e.,  $\alpha > .8$ ). Test-retest reliability for the AAI was excellent ( $r = .99$ ).

***NA meeting attendance.*** The frequency of NA meeting attendance was assessed on the NARII by asking participants, “In the past year, how often did you attend NA meetings?” Response options ranged on a scale from 0 (never) to 8 (6-7 times per week).

***Home group comfort.*** Comfort in one’s home group was assessed by averaging two items: (1) “I feel very comfortable at my home group”; and (2) “I have a strong connection to others at my home group,”  $r(126) = .926, p < .001$ . The response scale for these items ranged from 1 (never/almost never) to 4 (always/almost always). Individuals without a home group ( $n = 17$ ) were set to the minimum value of each subscale.

***Home group service.*** Participants' service to their home group was assessed by the statement "I do service work at my home group." Response choices ranged from 1 (never/almost never) to 4 (always/almost always).

***Sponsor support.*** The NARII contains a subscale of sponsorship-related items. A measure of sponsor support was calculated by averaging responses to the following eight items: I seek my sponsor's guidance on lots of issues related to my life; I consult my sponsor before making major life decisions; I can count on my sponsor when I really need him/her; my sponsor is trustworthy; my sponsor is supportive; my sponsor is loving; my sponsor is compassionate; my sponsor is a good listener. Response options for this scale ranged from 1 (disagree strongly) to 5 (agree strongly). Internal validity was good,  $\alpha = .87$ .

## CHAPTER III

### Results

#### Predicting Recovery Involvement

**Models testing the stress by abstinence duration interaction.** The first set of analyses consisted of four hierarchical linear regression models in which the effect of primary interest was the stress by abstinence duration interaction. The initial models were estimated with three predictor blocks; the first block included age, sex, helpfulness of emotional support received from those inside recovery, marital status, neuroticism, and substance use severity. The second predictor block included stress and abstinence duration, while the third block included the stress by abstinence duration interaction. Although overall  $R^2$  values for these models were significant, none of the interaction terms were significant and contributed little variance to the model. That is, for the stress-abstinence duration interaction term in the model predicting frequency of NA meeting attendance,  $\Delta F(1, 117) = .477, p = .491, \Delta R^2 = .003$ . For the interaction term in the model predicting home group comfort,  $\Delta F(1, 117) = 1.677, p = .198, \Delta R^2 = .012$ . For the interaction term in the model predicting sponsor support,  $\Delta F(1, 117) = .382, p = .538, \Delta R^2 = .002$ . Lastly, for the interaction term in the model predicting home group service,  $\Delta F(1, 117) = 2.958, p = .088, \Delta R^2 = .02$ . Given the lack of evidence supporting the hypothesized moderated effect (and the lack of support for the original hypothesis), the stress by abstinence duration interactions were dropped from further consideration.

**Simplified models predicting recovery involvement.** In the next set of analyses, the covariate set was pruned by eliminating non-significant predictors in a stepwise fashion, starting with the least salient predictors. Specifically, age was eliminated first,

followed by sex, then marital status. In the final simplified regression models, three covariates including emotional support from those inside recovery, neuroticism, and substance use severity were retained on the first block, while stress and abstinence duration were retained on the second block. The results of the final hierarchical regression models are presented below.

***Frequency of meeting attendance.*** The group of covariates accounted for significant variance in frequency of meeting attendance,  $F(3, 124) = 5.607, p = .001, R^2 = .119$  (Table 1). The second predictor block was also significantly associated with the frequency of meeting attendance,  $\Delta F(2, 122) = 5.182, p = .007, \Delta R^2 = .069$ . The overall model predicting frequency of meeting attendance was significant,  $F(5, 122) = 5.664, p < .001, R^2 = .188$ . Substance use severity and abstinence duration were the only significant individual predictors, and both were negatively associated with frequency of meeting attendance ( $sr^2 = .075$  and  $.064$ , respectively).

Table 1

*A hierarchical regression model predicting NA meeting attendance from person-level covariates, stress, and abstinence duration*

	B	se	p	sr <sup>2</sup>
Set 1: Covariates				
$F(3, 124) = 5.607, p = .001, R^2 = .119$				
Helpfulness of emotional support inside recovery	.182	.109	.099	.019
Neuroticism	-.115	.118	.333	.006
Substance use severity	-.426	.127	.001	.075
Set 2: Stress and Abstinence Duration				
$\Delta F(2, 122) = 5.182, p = .007, \Delta R^2 = .069$				
Stress	-.224	.175	.203	.011
Abstinence Duration	-.040	.013	.003	.064

*Note.* Full model was statistically significant,  $F(5, 122) = 5.664, p < .001, R^2 = .188$ . All coefficients are from final model.

**Home group comfort.** The covariate predictor block yielded significant variance in home group comfort,  $F(3, 124) = 6.244, p = .001, R^2 = .131$  (Table 2). The second predictor block did not account for significant incremental variance,  $\Delta F(2, 122) = .307, p = .736, \Delta R^2 = .004$ . The overall model predicting home group comfort was significant,  $F(5, 122) = 3.827, p = .003, R^2 = .136$ . In this model, the helpfulness of social support received from individuals inside recovery was positively associated with home group comfort ( $sr^2 = .070$ ) while substance use severity was negatively associated with home group comfort ( $sr^2 = .041$ ).

Table 2

*A hierarchical regression model predicting home group comfort from person-level covariates, stress, and abstinence duration*

	B	se	p	$sr^2$
Set 1: Covariates				
$F(3, 124) = 6.244, p = .001, R^2 = .131$				
Helpfulness of emotional support inside recovery	.323	.103	.002	.070
Neuroticism	-.116	.112	.302	.008
Substance use severity	-.289	.120	.017	.041
Set 2: Stress and Abstinence Duration				
$\Delta F(2, 122) = .307, p = .736, \Delta R^2 = .004$				
Stress	-.003	.165	.985	< .001
Abstinence Duration	-.009	.012	.437	.004

*Note.* Full model was statistically significant,  $F(5, 122) = 3.827, p = .003, R^2 = .136$ . All coefficients are from final model.

**Sponsor support.** The group of covariates accounted for significant variance in sponsor support,  $F(3, 124) = 10.055, p < .001, R^2 = .196$  (Table 3). The second predictor block also predicted significant incremental variance in sponsor support,  $\Delta F(2, 122) = 8.114, p < .001, \Delta R^2 = .094$ . The overall model predicting sponsor support was significant,  $F(5, 122) = 9.971, p < .001, R^2 = .290$ . In this model, nearly all predictors

independently accounted for significant variance in support received from a sponsor. Specifically, helpfulness of social support received from individuals inside recovery was positively associated with sponsor support ( $sr^2 = .166$ ), while neuroticism ( $sr^2 = .024$ ), substance use severity ( $sr^2 = .026$ ), and abstinence duration ( $sr^2 = .094$ ) all negatively predicted sponsor support.

