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PATTERNS OF ALCOHOL-SPECIFIC COPING AMONG INDIVIDUALS WITH ALCOHOL USE DISORDER: DOES COPING REPertoire MATTER?

Corey Roos

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**PATTERNS OF ALCOHOL-SPECIFIC COPING AMONG INDIVIDUALS WITH
ALCOHOL USE DISORDER: DOES COPING REPERTOIRE MATTER?**

BY

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THESIS

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ABSTRACT

Gaining a better understanding of mechanisms that underlie change in alcohol use behaviors is essential for designing more effective treatments for alcohol use disorders (AUDs; Longabaugh & Magill, 2011). One potentially important mechanism of change is the acquisition of alcohol-specific coping skills, defined as behaviors directly aimed at preventing one from drinking. It is unclear whether having a broad repertoire of distinct coping skills is an important factor in changing one's alcohol use. An emerging body of literature suggests that having a broad repertoire of coping skills is vital to promoting psychological well-being and may enable individuals to flexibly implement a diverse range of skills that are situationally appropriate (Bonnano & Burton, 2013). However, among individuals with AUDs there is limited research on coping repertoire, defined as the frequency in which one is able to use a variety of coping skills. Therefore, the present study examined the role of coping repertoire in changing alcohol use among 1,383 individuals who received treatment for AUDs as part of the COMBINE study

(COMBINE Study Research Group, 2008). We used latent class analysis (LCA) to empirically classify individuals into distinct coping repertoire groups based on their patterns of coping, as measured by the alcohol version of the Processes of Change Questionnaire (PCQ; Prochaska, Velicer, DiClemente, & Fava, 1988). We hypothesized that LCA would reveal a class of individuals who exhibit a broad coping repertoire, indicated by a pattern of frequently using numerous different coping skills, and that this group would have significantly better alcohol-related outcomes than classes with narrower coping repertoires. Using LCA, we identified 3 latent classes: a broad repertoire class (36.1 % of the sample), characterized by primarily high utilization across all coping skills, a moderate repertoire class (42.4 % of the sample), characterized by primarily moderate utilization across all coping skills, and a narrow repertoire class (21.6 % of the sample), characterized by primarily low utilization across all coping skills. As predicted, the broad repertoire class had the best alcohol-related outcomes (i.e., drinking frequency, intensity, and alcohol-related consequences) at end-of-treatment and the week 26 follow-up, whereas the moderate and narrow repertoire classes had poorer outcomes. These findings are consistent with findings from the small number of studies on coping repertoire among individuals with AUDs (Litman et al., 1979; Moser & Annis, 1996) and demonstrate that having a broad coping repertoire may be an important factor that mobilizes change in alcohol use behaviors. Accordingly, further empirical research is warranted in order to gain a better understanding of the role of coping repertoire in facilitating behavior change among individuals with AUDs.

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Introduction

Background

Alcohol use disorders (AUDs) remain a serious public health concern and are associated with numerous negative costs to society including injuries, assaults, and deaths, as well as additional healthcare costs from alcohol-related medical problems such as liver disease, heart disease, and neuropsychiatric disorders (World Health Organization, 2014). Additionally, problematic alcohol use is related to individual negative consequences such as unemployment, interpersonal problems, psychiatric disorders, and increased risk for accidental injuries and medical problems (Hasin, Stinson, Ogburn, & Grant, 2007). Recent efforts in alcohol treatment research have focused on mechanisms of behavior change in order to understand *how* treatments work and *why* changes in alcohol use behavior occur (Longabaugh & Magill, 2011; Moos, 2007). A greater understanding of the mechanisms that underlie behavior change may enhance our ability to design effective treatments that directly target these mechanisms.

Alcohol-Specific Coping Skills as a Mechanism of Change

One potentially important mechanism of change is the acquisition of coping skills during treatment. Coping among individuals with AUDs can be categorized into two types: general coping and alcohol-specific coping (Monti et al., 2001). General coping refers to skills or strategies such as problem solving that are aimed at managing diverse stressors in life. Alcohol-specific coping refers to behaviors directly aimed at preventing one from drinking. Examples of alcohol-specific coping skills include avoiding alcohol cues, engaging in substitute behaviors, and reappraising the consequences of drinking. Studies on general coping skills typically administer self-report measures on general

coping such as the Coping Response Inventory (CRI; Moos, 1993). Results reveal that an active style of general coping is related to favorable alcohol outcomes and an avoidant style of general coping (cognitive avoidance) is related to poorer alcohol outcomes (Cleveland & Harris, 2010; Chung et al., 2001; McKay, Maisto & O'Farrell, 1996; Moos, Brennan, Fondacaro, & Moos, 1990). Although these studies clarify the role of general coping styles in AUDs, they do not necessarily contribute to our understanding of whether clients acquire alcohol-specific coping skills that are often taught in alcohol treatments such as cognitive behavioral treatment (CBT). Measures of general coping do not assess how individuals manage alcohol urges and specific high-risk situations that may encourage relapse.

Alcohol-specific coping skills are important to study because teaching clients how to cope with urges and high-risk situations is a key component of many treatments. For example, CBT, one of the more widely utilized approaches for AUDs, emphasizes alcohol-specific coping skills (Marlatt & Gordon, 1985; Kadden, 1995). Whereas other treatments for AUDs may not directly focus on coping skills training in the same manner as CBT, many alcohol treatments still aim to assist clients in finding ways to manage situations that may lead to relapse. For example, 12 step-oriented treatments encourage skills such as avoiding drinking situations and seeking social support in order to prevent relapse (Nowinski, Baker, & Carroll, 1992).

Alcohol-specific coping skills also are important to study because a better understanding of the actual behaviors clients engage in to prevent drinking will likely lead to an enhanced ability to design and implement effective behavioral treatments for AUDs. However, our current understanding of how and why alcohol-specific coping

skills may prevent relapse is limited. Perhaps because of our limited understanding of how and why coping skills aid individuals in recovering from AUDs, it is not well understood how behavioral treatments can most effectively teach coping skills. In fact, there is little evidence to support the notion that CBT works by enhancing client coping skills (Morgenstern & Longabaugh, 2000). Despite the fact that CBT specifically emphasizes coping skills training, individuals in 12 step-oriented treatments exhibit equivalent increases in alcohol-specific coping skills compared to individuals receiving CBT (Finney, Noyes, Coutts, & Moos, 1998, Litt, Kadden, Cooney, & Kabela, 2003;).

A Review of Empirical Literature on Alcohol-Specific Coping Skills

To more clearly demonstrate the limitations of existing research on alcohol-specific coping, it is necessary to more closely examine literature to date in this area. Many studies have utilized behavioral role-play tasks to assess the acquisition of alcohol-specific coping skills. Behavioral role-play tasks involve asking clients to imagine themselves in high-risk situations and having them indicate how they would respond. Although studies using role-play tasks have found that an increase in coping is related to improved alcohol use outcomes, these studies have consistently failed to show that CBT enhances client coping skills to a greater extent than other treatments (Morgenstern & Longabaugh, 2000). One notable exception is a study by Kiluk, Nich, Babuscio, and Carroll (2010) that utilized a role-play task measure the quality of coping skills. This study demonstrated a significantly greater increase in coping skills among those receiving computerized CBT-based treatment in addition to treatment-as-usual (TAU) compared to those who received TAU alone. Furthermore, this study found that the quality of coping responses during the role-play task, as scored by independent raters, mediated the effects

of CBT. Although a role-play measure of coping was informative in the Kiluk et al. (2010) study, the majority of other studies have not found role-play measures useful for examining mechanisms of change in CBT for AUDs (Morgenstern & Longabaugh, 2000). Additionally, role-play measures may be limited because they present generic situations that are not specific to the individual and may not adequately assess the actual alcohol-specific coping skills that clients engage in outside of treatment.