Table 3

*A hierarchical regression model predicting sponsor support from person-level covariates, stress, and abstinence duration*

	B	se	p	$sr^2$
Set 1: Covariates $F(3, 124) = 10.055, p < .001, R^2 = .196$				
Helpfulness of emotional support inside recovery	.753	.141	< .001	.166
Neuroticism	-.311	.153	.044	.024
Substance use severity	-.350	.164	.035	.026
Set 2: Stress and Abstinence Duration $\Delta F(2, 122) = 8.114, p < .001, \Delta R^2 = .094$				
Stress	-.086	.226	.704	.001
Abstinence Duration	-.067	.017	< .001	.094

*Note.* Full model was statistically significant,  $F(5, 122) = 9.971, p < .001, R^2 = .290$ . All coefficients are from final model.

**Home group service.** The first predictor block accounted for significant variance in home group service,  $F(3, 124) = 7.757, p < .001, R^2 = .158$  (Table 4). The second predictor block did not account for significant incremental variance,  $\Delta F(2, 122) = .081, p = .922, \Delta R^2 = .001$ . The overall model predicting home group service was significant,  $F(5, 122) = 4.617, p = .001, R^2 = .159$ . Helpfulness of social support received from individuals inside recovery was significantly associated with higher levels of home group service ( $sr^2 = .071$ ) while substance use severity was negatively associated with home group service ( $sr^2 = .071$ ).

Table 4

*A hierarchical regression model predicting home group service from person-level covariates, stress, and abstinence duration*

	B	se	p	sr <sup>2</sup>
Set 1: Covariates				
$F(3, 124) = 7.757, p < .001, R^2 = .158$				
Helpfulness of emotional support inside recovery	.335	.104	.002	.072
Neuroticism	-.012	.112	.917	< .001
Substance use severity	-.387	.121	.002	.071
Set 2: Stress and Abstinence Duration				
$\Delta F(2, 122) = .081, p = .922, \Delta R^2 = .001$				
Stress	-.060	.166	.719	.001
Abstinence Duration	-.003	.012	.826	< .001

*Note.* Full model was statistically significant,  $F(5, 122) = 4.617, p = .001, R^2 = .159$ . All coefficients are from final model.

### **Additional Analyses**

**Non-linear associations between stress and recovery involvement.** Because abstinence duration did not function as a moderator of the stress-recovery practice association, the functional form of the association between stress and the four recovery involvement outcomes was examined post-hoc to determine whether a quadratic or cubic equation captures the nature of the stress-recovery involvement relationship more accurately than a linear equation. For example, it is possible that the association between stress and recovery practice involvement may be weaker at lower levels of stress and stronger at higher levels, which would suggest a quadratic form of growth over a linear form. Models testing linear, quadratic, and cubic trends were estimated for each of the four recovery involvement outcomes. However, none of these higher-order trends accounted for significant variance in any of the four recovery involvement outcomes. The resulting  $R^2$  values were small, ranging from .005 to .038 across all models.



**Descriptive information about stress variable.** Additional analyses were performed to further elucidate the stress variable in the present sample. On average, NA members reported occasional stress while their total stress levels ( $M = 21.60$ ,  $SD = 7.70$ ) were significantly higher than the large U.S. sample on which the psychometric properties of the PSS were established ( $N = 2355$ ,  $M = 19.62$ ,  $SD = 7.49$ ;  $t(2481) = 2.91$ ,  $p = .004$ ; Cohen & Williamson, 1988), although the magnitude of this difference was small,  $d = .26$ . To provide further context, the sample was divided into three groups by abstinence duration (i.e., lowest third, middle third, highest third). The general population sample was compared to stress levels of NA members who had at least one, but less than six years of recovery (the lowest third of the NA sample,  $n = 37$ ,  $M = 24.68$ ,  $SD = 8.24$ ), and the difference in stress levels was significant,  $t(2390) = 4.0710$ ,  $p < .001$ . The magnitude of effect is medium-to-large,  $d = .64$ . The stress levels of the upper third of the sample with at least 15 years of abstinence duration (the highest third,  $n = 43$ ,  $M = 19.77$ ,  $SD = 7.02$ ) was compared to the large U.S. sample, and the difference was non-significant,  $t(2396) = .1303$ ,  $p = .896$ ,  $d = .02$ .

**Bivariate relations between stress and other key study variables.** The stress variable was also further examined to determine possible relationships between stress and other variables of interest. A bivariate correlation was estimated to assess whether there was a relationship between overall stress levels and abstinence duration. Results indicated that there was a significant, moderately sized, negative correlation ( $r = -.324$ ,  $p < .001$ ) between stress and abstinence duration, suggesting that as abstinence duration increases, stress levels generally decrease. This relationship was further probed by examining stress levels in participants with less than or equal to three years in recovery ( $n = 16$ ,  $M = 24.75$ ,

$SD = 10.43$ ) versus those with more than three years in recovery ( $n = 112$ ,  $M = 21.15$ ,  $SD = 7.18$ ). Individuals in earlier recovery reported more stress compared to those in later recovery ( $d = .40$ ).

Correlations between stress and other predictors in the initial regression models were estimated in order to further contextualize these pair-wise associations. Stress was significantly correlated with neuroticism ( $r = .663$ ,  $p < .001$ ) and age ( $r = -.360$ ,  $p < .001$ ), but no significant relationships emerged between stress and helpfulness of emotional support received from those inside recovery ( $r = -.070$ ,  $p = .430$ ), sex ( $r = -.039$ ,  $p = .662$ ), marital status ( $r = -.015$ ,  $p = .869$ ), or substance use severity ( $r = .126$ ,  $p = .157$ ).

**Regression diagnostics.** The variance inflation factors (VIF) and tolerance values were used to evaluate the data for collinearity. The VIF values for the predictors were below the maximum cutoff of five (maximum value of 1.718), indicating an acceptable level of collinearity among predictors. The minimum tolerance value across the four models was .582. Since this number does not approach zero, the predictor variables are not overly redundant with one another. Overall, the VIF and tolerance statistics do not support the presence of an unacceptable level of collinearity among the predictors, so the assumption of noncollinearity is upheld for these four models.

The studentized deleted residuals were plotted against the predicted values to evaluate the assumptions of linearity and homoscedasticity for all four estimated models (Appendix C). The scatterplots indicate that the assumptions of homoscedasticity and linearity are plausible. Specifically, the scatterplots have approximately the same number of observations above and below the mean of zero and the shape of the data points

indicates a linear relationship. Thus, the assumption of normality is tenable using the descriptive method.