Retrospective self-report instruments also have been used to assess alcohol-specific coping skills. One of these instruments is the Coping Behaviours Inventory (CBI; Litman, Stapleton, Oppenheim, & Peleg, 1983), a 36-item measure that assesses four classes of alcohol-specific coping skills including positive thinking (e.g., “thinking about how much better off I am without drinking”), negative thinking (e.g., “thinking of the mess I’ve got myself into through drinking”), seeking social support (e.g., “telephoning a friend”), and avoidance/distraction (e.g., “going for a walk”). Studies utilizing the CBI have shown that positive thinking in particular is associated with abstinence from alcohol (Litman, Eiser, Rawson & Oppenheim, 1979; Litman et al., 1984; Miller, Westerberg, Harris, & Tonigan, 1996). Another measure of alcohol-specific coping skills is the Urge-Specific Strategies Questionnaire (USS; Monti et al., 2001). Administration of the USS involves first asking clients what strategies they use and having raters code the open-ended responses into distinct strategies. During and following treatment a version of the USS with close-ended questions representing client-specific distinct strategies is administered. The USS has also been administered with only researcher created close-ended questions representing 19 strategies commonly taught in cognitive-behavioral coping skills training. Using the 19-item USS, Dolan, Rosenhow, Martin, & Monti

(2013) found that 13 out of these 19 strategies at follow-up were correlated with a lower frequency of alcohol use days among clients receiving cognitive-behavioral coping skills training for AUDs. Effective strategies included 5 behavioral strategies (e.g., contact social support person), 7 cognitive strategies (e.g., think of the positive consequence of staying sober), and spiritual coping (e.g., call upon a higher power). Ineffective strategies included substituting food or drink, meeting a sponsor, self-punishment, and willpower. It is important to note that no studies have examined the factor structure of the USS. Rather, studies using the USS have only examined the relationship between alcohol outcomes and single items on the USS, each representing unique strategies.

The Processes of Change Questionnaire (PCQ; Prochaska et al., 1988) also has been utilized to examine coping skills among individuals with AUDs. The PCQ was originally developed on a sample of cigarette smokers and assesses 10 coping strategies that are theorized to promote health behavior change. These 10 processes include 5 cognitive processes (consciousness raising, dramatic relief, environmental reevaluation, self-reevaluation, and social liberation) and 5 behavioral processes (contingency management, counterconditioning, helping relationships, self-liberation, and stimulus control). Using the PCQ, Moggi, Ouimette, Moos & Finney (1999) demonstrated that an increase in overall coping following treatment predicted a greater likelihood of abstinence one year following treatment. Litt and colleagues (2003) developed a modified version of the PCQ called the Coping Strategies Scale (CSS), which was designed to assess coping strategies specifically used by individuals with alcohol and substance use disorders. Studies using the CSS have shown that an increase in overall coping during treatment is related to positive drug and alcohol use outcomes among individuals in

treatment (Litt et al., 2003; Litt, Kadden & Kabela-Cormier, 2009; Sugarman, Nich, & Carroll, 2010). Because evaluations of the factor structure of the CSS have not been consistent across studies, only total coping scores have been used in analyses and studies have not examined whether specific types of coping skills as measured by the CSS are associated with drinking outcomes.

In summary, research to date on alcohol-specific coping skills indicates that specific strategies such as cognitive reappraisal and seeking social support are effective, that increases in overall coping skills are related to improved alcohol treatment outcomes, and that the quality of coping may be especially important. Additionally, increases in alcohol-specific coping have not been shown to be a mechanism of behavior change in CBT for AUDs (Morgenstern & Longabaugh, 2000).

Coping Repertoire among Individuals with AUDs

One relatively unexplored question regarding alcohol-specific coping skills is whether coping repertoire, defined as the degree to which one is able to use a variety of coping skills, is an important factor in alcohol use behavior change. Individuals with a broad repertoire of skills may be more equipped to avoid relapse in high-risk situations because they have access to a variety of skills that are situationally appropriate. Moreover, having the ability to implement a wide range of different alcohol-specific skills may be more important than having the ability to implement any single strategy. It is important to note that although numerous studies have found that an increase in total scores on a measure of alcohol-specific skills is associated with improved outcomes, these studies do not clarify whether coping repertoire specifically explains these relationships. For example, a participant could exhibit increases in his or her total coping score by greatly

increasing the use of one or a few types of coping skills without necessarily widening their coping repertoire by using a broader range of skills. Another participant could show the same net increase in his or her total coping score but could have increased his or her use of several different types of skills rather than only showing large increases on one or a few types of skills. Thus, investigating the relationship between total scores on alcohol-specific coping skills and alcohol outcomes does not necessarily reveal how or whether widening one's coping repertoire is related to outcome.

Among individuals with AUD, only a few studies have examined the role of coping repertoire. Moser and Annis (1996) interviewed clients about their ways of coping with alcohol urges and high-risk situations throughout the course of treatment. Results indicated that using a greater number of coping strategies in potential relapse situations significantly increased one's odds of remaining abstinent. Additionally, study raters categorized each reported coping strategy into four categories based on whether the strategy was active versus avoidant and cognitive versus behavioral. Results indicated that those who combined active and avoidant strategies were more successful in achieving abstinence than those who used either strategy alone. Furthermore, those who used both cognitive and behavioral strategies had better outcomes than those who used either of these types of strategies alone. Altogether, results suggest that the ability to use multiple strategies and the ability to use categorically distinct strategies may be protective against relapse. Hence, a broad coping repertoire may be characterized by both the total number of coping strategies within one's repertoire and the categorical variability of strategies within one's repertoire. In another study among individuals with AUDs, Litman et al. (1979) investigated differences in coping behaviors between individuals

who were abstinent (“survivors”) versus those who had relapsed (“relapsers”). Using an open-ended written questionnaire to assess coping, they found that having a greater number of coping behaviors within one’s repertoire, as well as having a greater number of coping behaviors perceived as effective, discriminated survivors from relapsers. Accordingly, the authors concluded that having a variety of coping skills might assist one in resisting drinking in various high-risk situations. Finally, using a verbal role-playing task to assess coping responses among individuals with AUDs, Chaney, O’Leary, and Marlatt (1978) found that shorter response latencies, or the time elapsed until a participant provided a response, predicted greater number of days abstinent over a one-year period. This result suggests that the ability to quickly generate a coping response in a high-risk situation may be more important than the type of response. It is plausible that individuals with a greater number of strategies to choose from can more quickly generate a coping response in a high-risk drinking situation. Thus, although Chaney et al. (1978) did not directly assess coping repertoire in the role-play task, the finding regarding response latency suggests that coping repertoire could also be important because having a broad coping repertoire may potentially underlie the ability to quickly generate responses other than drinking. Altogether, these few studies suggest that coping repertoire may be an important protective factor against relapse. However, there has only been one published study (Moser & Annis, 1996) on this topic in the past three decades and there have been no published research on this topic since 1996.