The data were evaluated for influential observations using standardized DFFIT and DFBETA statistics. Using the guidelines set forth by Myers (1990, pp. 260-262), none of the observations were judged to exert undue influence on the regression coefficients, and all standardized DFFIT and DFBETA values across the four models were less than one.

## CHAPTER 4

### Discussion

#### **Relationships Among Stress, Abstinence Duration, and Recovery Practices**

The primary hypothesis that the association between stress and the recovery practices would vary by abstinence duration—such that the association between stress and recovery practice involvement would be stronger at lower levels of abstinence duration—was not supported. The interaction between stress and abstinence duration did not contribute significant variance in any of the models predicting recovery practices, indicating that in the present sample, abstinence duration did not moderate the relationship between stress and recovery involvement. Stress also did not make any significant independent contributions to the models predicting recovery practices. However, abstinence duration did predict frequency of NA meeting attendance and sponsor support, such that individuals with longer abstinence duration attended fewer NA meetings and received less support from their sponsor.

**Stress.** The total stress contrasts between the lower and upper third of the sample versus the general U.S. population suggest that while established MHO members may report slightly more stress than the general population, individuals in early recovery are more acutely stressed than either individuals with longer periods in recovery or members of the general population. The experience of higher stress levels in early recovery are consistent with a developmental model of recovery (Gorski, 1991), the biopsychological model of stress (Figure 1), and the biaxial model of recovery proposed by Kelly and Hoepfner (2014) where reduced stress mediates the relationship between increased recovery capital and longer periods of abstinence duration.

From a psychobiological perspective, the HPA axis likely begins to return to normal functioning within the first year of recovery, although it is not known whether HPA responses return to a normative level as a function of long-term recovery (Stephens & Wand, 2012). The psychobiological changes that occur as HPA regulation begins to recover—though beneficial for overall health—may create additional challenges for individuals in early recovery. This observation is based on the idea that since the individual's "tolerance" for cortisol is decreasing, substance cravings may return at unpredictable times and in response to small amounts of stress. Therefore, experiencing the stressors that early recovery brings without adequate coping skills can also raise cortisol levels and trigger a relapse at this particularly vulnerable time (Sinha et al., 2011).

**Abstinence duration.** Abstinence duration significantly, negatively predicted frequency of meeting attendance and sponsor support. It is possible that this sample of NA members with at least 1 year in recovery—relative to individuals newly in recovery—have already achieved a certain critical threshold of recovery capital, whereby increased abstinence duration is associated with declining engagement in recovery practices. As MHO members accrue more abstinence duration, patterns of recovery practices may go from group-focused practices (e.g., sponsorship, service, meeting attendance) to more private, individually-held practices or informal recovery activities (e.g., step work, reading 12-step literature, socializing with friends in recovery outside of meetings). For instance, other studies have shown that recovery practice engagement of individuals in extended recovery (up to 10 years) either is maintained or decreases as abstinence duration increases (Pagano et al., 2012). However, it also seems likely that

individual factors, such as neuroticism and/or substance use severity may play a role in determining long-term patterns of recovery engagement, as these factors may determine the type of feedback that the individual is receiving from the group and their reactions to feedback from group members.

### **Individual Characteristics and Recovery Involvement**

**Substance use severity.** There were several individual predictors that yielded significant incremental prediction of recovery practices. As a block, the person-level covariates (i.e., helpfulness of emotional support received from inside recovery, substance use severity, and neuroticism) accounted for significant variance in all four regressions predicting recovery involvement. Interestingly, NA members' substance use severity was the most robust variable across models predicting recovery practices, as it was a significant predictor across all four models. However, substance use severity was negatively correlated with the recovery practices, indicating that members with higher levels of substance use severity prior to recovery were less likely to be actively involved in prescribed recovery activities. This is an interesting result given that previous studies have found that individuals who affiliate with 12-step organizations have higher substance use severity and more substance-related consequences than individuals who pursue other methods of SUD recovery (Bogenschutz, 2008; Emrick et al., 1993). The present result suggests that within the group of individuals who affiliate with MHOs on a longer-term basis, those who report higher historical substance use severity are likely to be the least actively engaged. While consistent with the theory that individuals who have more severe substance use problems are likely to engage in higher levels of avoidant coping and to have more stress dysregulation than individuals with less severe substance

use, this finding seemingly conflicts with results of other studies that have found similar or greater levels of recovery practice engagement among MHO members with dual diagnoses versus members with only SUD diagnoses (e.g., Aase et al., 2008; Bergman et al., 2014; Chi et al., 2013; Grella, Joshi, & Hser, 2004; Witbrodt & Kaskutas, 2005). Individuals with higher levels of substance use severity are also more likely to have psychiatric dual diagnoses and greater psychosocial consequences relative to individuals with only a SUD diagnosis, yet other studies have shown that these MHO members are likely to be more engaged in recovery practices than individuals without comorbidities (Bergman et al., 2014). It is possible that the observed differences represent differences in the way that that substance use severity was operationalized in this sample versus other studies (i.e., a composite of age at first use and number of problematic substances), and that individuals who have already been involved in a MHO for greater than one year have lower involvement overall relative to post-treatment samples that are in earlier recovery. It is also possible that the ostensible difference in findings may be attributable to a selection effect in that samples of most studies are composed of individuals early in recovery whereas the present sample was much more heterogeneous in this respect. Therefore, the observed result could be conceptualized as a sustained involvement effect.

**Neuroticism.** Individuals with high levels of neuroticism reported receiving less support from their sponsor. While neuroticism exerted influence on the sponsorship relationship, it is noteworthy that neuroticism did not significantly predict other recovery practices that are socially-oriented, such as home group comfort. Unlike feeling comfortable in one's home group, receiving meaningful support from a sponsor requires cultivating a more profound interpersonal connection with one individual. It is possible

that MHO members who are more neurotic have difficulty cultivating deeper interpersonal relationships, but in contrast, developing a comfort level with a home group requires more superficial relationships with less opportunity for perceived social slights. Psychobiological research has indicated that individuals with SUDs who are neurotic generally have higher levels of HPA dysregulation, and thus higher cortisol levels than individuals who are not neurotic (Wand, 2008). This higher level of dysregulation could be one mechanism whereby neuroticism creates poorer outcomes for MHO members (Fisher, Elias, & Ritz, 1998). Maintaining a sponsorship relationship has been shown to be a beneficial aspect of MHO involvement with respect to maintaining abstinence, particularly for individuals in early recovery (Tonigan & Rice, 2010). If MHO members have difficulty forming a sponsorship relationship, maintaining abstinence may be more challenging. Additionally, individuals who are more neurotic may create more situational stress for themselves through interpersonal discord, thereby trapping themselves in the dysregulated HPA-stress-coping loop (Figure 1). In the present study, this notion is supported by a large bivariate correlation between stress and neuroticism,  $r = .663$ ,  $p < .001$ .

**Social support.** The helpfulness of emotional support received from individuals in recovery was significantly and positively associated with higher levels of home group comfort, sponsor support, and home group service, but not with frequency of meeting attendance. This pattern of results suggests that there may be a bidirectional, reciprocal relationship between receiving helpful social support in MHOs and being an active recovery practice participant. For example, individuals who receive quality social support from other MHO members are likely more encouraged to continue engaging in recovery



practices alongside the sources of social support. Conversely, individuals who are more actively engaged in recovery practices are more likely to receive quality social support from other MHO members given they are likely also spending more time with people in recovery. Helpfulness of emotional support from individuals inside recovery accounted for 15.6% of the variance in sponsor support, and was the single strongest predictor across all four models. According to AA (1983), it is the sponsor's role to bridge the gap between working the program and forming recovery relationships. In a study examining NA members, continued participation in NA predicted improvements in social support (Toumbourou, Hamilton, U'Ren, Stevens-Jones, & Storey, 2002), while perceived social support predicted short-term abstinence (Lev-Wiesel, 2000), suggesting that the relationship between recovery involvement and social support is likely bidirectional.

### **Limitations**

There are several limitations that impact the conclusions that can be drawn from the current study. The cross-sectional design precludes the ability to draw firm conclusions about temporal precedence and causality. Data were stratified by length of time in recovery which may yield hypotheses about the developmental trajectory of stress and recovery involvement. However, further longitudinal studies are needed in order to fully establish the temporal relationships between individual factors, stress, and recovery involvement. The process of recovery from SUDs and of improved stress regulation is likely a developmental process that would be best captured by a longitudinal study. However, longitudinal studies of naturalistic, community-based MHO samples are difficult to implement given that the organizations are strictly non-professional and do not keep records of members' attendance and participation.

Second, the modest sample size ( $N = 128$ ) may not provide ideal external or statistical conclusion validity. While the sample is fairly heterogeneous (e.g., age, abstinence duration, geographical location), most studies examining MHOs use treatment-seeking samples that may be more balanced with regard to demographic variables, treatment history, and other important factors. Furthermore, if the sample were larger, additional analyses examining patterns of recovery involvement within specific abstinence duration strata would be possible. This would give a clearer picture of the functional form of the patterns of recovery involvement associated with different levels of abstinence duration over time.

Lastly, it is possible that the PSS did not accurately capture the stress construct in this population. As the PSS was designed for general use, and not specifically for application with individuals with SUDs, there may be elements of stress appraisals or stress severity present in the NA sample that are not accurately measured with the PSS. A comparison of the normative sample's reported stress to the present sample's stress suggests that this is likely not the case, because individuals in early recovery have more stress relative to the general population and to other individuals in recovery, but individuals in later recovery have about as much stress as the general population. It is possible, however, that NA members experience significant stress that is not accurately reflected by the PSS items. Nevertheless, further research is needed to determine whether additional and/or modified items—or an entirely different instrument—would be better suited to this population than the current PSS.

## **Strengths and Future Directions**

**Strengths.** A key strength of this study is that it fills a gap in the literature, as it is among the first quantitative studies to examine stress in members of 12-step organizations beyond the first year of recovery. While stress and coping theory more generally has implications about how MHO recovery practices may help members to cope with stress, few studies have examined the relationships between recovery engagement, stress, and length of time in recovery. Furthermore, this study is only one of a handful that has examined NA members or MHO members specifically after their first year of recovery, as the vast majority of MHO studies thus far have focused on treatment-seeking AA members within their first two years of recovery initiation. This sample also is unique in that it is a naturalistic, community-based sample that provides some insight into how recovery constructs may function in non-treatment referred individuals who affiliated MHO. Despite the lack of evidence for this study's hypotheses, information regarding stress levels in early recovery versus later recovery does provide tentative support for existing psychobiological theory regarding how stress levels change in recovery. Furthermore, the prominence of individual characteristics (e.g., neuroticism, substance use severity, availability of useful social support) underscores the deeply individualized nature of recovery involvement and enhances support for research focused on mechanisms of active engagement in recovery practices other than MHO meeting attendance alone.

**Future directions.** Future studies should continue to examine the relationship between stress, coping, and how recovery practices may serve as mechanisms to promote active coping in MHO members. Investigations that incorporate NA-specific or mixed

NA and AA samples are still needed to flesh out theory in this area. Valuable information about the developmental aspect of stress and coping in NA members would be gained by replicating a version of the present study in a sample of individuals with 0-1 year in recovery. Additional quantitative and longitudinal studies examining support for a psychobiological framework of recovery would be useful to establish temporal precedence, causality, and to generate empirical support for a SUD-specific theory of stress, coping, and recovery. Cortisol sampling is one method future studies could utilize to establish how recovery-oriented behaviors may be related to biological aspects of stress and coping. Further refining the psychobiological model could lead to important, clinically relevant treatment adaptations and development of interventions to help strengthen coping abilities in both early and later recovery. Current treatment methods (i.e., twelve-step facilitation) may also be further informed and strengthened through additional research on other types of MHOs and by examining components of the intervention through a stress and coping lens. For instance, taking a developmental approach into account (see Gorski, 1999), treatment approaches working with individuals in early recovery may be strengthened by focusing more specifically on teaching and practicing adaptive coping skills to help individuals navigate early recovery.

### **Conclusions**

Strong empirical support for a stress and coping theory applied to MHO members is presently lacking. However, the current study expanded upon theoretical frameworks proposed by MHO researchers by conceptualizing recovery practices as coping strategies in a larger psychobiological framework of recovery. Although stress did not significantly predict engagement in any of the recovery practices examined (frequency of NA meeting

attendance, home group comfort, sponsor support, and home group service), several other predictors emerged as individual-level factors that predict recovery engagement. These characteristics include the helpfulness of social support received from individuals inside recovery, neuroticism, substance use severity prior to recovery, and length of time in recovery. Because stress was not related to any of the four recovery practices investigated, more research is needed to determine whether these recovery practices may serve as compensatory coping strategies for MHO members. Stress does not appear to moderate the relationship between abstinence duration and recovery practice involvement, and there does not appear to be any association (i.e., linear, quadratic, cubic) between stress and engagement in any of the recovery practices examined. However, a closer examination of stress levels in NA members supports the theory that individuals who are in early recovery experience higher levels of stress relative to members who are in longer-term recovery. Further investigations are warranted to identify additional individual factors that influence the experience of stress and coping among NA and MHO members.