The Emerging Body of Literature on Coping Flexibility

Although alcohol researchers have not explored the role of coping repertoire extensively, there has been a rapid increase in attention given to coping repertoire among

coping and emotion regulation researchers. For example, Bonanno and Burton (2013) asserted that coping repertoire is a key component of the broader construct called regulatory or coping flexibility, defined as a person's ability to flexibly implement diverse strategies that meet the demands of a given situation. According to Bonanno and Burton (2013), coping and emotion regulation researchers have focused far too much attention on whether certain strategies are more effective than others across people and contexts. The authors highlighted that empirical findings regarding the efficacy of specific strategies are variable and do not reveal one strategy to be consistently superior to others. Thus, Bonanno and colleagues posited that there is a need for more research on how various strategies may function in different contexts and for different individuals, and how coping flexibility may play an important role in facilitating adjustment to stressors. In fact, there is an emerging body of literature in coping and emotion regulation research suggesting that having a broad coping repertoire is vital in promoting positive mental health outcomes (Bonanno & Burton, 2013). For example, Loughheed and Hollenstein (2012) used latent profile analysis to examine how the size of adolescents' emotion regulation repertoire was related to mental health outcomes. Five measures of emotion regulation strategies (e.g., reappraisal and suppression) were used to characterize adolescents into distinct profiles. They found that adolescents with emotion regulation profiles indicating average to high utilization of several emotion regulation strategies had significantly better mental health outcomes than adolescents with profiles indicating high scores on only one or two strategies. These findings suggest that relying on a few strategies may not be as effective as having a broader range of strategies at one's disposal. Cheng (2001) investigated the role of coping flexibility among college students

and adults by using a daily diary method. Cluster analyses revealed that one group of participants showed the most variability in their use of problem-focused and emotion-focused coping strategies across six different stressful events. This group reported being able to handle stressors better than other groups of participants who tended to rely on a particular type of coping strategy across situations. Aldao and Nolen-Hoeksema (2012) also found that variability in using certain coping strategies was related to mental health outcomes. In this study participants were asked to identify eight unique situations that elicited emotions and explain what strategies they used to regulate their emotions. Results indicated that greater variability (measured as standard deviation scores) in using problem solving and acceptance across the eight situations was associated with improved mental health outcomes. These findings suggest that selectively utilizing strategies that meet the demands of a given situation may be as or more effective than utilizing a strategy across all emotion-eliciting situations.

Research among trauma-exposed individuals also has demonstrated the importance of coping flexibility. For example, Bonnano, Pat-Horenczyk, & Noll (2011) examined patterns of coping following a traumatic event and found that the ability to flexibly implement both future-oriented and trauma-focused coping strategies predicted more positive adjustment. Orcutt, Bonanno, Hannan, and Miron (2014) found that students who were able to use a greater number of emotion regulation strategies were better adjusted following a campus shooting. Another study by Bonanno et al. (2004) indicated that the ability to flexibly modulate emotional reactions was adaptive among trauma-exposed individuals. In an experimental task participants viewed distressing images and at different times were asked to either enhance or suppress their emotional

reactions. Participants who were judged by raters as being better able to both enhance and suppress their emotions during the experimental task exhibited significant reductions in distress six months later. Using the same experimental paradigm, Gupta and Bonanno (2011) found similar results among bereaved adults.

Another approach to assessing coping flexibility is to measure the construct with a self-report instrument. For example, Kato (2012) developed the Coping Flexibility Scale (CFS) to assess one's ability to switch between different strategies and utilize alternative strategies as needed (e.g., "When a stressful situation has not improved, I try to think of other ways to cope with it"). Using a sample of over 4,000 participants, Kato (2012) demonstrated strong psychometric properties of the CFS and found that higher levels of coping flexibility were related to more positive mental health outcomes.

Overall, a growing body of research has begun to take several different approaches to empirically examine the construct of coping flexibility. As Bonanno and Burton (2013) note, coping repertoire appears to be a key aspect of overall flexibility in coping with stressors and regulating emotions. With a larger repertoire of strategies, individuals are likely more able to flexibly implement strategies that meet the changing demands of different situations.

The Current Study

Given that a broad coping repertoire has been found to be related to positive psychological outcomes in a variety of different populations (e.g., adolescents, trauma-exposed individuals, college students, community samples), coping repertoire also may be related to positive outcomes among individuals with AUDs. Having a broad repertoire of alcohol-specific coping skills may allow individuals to more effectively implement

contextually-appropriate skills that prevent relapse in various high-risk situations. However, to date, coping repertoire has not been examined extensively among individuals with AUDs. Hence, the present study aimed to fill this gap by investigating how coping repertoire is related to alcohol outcomes among individuals receiving treatment for AUDs.

Importantly, in this study we define the construct of coping repertoire as *the frequency* in which one is able to use a variety of coping skills. This conceptualization of coping repertoire emphasizes *the degree or frequency* with which an individual implements a wide range of skills, rather than assuming that *any* use of a particular skill means that this skill is an important skill in one's repertoire and that an individual is equally able to implement this skill compared to other skills. Thus, for example, even though two individuals may report at least some use of ten different skills, an individual utilizing the ten skills at a moderate to high level of frequency would be considered as having a broader coping repertoire compared to an individual utilizing the ten skills at a low level of frequency. Moreover, it is important to note that variability in using coping skills may take on two forms. First, using a variety of skills may entail using a large number of different skills, which may or may not belong to the same overall category of coping skills. Second, using a variety of skills may entail drawing from a variety of distinct overall categories of skills (e.g., cognitive vs. behavioral or active vs. avoidant).

To assess the construct of coping repertoire, as operationalized in this study, we used finite mixture modeling to examine distinct patterns of alcohol-specific coping. Finite mixture modeling (FMM) is a person-centered approach that initially was developed as a method for approximating a non-normal distribution of scores with a

mixture of normal distributions (McLachlan & Peel, 2000). FMM recently has been applied to various fields of psychology as a technique for empirically deriving distinct groups (i.e., “classes” in latent class analysis or “profiles” in latent profile analysis) of individuals who exhibit similar patterns of data across multiple indicators (Collins & Lanza, 2010). Thus, by using FMM on a measure of alcohol-specific coping skills we investigated whether there were different classes of coping repertoires characterized by distinct patterns of utilizing various coping skills at varying levels of frequency. We reasoned that a broad coping repertoire, defined as being elevated in one’s ability to use a variety of strategies, would be represented by latent classes exhibiting patterns of coping characterized by using numerous different skills at a relatively high level of frequency. Additionally, we were interested in whether groups of individuals with broad coping repertoires have significantly better alcohol outcomes than groups with narrow coping repertoires.

The current study utilized data from the COMBINE study, a multi-site alcohol treatment trial involving 1,383 participants diagnosed with AUDs (COMBINE Study Research Group, 2008). The measure of alcohol-specific coping skills administered in COMBINE was the alcohol version of the 40-item Processes of Change Questionnaire (PCQ; Prochaska et al., 1988). The present study therefore utilized the PCQ to examine patterns of alcohol-specific coping following treatment. Figure 1 presents a list of all 40 items of the PCQ.