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## Tables

Table 5

	Meeting Attendance	Home Group Comfort	Sponsor Support	Home Group Service
Social support	.116	<b>.267</b>	<b>.371</b>	<b>.285</b>
Neuroticism	-.152	-.125	-.152	-.069
Substance Use Severity	<b>-.314</b>	<b>-.240</b>	<b>-.224</b>	<b>-.289</b>
Stress	.149	-.081	-.104	-.072
Abstinence Duration	<b>-.183</b>	.003	<b>-.197</b>	.034

*Note.* Bolded entries indicate clinically significant correlations,  $p < .05$ ; \*Responses were on a 4-point Likert scale: 1 (*never/almost never*), 2 (*sometimes*), 3 (*often*), and 4 (*always/almost always*)

Table 6

	1	2	3	4
1. NA meeting attendance	.325			
2. Home group comfort	<b>.386</b>	.653		
3. Sponsor Support	<b>.454</b>	<b>.307</b>	.233	
4. Home group service	<b>.484</b>	<b>.808</b>	<b>.358</b>	.690

*Note.* Bolded entries indicate clinically significant correlations,  $p < .05$ ; Multiple correlations for each variable with all other variables are presented on the main diagonal.

Table 7

	1	2	3	4	5
1. Social support	.035				
2. Neuroticism	.017	.418			
3. Substance Use Severity	-.050	.164	.036		
4. Stress	-.051	<b>.618</b>	.067	.395	
5. Abstinence Duration	.153	<b>-.289</b>	.008	<b>-.277</b>	.125

*Note.* Bolded entries indicate clinically significant correlations,  $p < .05$ ; Multiple correlations for each variable with all other variables are presented on the main diagonal.

## Appendix A

### Perceived Stress Scale (PSS; adapted from Cohen et al., 1983)

These questions ask you about feelings and thoughts during the PAST 3 MONTHS. In each case, you will be asked to indicate how often you felt or thought a certain way.

Although some of these questions are similar, there are differences between them and you should treat each one as a separate question.

Almost Never or Never	Once in a While	Sometimes	A Lot of the Time	Almost Always or Always
1	2	3	4	5

1. How often have you been upset because of something that happened unexpectedly?
2. How often have you felt that you were unable to control the important things in your life?
3. How often have you felt nervous or “stressed”?
4. How often have you dealt successfully with irritating life hassles?\*
5. How often have you felt that you were effectively coping with important changes occurring in your life?\*
6. How often have you felt confident about your ability to handle your personal problems?\*
7. How often have you felt that things were going your way?\*
8. How often have you found that you could not cope with all the things you had to do?
9. How often have you been able to control irritations in your life?\*
10. How often have you felt that you were on top of things?\*

11. How often have you felt angered because of things that happened that were outside of your control?
12. How often have you found yourself thinking about things you have to accomplish?
13. How often have you been able to control the way you spend your time?
14. How often have you felt difficulties were piling up so high that you could not overcome them?

*Note.* \*Denotes reverse-coded items. The total score is obtained by summing all 14 items.



## Appendix B

### Narcotics Anonymous Recovery Involvement Inventory

Please complete the following.

1. Age at first NA meeting: \_\_\_\_\_
2. Age at first other meeting (AA, CA, etc.): \_\_\_\_\_

Please use the following scale to indicate the frequency with which you engaged in the activities below in the past year: (circle one)

<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>
(never)	(1-5 times/ year)	(6-11 times/ year)	(1 time/ month)	(2-3 times/ month)	(1 time/ week)	(2-3 times/ week)	(4-5 times/ week)	(6-7 times/week)

3. Attended NA meetings 0   1   2   3   4   5   6   7   8

4. Attended other substance abuse-related  
12-step fellowships (combined) 0   1   2   3   4   5   6   7   8

Please use the following scale to indicate the level of importance for the item below: (circle one)

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
(Not important at all)	(Somewhat important)	(Very important)	(Extremely important)

5. **How important is NA membership to your life?**                    1                    2                    3                    4
6. **Where do you attend the majority of your NA meetings?**    City: \_\_\_\_\_                    State: \_\_\_\_\_
7. **How many times have you worked NA's 12-steps with the assistance of an NA sponsor?**                    \_\_\_\_\_
8. **If you have not completed all 12 steps, how many of NA's steps have you worked with the assistance of an NA sponsor?**                    \_\_\_\_\_
9. **During your current recovery period, have you had a spiritual awakening through your NA involvement? (Please check)**                    Yes: \_\_\_\_\_                    No: \_\_\_\_\_
10. **How many sponsees have you assisted in working NA's 12 steps?**                    \_\_\_\_\_
11. **How many sponsors have you had during your current recovery episode?**                    \_\_\_\_\_
12. **Do you currently have a sponsor? (Please check)**                    Yes: \_\_\_\_\_                    No: \_\_\_\_\_

13. **My current sponsor has sponsored me for...**(Please fill in years and months) \_\_\_\_\_(years) \_\_\_\_\_(months)
14. **How many years has your sponsor been clean?** \_\_\_\_\_(years)
15. **My sponsor is:** (please check) **Male:**\_\_\_\_\_ **Female:**\_\_\_\_\_

**Please indicate your level of agreement with the following statements based on this 5-point response scale.**

	<b>1</b> (Disagree Strongly)	<b>2</b> (Disagree)	<b>3</b> (Neutral)	<b>4</b> (Agree)	<b>5</b> (Agree strongly)
16. <b>My sponsor is currently working a strong program of recovery.</b> (Please circle)	1	2	3	4	5
17. <b>My sponsor has a lot of knowledge when it comes to NA's 12 steps.</b> (Please circle)	1	2	3	4	5
18. <b>My sponsor has a lot of knowledge when it comes to NA's 12 traditions.</b> (Please circle)	1	2	3	4	5
19. <b>My sponsor has a lot of NA-related service experiences.</b> (Please circle)	1	2	3	4	5