The ten processes of change measured by the PCQ were first identified by Prochaska and colleagues by studying common ways in which people change various problem behaviors across different modalities of treatment or without receiving treatment

(Prochaska, DiClemente, & Norcross, 1992). The processes of change are part of the Transtheoretical Model of Change (TTM; Prochaska & DiClemente, 1982), a model that delineates stages of behavioral change (e.g., precontemplation) and specific processes that enable individuals to advance through different stages and achieve behavioral change. As previously noted, the ten theorized processes of change include five cognitive processes (consciousness raising, dramatic relief, environmental reevaluation, self-reevaluation, and social liberation) and five behavioral processes (contingency management, counterconditioning, helping relationships, self-liberation, and stimulus control). The PCQ was originally developed and validated among cigarette smokers (Prochaska et al., 1988). Principal components analysis of a 65-item PCQ revealed a 40-item questionnaire with ten first-order factors representing the ten processes and two second-order factors representing the two overarching types of processes: behavioral and cognitive. Subsequent studies among smokers have supported this factor structure in both a 40-item and 20-item version of the PCQ (Guo, Fielding, Sutton, & Aveyard, 2011; Hoepfner et al., 2006). The smoking version of the PCQ has also been adapted for individuals with AUDs. However, there is less supporting evidence of the factor structure of the PCQ among individuals with AUDs. Snow, Prochaska & Rossi (1994) found support for eight out of the ten processes. Freyer et al. (2006) could not confirm the factor structure of the 40-item PCQ, but were able to confirm the factor structure using a 20-item version that excluded poorly performing items.

Because of the limited evidence to support the factor structure of the PCQ among individuals with AUD, the first aim of this study was to conduct a confirmatory factor analysis (CFA) to evaluate whether the hierarchical model for the PCQ was supported

and to inform our analytic approach for examining coping repertoire (i.e., whether to examine patterns of coping across the ten subscales of the PCQ). The second aim was to empirically examine patterns of alcohol-specific coping at the end of treatment. We planned to use latent profile analysis (LPA) using the ten subscale scores as continuous indicators if the hierarchical factor structure of the PCQ was supported by the CFA. We planned to use latent class analysis (LCA) using each of the 40 items as categorical indicators if the hierarchical factor structure was not supported by the CFA. In sum, the primary aim of the current study was to utilize FMM (LCA with categorical indicators or LPA with continuous indicators) to examine how the patterns of alcohol-specific coping repertoires were related to alcohol use outcomes among individuals receiving treatment for AUDs. To our knowledge, there are no published studies that have used either LCA or LPA on the PCQ.

Study Hypotheses

Because the 10-factor structure of the PCQ has not been adequately supported among those with AUDS, we hypothesized that the ten-factor structure would not be supported in the present study. Further, we hypothesized that a series of latent class analyses would reveal four latent classes, which upon inspection could be interpreted as: a) narrow repertoire (i.e., those who primarily demonstrate low frequency of using coping skills across the 40 items), b) broad repertoire (i.e., those who primarily demonstrate high frequency of using coping skills across the 40 items), c) cognitive repertoire (i.e., those who report primarily high frequency on cognitive skills but low frequency on behavioral skills), d) behavioral repertoire (i.e., those who report primarily low frequency on cognitive skills and high frequency on behavioral skills). These hypotheses regarding the

potential latent classes were generated considering prior research on the association between alcohol use outcomes among individuals with AUDs and the number of skills in one's repertoire (Litman et al., 1979; Moser & Annis, 1996), the frequency of using skills in one's repertoire (Dolan et al., 2013; Sugarman et al., 2010), and prior categorizations of coping skills (e.g., behavioral vs. cognitive; Moser & Annis, 1996).

Finally, we hypothesized that the broad repertoire class would have significantly better drinking outcomes than the other three classes and the narrow repertoire would have the worst drinking outcomes among the four classes.

Method

This study was a secondary data analysis using data from the COMBINE study (COMBINE Study Research Group, 2008), a multi-site randomized controlled trial comparing combinations of medications (acamprosate, naltrexone, or placebo) and psychosocial treatments (combined behavioral intervention or medication management). A total of 1,383 individuals were recruited from eleven research sites across the U.S. Primary inclusion criteria were: at least 18 years of age, current DSM-IV diagnosis of alcohol dependence, at least 14 drinks (females) or 21 drinks (males) per week over 30 consecutive days, at least two heavy drinking days, no more than four consecutive abstinent days, and no more than 21 days abstinent during the 90 days prior to initiation of abstinence. Primary exclusion criteria were: DSM-IV diagnosis of bipolar disorder, schizophrenia, dementia, bulimia/anorexia, or a mental health disorder requiring medication, other drug dependence (except for nicotine and cannabis), significant medical disorders, and pregnant or nursing women. All participants received treatment

over the course of 16 weeks and were followed up for the 12-month period following treatment.

Participants

For analyses in this study, we only included participants who had available data for the Processes of Change Questionnaire (PCQ), which was administered at the end of the 16-week treatment period. Table 1 presents the client demographic data for the full study sample ($n = 1,383$) and the sample available for this study ($n = 1101$). There were no significant differences in client demographics or baseline alcohol consumption between the full study sample and the sample available for this study.

Measures

Alcohol-specific coping skills. The alcohol version of the Processes of Change questionnaire (PCQ) was used to assess alcohol-specific coping skills. The PCQ is a 40-item self-report measure assessing the frequency with which individuals use various behaviors to help them not drink. Although the factors of the PCQ are labeled as processes, these processes can also be labeled as alcohol-specific coping skills, or behaviors directly aimed at preventing one from drinking. The instructions for the PCQ are: “How often did you make use of a particular situation or thought to help you not drink alcohol in the past week?” Participants respond to each item on a five-point Likert-type scale ranging from 1 (never) to 5 (repeatedly). The PCQ originally was designed to assess ten key processes. A list of all 40 items in the PCQ organized by these ten subscales is presented in Figure 1. For the current study, the PCQ was administered at the end of the 16-week treatment period and the assessment window for use of the coping

strategies of the PCQ was the past week. The internal consistency reliability of the PCQ at the 16-week follow-up in the COMBINE study was $\alpha = 0.94$.

Alcohol use outcomes. The Form-90 (Miller, 1996) and the Timeline Follow-back Interview (TLFB; Sobell & Sobell, 1992) were used to assess alcohol use outcomes. The Form-90 and the TLFB are both calendar-based interview methods to assess a person's drinking behavior. The Form-90 was used to assess drinking behavior during the period prior to beginning treatment and the period following treatment. The TLFB was used to assess drinking behavior during the 16-week treatment period. In this study, the Form 90 and TLFB data were used to calculate four indices of alcohol consumption: percent days abstinent (PDA), defined as the percentage of days during a given interval in which the individual reported no drinking, drinks per drinking day (DDD), defined as the average number of drinks on days that an individual reported any drinking, percent heavy drinking days (PHD), defined as the percentage of days during a given interval in which an individual reported heavy drinking (5 or more standard drinks for men; 4 or more standard drinks for women), and maximum number of drinks in a day in a given period (MXD). We examined DDD two different ways. First, we estimated DDD with non-drinkers (i.e., individuals who did not have any drinking days in a given period) included in the analyses with a value of zero DDD. Second we estimated DDD among only individuals who had at least one drinking day in the time period and with non-drinkers excluded from the analyses. PDA is a measure of drinking frequency, whereas DDD and MXD are measures of drinking intensity. PHD is a combined measure of frequency and intensity because it measures the frequency of consuming a specific amount of alcohol. We examined PDA, DDD, PHD, and MXD during the final week (7 days) of the 16-week

treatment period and during the 30 days prior to the week 26 follow-up interview (10 weeks post-treatment). We chose to examine drinking outcomes during the final week of treatment because the PCQ was administered at the end-of-treatment and asked participants what skills they used in the past week. We chose to examine drinking outcomes during the 30 days prior to the week 26 follow-up because the first follow-up time point in the COMBINE study was at 26 weeks (10 weeks post-treatment) and we wanted to assess whether coping skills reported during the last week of treatment were prospectively related to future drinking outcomes. The 30-day period prior to the week 26 assessment was selected given research indicating that TLFB assessments with shorter time windows may have increased accuracy compared to longer time windows (Hoepfner, Stout, Jackson, & Barnett, 2010; Toll, Cooney, McKee, & O'Malley, 2006), and that drinking data from assessments with shorter time windows can be utilized to adequately represent patterns of drinking over longer periods (Vakili, Sobell, Sobell, Simco, & Agrawal, 2008). Drinking measures computed at baseline for PDA, DDD, PHD, and MXD were also based on the 30-days prior to the baseline assessment.

Alcohol-related consequences. The Drinker Inventory of Consequences (DrInC) is a 50-item measure of alcohol-related consequences using a Likert-type response scale (1 = never, 4 = daily or almost daily). In this study, we used the DrInC to assess alcohol-related consequences at baseline and week 26. The DrInC administration at baseline asked participants to report on alcohol-related consequences in the past 90 days whereas the DrInC administration at week 26 asked participants to report on alcohol-related consequences experienced since the last interview, which was 10 weeks earlier at the end-of-treatment (week 16). We chose to examine alcohol-related consequences at this

time point because in the COMBINE study the first follow-up assessment following treatment was at 26 weeks (10 weeks post-treatment).

Covariates. A basic demographic questionnaire was used to assess a number of demographic covariates including gender, race, marital status, ethnicity, age, income, and years of education. The University of Rhode Island Change Assessment (URICA) was used to measure baseline readiness to change (McConnaughy, Prochaska, & Velicer, 1983). The URICA is a 24-item measure using Likert-type responses (1 = Strongly Disagree, 5 = Strongly Agree). To assess readiness to change, we used the Overall Readiness Score, which is derived by summing the means of the contemplation, action, and maintenance subscales and then subtracting the mean of the precontemplation subscale. The Alcohol Dependence Scale (ADS), a 25-item self-report measure, was used to assess baseline severity of alcohol dependence (Skinner & Allen, 1982).

Analyses

SPSS Version 22 was used to prepare the data and conduct descriptive analyses. Mplus Version 7.2 (Muthén & Muthén, 2012) was used to conduct all other analyses. Confirmatory factor analysis (CFA) was used to evaluate the factor structure of the PCQ that was administered to COMBINE participants at the end of treatment. For the CFA, the PCQ data were treated as categorical and parameters were estimated using robust weighted least squares estimates (WLSMV). Scaling of latent variables was accomplished by fixing the first factor loading to one. Model fit was determined by χ^2 values, the Root Mean Square Error of Approximation [RMSEA; (Browne & Cudeck, 1993)], and the Comparative Fit Index [CFI; (Bentler, 1990)]. Models with nonsignificant χ^2 values, RMSEA < 0.05, and CFI > 0.95 were considered a good fit to the observed

data (Hu & Bentler, 1999). Models with RMSEA < 0.08 and CFI > 0.90 were considered a reasonable fit.

Finite mixture modeling was used to examine subpopulations of coping based on the PCQ data. Latent profile analysis (LPA) is a finite mixture model that is appropriate when the underlying data are continuous (e.g., 10 subscales of the PCQ, if the PCQ factor structure was supported by the CFA). Latent class analysis (LCA) is a finite mixture model that is appropriate when the data are categorical (e.g., 40 items as categorical indicators if the hierarchical factor structure of the PCQ was not supported by the CFA).

LCA and LPA are both latent variable modeling methods for classifying individuals into distinct groups based on similar patterns of data (Collins & Lanza, 2010). LCA and LPA are person-centered approaches because they emphasize studying individuals rather than examining associations between variables, averaging across individuals. LCA and LPA have recently have been widely utilized across various areas of research (Collins & Lanza, 2010). For example, in alcohol research LCA has been used to classify individuals into groups based on their alcohol use patterns (Sacco, Bucholz, & Spitznagel, 2009; Smith & Shevlin, 2008). LCA and LPA improve upon other clustering techniques such as cluster analysis because LCA and LPA fit a statistical model to the data and account for measurement error. Both LCA and LPA are distinct from other latent variable modeling methods such as factor analysis because the latent variable being estimated is categorical rather than continuous.

LCA and LPA require the analyst to designate the number of classes to be estimated. To determine the optimal number of classes to represent the data, we used the Lo-Mendell-Rubin Adjusted Likelihood Ratio Test (Lo et al., 2001; Vuong, 1989), which

compares whether a k class solution fits better than a $k - 1$ class solution. We also examined Akaike's Information Criterion (AIC), the Bayesian Information Criterion (BIC), sample size adjusted BIC (aBIC), and entropy to determine the optimal number of classes to represent the data. Lower values of AIC, BIC and aBIC indicate a better fitting model. Higher entropy values indicate better latent class separation or better classification precision, meaning that a response pattern is characteristic of a particular class and not other classes. For all finite mixture models, parameters were estimated using maximum likelihood estimation with robust standard errors (MLR). Two parameters were of greatest interest in the LCA and LPA models. Latent profile models use continuous indicators and estimate two parameters: latent class prevalences and conditional response means for each class. Latent class models estimate two parameters: latent class prevalences and the probability of each response for a variable given that an individual belongs to a particular latent class. We planned to utilize these parameter values for interpreting the latent classes and labeling each class with a qualitative description.

To examine the association between baseline covariates and latent class membership, we used the Modal Maximum Likelihood (ML) method for analyzing predictors of latent class (Vermunt, 2010). The Modal ML method accounts for classification error when estimating the associations between covariates and latent class. Because class assignments are probabilistic estimates and not in fact known, estimates of the relation between covariates and class membership may be biased according to the level of classification error in the latent class model. To account for classification error and make unbiased estimates of the associations between covariates and latent class, the Modal ML method (referred to as the R3STEP method in Mplus) involves the following

steps: a) conduct an LCA using only the latent class indicators and not the covariates, b) use the most likely latent class assignments, which are based on posterior probabilities (i.e., probability of belonging to a latent class given an observed set of responses), to create a nominal variable N (i.e., each case assigned a value of 1, 2, or 3 if there are three classes) , c) compute the measurement error probability for this nominal variable N, d) conduct a separate latent class model with the covariates included and with the nominal variable N used as a single latent class indicator with the measurement error parameter of this indicator fixed to the value of the measurement error probability computed in the previous step. Thus, in the final step the nominal variable N is used as the only latent class indicator and the observed items of the Processes of Change Questionnaire (PCQ) used in the initial latent class model are not used as indicators of the latent class variable. The final structural regression model provides multinomial regression coefficients, odds ratios, and 95% confidence intervals for each covariate. The covariates we used in the structural regression model included baseline PHD, treatment assignment (whether or not the participant received the combined behavioral intervention), age, marital status (married or not married), gender, years of education completed, yearly income, race (white or non-white), baseline readiness to change, and baseline alcohol dependence severity.