- |     |  |          |          |          |          |          |
|-----|--|----------|----------|----------|----------|----------|
| 20. | <b>My sponsor has a lot of experiences incorporating spiritual principles into his/her life.</b> (Please circle) | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> | <b>5</b> |
| 21. | <b>My sponsor and I have similar backgrounds.</b> (Please circle)  | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> | <b>5</b> |
| 22. | <b>I seek my sponsor's guidance on lots of issues related to my life.</b> (Please circle)                        | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> | <b>5</b> |
| 23. | <b>I consult my sponsor before making major life decisions.</b> (Please circle)                                  | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> | <b>5</b> |
| 24. | <b>I can count on my sponsor when I really need him/her.</b> (Please circle)                                     | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> | <b>5</b> |
| 25. | <b>My sponsor has little time for me.*</b><br>(Please circle)  | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> | <b>5</b> |
| 26. | <b>My sponsor helps me cultivate my own understanding of recovery.</b> (Please circle)                           | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> | <b>5</b> |
| 27. | <b>My sponsor wants me to adopt his/her views on recovery.</b> (Please circle)                                   | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> | <b>5</b> |
| 28. | <b>My sponsor helps me work NA's 12 steps.</b><br>(Please circle)  | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> | <b>5</b> |

- |            |   |   |   |   |   |   |
|------------|---|---|---|---|---|---|
| 29.        | <b>My sponsor helps me work NA's 12 traditions.</b> (Please circle) | 1 | 2 | 3 | 4 | 5 |
| 30.        | <b>My sponsor is close-minded.</b> (Please circle)*                 | 1 | 2 | 3 | 4 | 5 |
| 31.        | <b>My sponsor is trustworthy.</b> (Please circle)                   | 1 | 2 | 3 | 4 | 5 |
| 32.        | <b>My sponsor is supportive.</b> (Please circle)                    | 1 | 2 | 3 | 4 | 5 |
| 33.        | <b>My sponsor is loving.</b> (Please circle)                        | 1 | 2 | 3 | 4 | 5 |
| 34.<br>Q19 | <b>My sponsor is compassionate.</b> (Please circle)                 | 1 | 2 | 3 | 4 | 5 |
| 35.        | <b>My sponsor is judgmental of me.</b> (Please circle)*             | 1 | 2 | 3 | 4 | 5 |
| 36.        | <b>My sponsor is a good listener.</b> (Please circle)               | 1 | 2 | 3 | 4 | 5 |
| 37.        | <b>My sponsor is a good friend.</b> (Please circle)                 | 1 | 2 | 3 | 4 | 5 |

38. **My sponsor seeks my advice on issues related to his/her life.** (Please circle)      1      2      3      4      5
39. **My sponsor has let me down in some important ways.** (Please circle)\*      1      2      3      4      5
40. **My sponsor is very directive (e.g., gives me lots of suggestions).** (Please circle)      1      2      3      4      5

**For the items below, please use the following scale.**

- |  | <b>0</b> | <b>1</b>             | <b>2</b>             | <b>3</b>          | <b>4</b>              | <b>5</b>          | <b>6</b>             | <b>7</b>             | <b>8</b>            |
|--|----------|----------------------|----------------------|-------------------|-----------------------|-------------------|----------------------|----------------------|---------------------|
|  | (never)  | (1-5 times/<br>year) | (6-11<br>times/year) | (1<br>time/month) | (2-3 times/<br>month) | (1 time/<br>week) | (2-3 times/<br>week) | (4-5 times/<br>week) | (6-7<br>times/week) |
| 41. <b>How often have you called your sponsor (in the past year)?</b> (Please circle)  | <b>0</b> | <b>1</b>             | <b>2</b>             | <b>3</b>          | <b>4</b>              | <b>5</b>          | <b>6</b>             | <b>7</b>             | <b>8</b>            |
| 42. <b>How often have you seen your sponsor at meetings (in the past year)?</b> (Please circle)                                | <b>0</b> | <b>1</b>             | <b>2</b>             | <b>3</b>          | <b>4</b>              | <b>5</b>          | <b>6</b>             | <b>7</b>             | <b>8</b>            |
| 43. <b>How often have you socialized with your sponsor outside of meetings and for fun (in the past year)?</b> (Please circle) | <b>0</b> | <b>1</b>             | <b>2</b>             | <b>3</b>          | <b>4</b>              | <b>5</b>          | <b>6</b>             | <b>7</b>             | <b>8</b>            |
| 44. <b>How often have you socialized with your sponsor outside of meetings—but for recovery-related activities (e.g., step</b> | <b>0</b> | <b>1</b>             | <b>2</b>             | <b>3</b>          | <b>4</b>              | <b>5</b>          | <b>6</b>             | <b>7</b>             | <b>8</b>            |

**discussions) (in the past year)?** (Please circle)

45. **How many people do you currently sponsor?** (Fill in blank) \_\_\_\_\_

46. **If you currently sponsor people, in general, how often have you talked to them in the past year?** (Please circle)      **0    1    2    3    4    5    6    7    8**

**Please complete the following.**

47. **Approximately how many home groups have you had during your current recovery episode?** (Fill in blank) \_\_\_\_\_

48. **Do you currently have a home group?**      **Yes:**\_\_\_\_\_      **No:**\_\_\_\_\_ (Please check)

**Using the following scale, please respond to the items below based on your experiences with your current or most recent home group.**

**1**    **2**    **3**    **4**  
 (never/almost never)                      (sometimes)                              (often)    (always/almost always)

- |     |  |          |          |          |          |
|-----|--|----------|----------|----------|----------|
| 49. | <b>I attend my home group regularly.</b> (Please circle)                                 | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> |
| 50. | <b>I feel very comfortable at my home group.</b> (Please circle)                         | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> |
| 51. | <b>I have a strong connection to others at my home group.</b> (Please circle)            | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> |
| 52. | <b>I celebrate recovery birthdays/anniversaries at my home group.</b> (Please circle)    | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> |
| 53. | <b>I do service work at my home group.</b> (Please circle)                               | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> |
| 54. | <b>I attend business meetings at my home group.</b> (Please circle)                      | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> |
| 55. | <b>I socialize with home group members before my home group meeting.</b> (Please circle) | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> |
| 56. | <b>I socialize with home group members after my home group meeting.</b> (Please circle)  | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> |
| 57. | <b>I participate in my home group by sharing during the meeting.</b> (Please circle)     | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> |



Please use the following scale to answer the questions below about your relationships with NA members other than your sponsor.