We also examined differences in alcohol-related outcomes (i.e., “distal outcomes”) among latent classes using the BCH method (Bakk, Vermunt, & Room, 2014). The BCH method is similar to the abovementioned Modal ML method in that it aims to account for classification error when estimating parameters in latent class models with auxiliary variables. The BCH method, in particular, is used to account for

classification error when estimating the means of continuous variables across latent classes. In LCA each individual within a class has a response pattern on the latent class indicators that is associated with a different level of classification error, which is based on the posterior probability (i.e., probability of belonging to a latent class given an observed set of responses). Without accounting for the varying levels of classification error among classes, estimates of the means across classes may be biased because different levels of classification error among classes may be contributing to mean differences rather than actual differences in the level of the distal outcome. Thus, the BCH method aims to adjust the means of the distal outcome among classes by re-weighting the means by the inverse of the classification error probabilities. Equality of means across latent classes is then tested with a Wald chi-square test. Bakk, Vermunt, and Room (2014) recently conducted a simulation study that compared various approaches for comparing means of continuous distal outcomes in LCA and found that the BCH method produced the least biased mean estimates (i.e., standard errors closer to zero and smaller confidence intervals), even with non-normal distributions of the distal outcome.

For each of the distal outcome analyses we controlled for the following covariates: baseline alcohol use or alcohol-related consequences (using the summary score that corresponds to the distal outcome used in the analysis; e.g., use baseline PDA when PDA was distal outcome and use baseline DrInC scores when alcohol-related consequences was the distal outcome), treatment assignment, age, marital status, gender, years of education completed, total yearly income, race, baseline readiness to change, and baseline alcohol dependence severity. These covariates were chosen based on prior

research on the COMBINE data (Anton et al., 2006), as well as considerations of what other variables might be related to coping behavior.

The first set of distal outcome analyses examined differences in PDA, DDD, PHD, and MXD during the final week of treatment (week 16). Because the PCQ at week 16 assessed alcohol-specific coping skills used in the past week, we considered distal outcome analyses of outcomes during the final week (week 16) as an evaluation of the concurrent validity of latent classes. The second set of analyses examined the predictive validity of latent classes by evaluating differences in PDA, DDD, PHD, MXD, and alcohol-related consequences at the week 26 follow-up.

Results

Confirmatory Factor Analysis

A CFA was conducted to evaluate a hierarchical model of the PCQ, which proposes ten first-order factors, representing distinct processes of change, and two second-order factors with five first-order factors each, representing behavioral and cognitive processes. This hierarchical model has been supported by previous studies among smokers (Prochaska et al., 1988) and corresponds with the Transtheoretical model, which posits that there are both cognitive and behavioral processes that facilitate health behavior change. Results from the CFA suggested this model did not provide a reasonable fit to the observed data ($\chi^2(729) = 6562.075, p < 0.001$; RMSEA = 0.085 (90% CI [0.083, 0.087]; CFI = 0.869). Figures 2 and 3 present the factor loadings for the CFA. The correlation between the two second-order factors was very high ($r = .848, p < .001$). Because the CFA demonstrated that the hierarchical factor structure did not provide a reasonable fit to the observed data, we did not proceed with analyzing patterns

of alcohol-specific coping with LPA using the ten subscale scores as continuous indicators, but rather decided to conduct a series of latent class analyses using each item of the PCQ as a categorical indicator.

Correlations among Processes of Change Items and Alcohol-Related Outcomes

Before conducting LCA, we first examined how each individual item on the PCQ was associated with alcohol-related outcomes, which might in turn inform our ability to interpret identified latent classes (e.g., one class may primarily use skills that are negatively related to drinking whereas other classes may primarily use skills that are unrelated or positively related to drinking). Table 2 presents the zero-order correlations among the 40 PCQ items and the alcohol-related outcomes at the two time points (week 16 and 26). The majority of items were significantly related to less drinking intensity and frequency, and less alcohol-related consequences. However, some items (i.e., Q3 Get upset by related illnesses, Q19 Stories about alcohol upset me, Q23 Disappointed when I depend on alcohol) were related to greater drinking frequency and intensity, as well as greater alcohol-related consequences. Some items (i.e., Q5 Think how drinking is hurting other people, Q14 Others benefit without my drinking, Q22 Feeling of how drinking has hurt others, Q27 Don't let self have fun when drinking, Q31 Think drinking causes problems for others) were primarily related to greater drinking intensity and alcohol-related problems. Some items (i.e., Q11 Health warnings have emotional effect, Q24 Look for info on problem drinking) were unrelated to drinking but were related to greater alcohol-related consequences.

Latent Class Analyses

Number of classes. The Lo-Mendell-Rubin Adjusted Likelihood Ratio Test indicated that a two-class solution fit better than a one-class solution ($p < 0.01$), that a three-class solution fit better than a two-class solution ($p < 0.01$), but that a 4-class solution did not fit significantly better than a three-class solution ($p = .812$). Table 3 presents fit statistics for class solutions ranging from one class to six classes. Entropy is high for classes one through six and the AIC, BIC, and adjusted BIC continue to decrease from classes one through five. However, based on the results from the Likelihood Ratio Test we chose the three-class solution, which had an entropy level of .950, indicating excellent classification precision.

Labeling classes. The latent class prevalence (P) within each class, which is an estimation of the proportion of individuals most likely classified in each class based on estimated posterior probabilities, were: class one (P = .216), class two (P = .424), and class three (P = .361). Figures 4 and 5 present the pattern of item response probabilities based on class membership. Figure 4 shows the probability of endorsing either never or seldom on a given item based on class membership. Figure 5 shows the probability of endorsing either occasionally, frequently, or repeatedly on a given item based on class membership. We labeled class one (approximately 21.6% of the sample) as the “narrow repertoire class,” because this class consistently showed the lowest frequency of using skills across the 40 items. We labeled class two (approximately 42.4% of the sample) as the “moderate repertoire class” because this class primarily showed moderate frequency of using skills across the 40 items. We labeled class three (approximately 36.1% of the sample) as the “broad repertoire class” because this class primarily showed high frequency of using skills across the 40 items. Among the three classes, there were no

noticeable differences in patterns of using cognitive versus behavioral skills and there were no noticeable differences in patterns of using skills that had differential correlations with drinking outcomes.

Predictors of class membership. Table 4 depicts predictors of class membership with class three (broad repertoire class) as the reference group. Receiving the combined behavioral intervention (OR = 0.684), being married (OR = 0.600), greater baseline readiness to change (OR = 0.677), and greater baseline alcohol dependence severity (OR = 0.923) were significantly associated with a decreased probability for expected classification in the narrow repertoire class relative to the broad repertoire class. Being non-white (OR = 0.623) and greater baseline readiness to change (OR = 0.734) were significantly associated with a decreased probability of expected classification in the moderate repertoire class relative to the broad repertoire class.