<b>0</b> (never)	<b>1</b> (1-5 times/ year)	<b>2</b> (6-11 times/year)	<b>3</b> (1 time/ month)	<b>4</b> (2-3 times/ month)	<b>5</b> (1 time/ week)	<b>6</b> (2-3 times/ week)	<b>7</b> (4-5 times/ week)	<b>8</b> (6-7 times/ week)					
58.	<b>How often in the past year have you socialized with other NA members?</b> (Please circle)				<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>
59.	<b>How often in the past year have you sought the advice of other NA members?</b> (Please circle)				<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>
60.	<b>How often in the past year have you attended NA-related events (e.g., dances, group celebrations, etc.)?</b> (Please circle)				<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>
61.	<b>How often in the past year have you attended an NA-related convention?</b> (Please circle)				<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>
62.	<b>How often in the past year have you read NA's book of daily meditations (the Just for Today book)?</b> (Please circle)				<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>

63. **How often in the past year have you read NA's Basic Text?** (Please circle)      0   1   2   3   4   5   6   7   8
64. **How often in the past year have you read NA's book on the 12 steps and 12 traditions (It Works: How and Why?)** (Please circle)      0   1   2   3   4   5   6   7   8
65. **How often in the past year have you read NA's step working guides (the step workbook with questions in it)?** (Please circle)      0   1   2   3   4   5   6   7   8
66. **How often in the past year have you read NA's sponsorship book?** (Please circle)      0   1   2   3   4   5   6   7   8
67. **How often in the past year have you read NA's booklets (e.g., Twelve Concepts for NA Service, In Times of Illness, etc.)?** (Please circle)      0   1   2   3   4   5   6   7   8
68. **How often in the past year have you read NA's information pamphlets (e.g., Sponsorship, The Triangle of Self Obsession, etc.)?** (Please circle)      0   1   2   3   4   5   6   7   8
69. **How often in the past year have you listened to NA speaker tapes (e.g., taped**      0   1   2   3   4   5   6   7   8

**recordings of NA members speaking at NA conventions)? (Please circle)**

70. **How often in the past year have you visited the NA World Service Website to find NA-related information?** (Please circle)

0   1   2   3   4   5   6   7   8

**Please use the following scale to answer the question below.**

**1**                      **2**                      **3**                      **4**                      **5**  
(Disagree strongly)    (Disagree)            (Neutral)            (Agree)            (Agree strongly)

71. **How much do you agree with the following statement: I work hard to establish and maintain relationships with other NA members.** (Please circle)

1                      2                      3                      4                      5

## NA Service Work Experiences

For each category of service, denoted by the boxes shaded in gray, please enter the number of years of experience in the ‘total years’ boxes at the bottom of the columns. In the remaining boxes, please check all that apply to the left of the service activity.

Group		Area/Regional		Zonal Service		World Service	
	Secretary		ASC/RSC Admin		Fellowship Development		Ad Hoc/Focus
	Chair		Events/Activities		Other Zonal Service		Group/Workgroup
	Treasurer		Fellowship Development		Translations		Human Resource Panel
	Greeter		Group Service Representative		Website		NAWS Development Travel
	Speaker seeker		Hospitals & Institutions		Zonal Forum Admin		NAWS Public Relations
	Coffee		Literature		Board of Directors (BOD)		Pre-1998 WSC Committees or Boards
	Meeting set-up / clean-up		Outreach		Committee Member		Regional Delegate/ Alternate
			Phone/Helpline		Executive Committee		Special Worker
			Public Information		Special Worker		World Board
			Public Relations		Volunteer		WSC Co-facilitator
			Policy		Convention / corporation / service office		

			Regional Committee Member				
			Translations				
			Website				
	<b>Total Years Group</b>		<b>Total Years Area/Regional</b>		<b>Total Years Zonal</b>		<b>Total Years World</b>

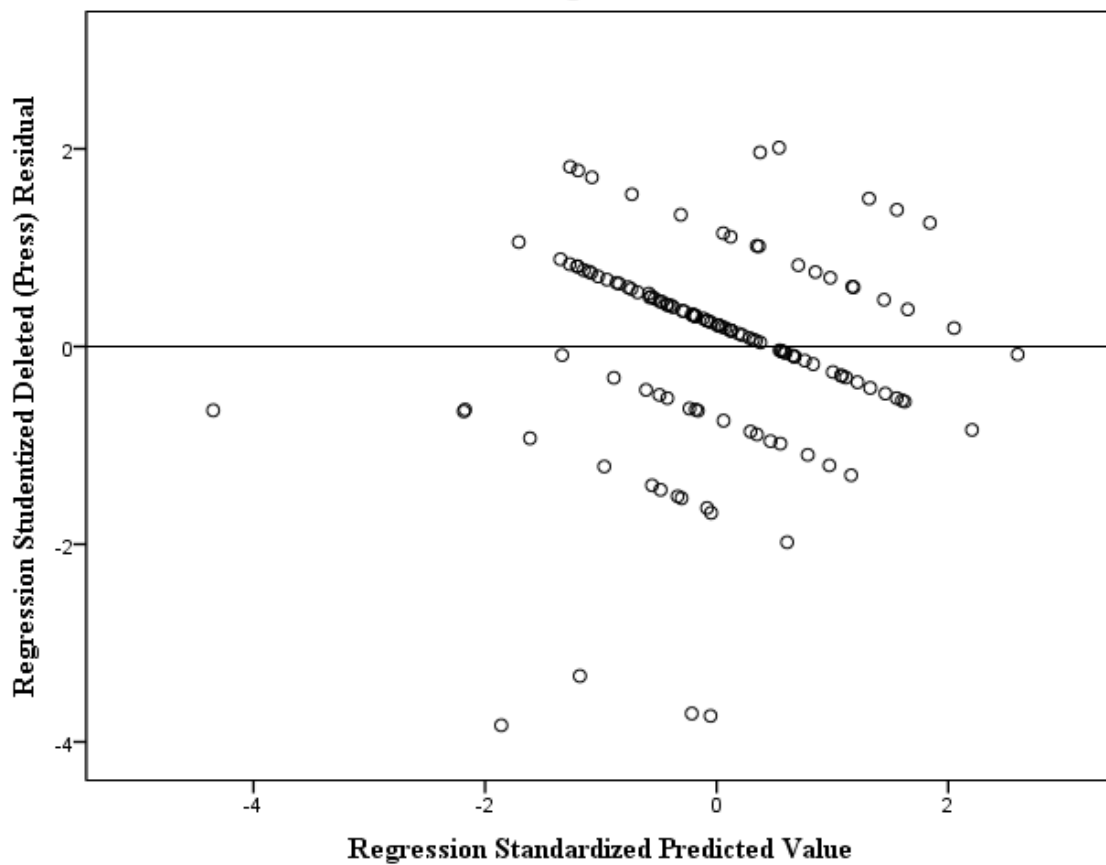
*Scoring instructions*

For the sponsorship qualities inventory, items followed by an asterisk are reverse scored. For the service activity grid, sum number of checks in each service domain (e.g., group) to obtain number of activities per domain. Then sum all checks to obtain total number of service activities.

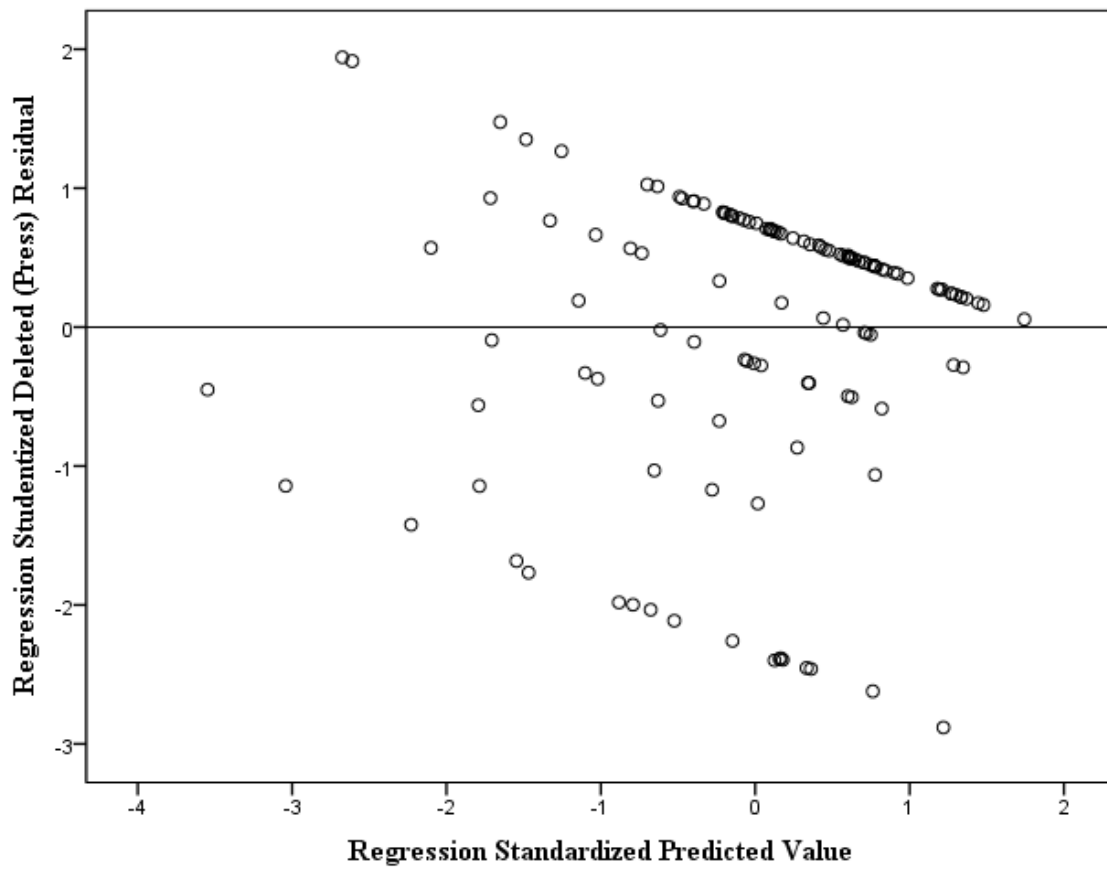
## Appendix C

## Regression Diagnostic Plots

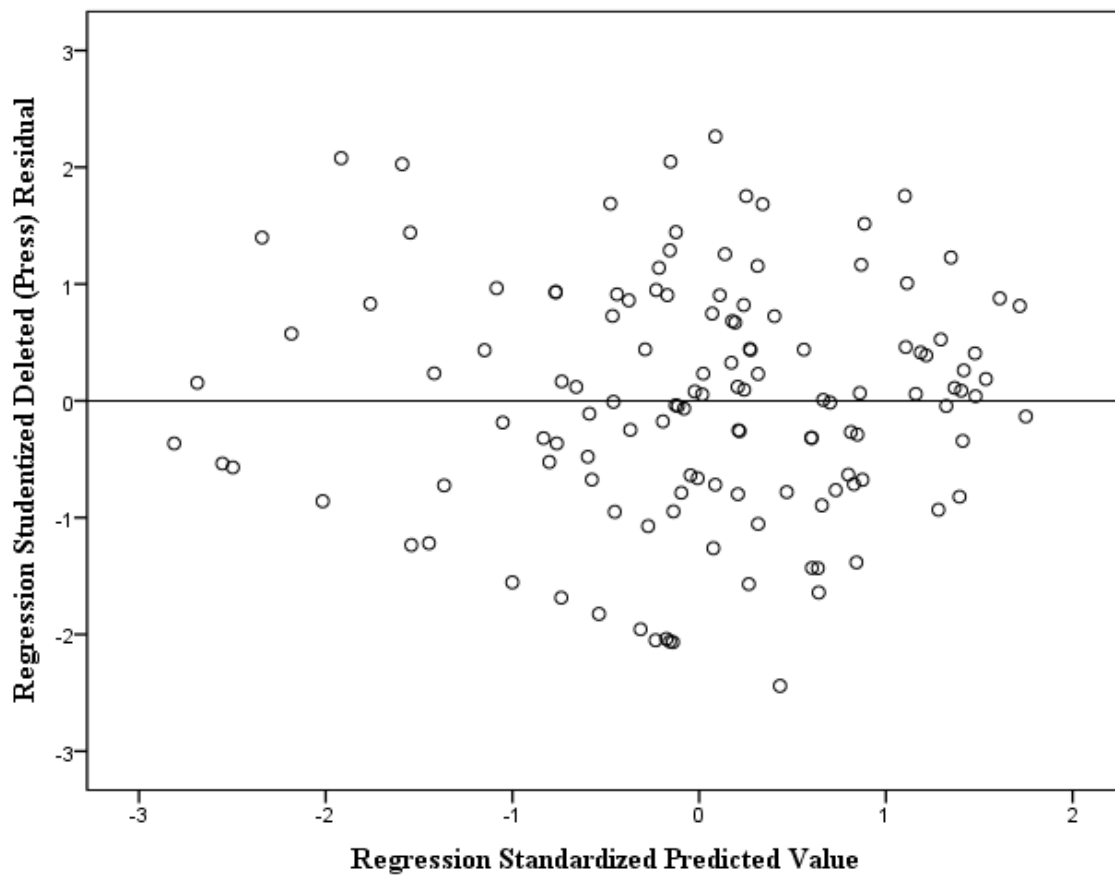
Regression diagnostic scatterplot of studentized deleted residuals against predicted values for NA meeting attendance



Regression diagnostic scatterplot of studentized deleted residuals against predicted values for home group comfort



**Regression diagnostic scatterplot of studentized deleted residuals against predicted values for connection with sponsor**





Regression diagnostic scatterplot of studentized deleted residuals against predicted values for home group service