With class one (narrow repertoire class) as the reference group, greater baseline alcohol dependence severity was associated with an increased probability of expected classification in the moderate repertoire class (OR = 1.067, 95 % CI [1.037-1.096], B = 0.065, SE = 0.015, $p < .01$). Age (OR = 1.001), receiving the combined behavioral intervention (OR = 1.280), being married (OR = 1.381) being female (OR = .8693), years education (OR = 1.010), income (OR = .9231), being non-white (OR = .8236), baseline readiness to change (OR = 1.083), and baseline percent heavy drinking days (OR = .9990) were not significantly associated with expected classification in the moderate repertoire class, as compared to the narrow repertoire class.

Differences in alcohol-related outcomes among latent classes. Table 5 presents mean comparisons of alcohol-related outcomes among the three latent classes. At weeks

16 and 26, the broad repertoire class demonstrated significantly greater PDA, lower PHD and MXD, and fewer alcohol-related consequences than both the moderate and narrow repertoire classes. When non-drinkers were excluded from analyses of DDD, at weeks 16 and 26 there were no differences among classes in DDD. When non-drinkers were included in analyses of DDD, at weeks 16 and 26 the broad repertoire class had significantly lower DDD than both the moderate and narrow repertoire classes.

Thus, in general, the broad repertoire class had the best outcomes, whereas the moderate and narrow repertoire classes had poorer outcomes and were relatively similar in their drinking outcomes.

Discussion

The aim of this study was to examine whether a broad coping repertoire, characterized by a pattern of frequently using numerous different alcohol-specific coping skills, was related to better drinking outcomes among individuals receiving treatment for AUDs. We used finite mixture modeling to identify classes of coping repertoires, characterized by distinct patterns of self-reported alcohol-specific coping, as measured by the Processes of Change Questionnaire (PCQ; Prochaska et al., 1988). In order to inform our approach for using finite mixture modeling analyses (e.g., whether to use continuous subscale scores or individual items as indicators of latent classes) we first performed a confirmatory factor analysis (CFA) to evaluate a hierarchical factor structure of the PCQ composed of ten first-order factors and two higher order factors, which has been found in studies among smokers (Guo et al., 2011; Hoeppepner et al., 2006; Prochaska et al., 1988). Results indicated that this model did not provide a reasonable fit to the data. Thus, we

proceeded to use latent class analysis (LCA) with the 40 PCQ items as categorical indicators of latent classes.

Using LCA, we identified three latent classes of individuals characterized by distinct types of coping repertoires. Specifically, we identified a broad repertoire class (approximately 36.1% of the sample), characterized by high frequency of using skills across all 40 PCQ items, a moderate repertoire class (approximately 42.4 % of the sample), characterized by moderate frequency of using skills across all 40 PCQ items, and a narrow repertoire class (approximately 21.6 % of the sample), characterized by low frequency of using skills across all 40 PCQ items. Examination of differences in alcohol-related outcomes among classes revealed that the broad repertoire class had the best outcomes at end-of-treatment and the week 26 follow-up, whereas the moderate and narrow repertoire classes had poorer outcomes. Specifically, the broad repertoire had significantly better outcomes on measures of drinking frequency, drinking intensity, and alcohol-related consequences than the moderate and narrow repertoire classes. There were no significant differences on any outcomes between the moderate and narrow repertoire classes. It is important to note that there were no differences among classes in drinks per drinking day (DDD) when non-drinkers were excluded from analyses, yet the broad repertoire class had significantly lower DDD when non-drinkers were included in analyses with a value of zero. These results indicate that the broad repertoire class had many non-drinkers with scores of zero on DDD, which served to lower the mean score of DDD when non-drinkers were included in analyses comparing DDD across classes.

Results also revealed several factors predicting expected classification in the broad repertoire class. We found that receiving the combined behavioral intervention,

greater baseline readiness to change, and greater baseline alcohol dependence severity were associated with an increased likelihood of expected classification in the broad repertoire class, relative to the narrow class. We also found that being non-white and greater baseline readiness to change were associated with an increased likelihood of expected classification in the broad repertoire class, relative to the moderate repertoire class. These results suggest that individuals entering treatment who are white, are not motivated to change, and/or have less severe alcohol dependence may be less likely to employ a diverse range of coping skills. Additionally, these results indicate that clients who received the combined behavioral intervention, which involved teaching coping skills to clients, were in fact more likely to acquire of a diverse range of coping skills.

Overall, results support our main hypothesis that having a broad repertoire of alcohol-specific coping skills would be associated with better alcohol-related outcomes. As predicted, we found distinct classes of individuals based on how frequently they used skills across the 40 PCQ items. However, we did not find support for our hypothesis that there would be classes characterized by the predominant use of either cognitive or behavioral skills. The high correlation between the cognitive and behavioral second order factors in the CFA ($r = .848$) may partially explain why we did not find evidence for a cognitive or behavioral repertoire class.

Our finding that a broad coping repertoire was related to better alcohol outcomes is consistent with other studies that have utilized interview methods among individuals with AUDs to assess the construct of coping repertoire (Litman et al., 1979; Moser & Annis, 1996). Our study builds upon these studies by showing that LCA of standardized self-report questionnaire data is a viable method to examine coping repertoire among

individuals with AUDs. Person-centered analyses such as LCA may provide some advantages over variable-centered analyses that examine associations between variables and assume that these associations operate across all individuals. For example, in this study variable-centered analyses (i.e., Pearson correlations reported in Table 2) of the associations between individual PCQ items and alcohol-related outcomes revealed that eleven of the PCQ items (e.g., “Think about how drinking is hurting other people”) were significantly correlated with greater alcohol use and/or greater alcohol-related consequences. However, person-centered analyses revealed that the broad repertoire class, which had the best outcomes, reported using these eleven items more frequently than the other classes. These results suggest that these eleven coping skills may not be maladaptive for all individuals but may depend on contextual factors such as whether an individual has a broad repertoire of skills or tends to rely on a limited range of skills.

The results of our study are consistent with empirical findings from other studies among non-AUD populations that demonstrate that a broad coping repertoire is related to better mental health outcomes (Lougheed & Hollenstein, 2012; Orcutt et al., 2014). Our study findings also provide support for the construct validity of coping repertoire (Bonanno & Burton, 2013) among individuals with AUDs. Theoretical models of coping that emphasize person-situation interactions, such as the transactional model of coping (Lazarus & Folkman, 1987), can inform our understanding of how coping repertoire may assist individuals in alcohol behavior change. Among individuals with AUDs, it is plausible that having a broad coping repertoire may increase the likelihood that individuals are able to choose strategies (e.g., “Do something else instead of drinking to deal with tension”) that are contextually appropriate and meet the specific demands of a

high-risk situation that may precipitate relapse (e.g., stressful argument with spouse). Thus, coping repertoire may be a key component of coping flexibility, or the ability to implement a diverse range of strategies that are contextually appropriate (Bonanno & Burton, 2013). In addition to being able to skillfully respond in the moment during high-risk situations, it also is possible that individuals with a broad coping repertoire may be more likely to capitalize on key opportunities or environmental resources that may prevent future drinking. For example, the broad repertoire class in this study demonstrated high frequency of using several coping skills that involved making use of resources or opportunities in order to reduce the likelihood of future drinking (e.g., “Look for information related to problem drinking;” “Reward myself when I don’t give in to my urge to drink”). Thus, having a broad coping repertoire may not only enhance an individual’s ability to successfully navigate the *challenges* of high-risk situations, but may also enhance an individual’s ability to be aware of the *opportunities* in one’s environment for engaging in behaviors that prevent future drinking. Finally, it is also plausible that having a broad coping repertoire may increase the likelihood that individuals are simply able to access alternative behaviors besides drinking, regardless of the context (Chaney & Marlatt, 1978).

The current study has several limitations that should be noted. First, we relied on self-report data to examine coping repertoire and participants’ retrospective reports of coping skills may not accurately reflect actual coping skills used by the individual. Second, the three latent classes of alcohol-specific coping skills identified in this study may be specific to the study sample and may not be representative of different AUD populations (e.g., clients who are racially diverse or who have severe co-occurring mental

disorders). Third, we may have failed to assess important alcohol-specific skills in clients' repertoires because these skills were not measured on the PCQ. For example, the PCQ does not assess drink refusal skills or mindfulness-based coping skills such as urge surfing, both of which were included in treatment modules of the combined behavioral intervention. Finally, another limitation of our study is that the COMBINE study did not assess coping at baseline and we were thus unable to examine transitions in latent classes from before treatment to after treatment.

Further empirical research using a variety of methods is needed to clarify what role coping repertoire and coping flexibility play in behavior change among individuals with AUDs. These methods may include latent class or latent profile analyses of other coping questionnaires, daily-diary or ecological momentary assessment methods to capture person-situation interactions, examining variability of responses (Aldao & Nolen-Hoeksema, 2012) across behavioral role-play tasks, or utilizing self-report measures that directly assess the construct of coping flexibility (Kato, 2012). Further research on potential cognitive processes (e.g., mindfulness) associated with coping flexibility may also clarify the function of coping flexibility, as well as the best way to foster coping flexibility in clients.

Although further research is needed on coping flexibility among individuals with AUDs, the results from the current study have some preliminary clinical implications. Our results suggest that it may be beneficial for clinicians to assess whether clients' alcohol-specific coping repertoire is narrow and to focus on teaching a diverse array of alcohol-specific coping skills in order to broaden clients' repertoires.

The results add to a burgeoning body of literature showing that coping flexibility may be a key process underlying psychological health for individuals dealing with a wide range of problems (Bonnano & Burton, 2013). Among individuals with AUDs, coping flexibility is still an understudied construct and we have just begun to understand the role of coping flexibility in AUD recovery. Our findings suggest that coping repertoire, a component of coping flexibility, may be an important mechanism underlying behavior change among individuals with AUDs and that further research in this area is warranted.

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Table 1

Demographics

	Full Sample (<i>n</i> = 1383)		Available Sample (<i>n</i> = 1101)	
	<i>n</i> (%)	<i>M</i> (<i>SD</i>)	<i>n</i> (%)	<i>M</i> (<i>SD</i>)
Gender				
Male	955 (69.1)		758 (68.8)	
Female	428 (30.9)		343 (31.2)	
Age		44.43 (10.19)		45.14 (10.19)
Race				
American Indian	18 (1.3)		11 (1)	
Alaska Native				
Asian	4 (.3)		2 (.2)	
Black/African American	109 (7.9)		95 (8.6)	
White	1062 (76.5)		867 (78.7)	
Hispanic	155 (11.2)		96 (8.7)	
Multi-racial	18 (1.3)		15 (1.4)	
Other	17 (1.2)		15 (1.4)	
Ethnicity				
Non-Hispanic	1062 (76.8)		867 (76.7)	
White				
Other	321 (23.2)		234 (21.3)	
Income				
Less than \$15,000	139 (10.2)		112 (10.3)	
\$15,000 – \$29,999	219 (16.1)		177 (16.3)	
\$30,000 - \$59,999	408 (30.5)		327 (30.1)	
\$60,000 - \$89,999	266 (19.5)		207 (19.1)	
More than \$90,000	330 (24.2)		262 (24.1)	
Missing	21 (1.5)		16 (1.5)	
Marital Status				
Not Married	801 (58)		639 (58)	
Married	581 (42)		462 (42)	
Missing	1 (.1)		0 (0)	
Education Years		14.55 (2.73)		14.65 (1.01)

Table 2

Correlations among Processes of Change Items and Drinking Outcomes

	PDA wk 16	PDA wk 26	PHD wk 16	PHD wk 26	DDD wk 16 (non- drinkers excluded)	DDD wk 16 (non- drinkers included)	DDD wk 26 (non- drinkers excluded)	DDD wk 26 (non- drinkers included)	MXD wk 16	MXD wk 26	DrInC wk 26
Q1 Reward self for making efforts	.146**	.142**	-.133**	-.148**	-.060	-.119**	-.030	-.099**	-.121**	-.069*	-.079**
Q2 Talk to 1 special person	.185**	.166**	-.147**	-.146**	-.024	-.113**	.012	-.103**	-.122**	-.087**	-.107**
Q3 Get upset by related illnesses	-.081**	-.104**	.112**	.134**	.106*	.113**	.117**	.137**	.100**	.093**	.242**
Q4 See signs helping people not drink	-.009	.004	.011	-.009	-.043	-.026	.061	.023	-.022	.000	.054
Q5 Think how drinking is hurting people	.010	-.009	.046	.062*	.116**	.076*	.136**	.091**	.074*	.092**	.235**
Q6 Feel good about self for changing	.159**	.153**	-.121**	-.132**	-.018	-.076*	.005	-.071*	-.090**	-.049	.000
Q7 Remove reminders of drinking	.158**	.139**	-.104**	-.080**	-.037	-.076*	.022	-.072*	-.093**	-.019	.039
Q8 Calm self when have urge	.220**	.181**	-.217**	-.190**	-.127**	-.146**	-.070*	-.142**	-.152**	-.084**	-.074*
Q9 Reward self when resist urge	.133**	.118**	-.145**	-.142**	-.070	-.091**	-.061	-.086**	-.103**	-.060*	-.034
Q10 Talk to someone who understands	.221**	.199**	-.161**	-.166**	-.024	-.142**	.028	-.125**	-.155**	-.097**	-.106**
Q11 Health warnings have emotional effect	.029	-.012	-.001	.023	.003	-.002	-.007	.013	-.024	-.007	.080*
Q12 Use will power to not drink	.264**	.198**	-.250**	-.218**	-.187**	-.225**	-.168**	-.191**	-.227**	-.177**	-.225**
Q13 Desire to not be pressed to drink	.129**	.109**	-.077*	-.076*	.061	-.042	.059	-.043	-.059*	-.050	-.019
Q14 Others benefit without my drinking	.093**	.095**	-.011	-.006	.144**	.016	.164**	.025	-.001	.033	.179**
Q15 Read stories to help quit	.070*	.054	-.071*	-.041	.006	-.022	.037	-.027	-.040	-.010	.036
Q16 Avoid drinking situations	.269**	.219**	-.226**	-.185**	-.043	-.138**	.043	-.100**	-.148**	-.053	-.054
Q17 Think about other things instead	.214**	.169**	-.171**	-.129**	-.049	-.111**	-.001	-.110**	-.120**	-.066*	-.059
Q18 Have someone who listens	.206**	.193**	-.137**	-.156**	-.015	-.127**	.022	-.117**	-.134**	-.090**	-.102**
Q19 Stories about alcohol upset me	-.026	-.034	.051	.069*	.093*	.092**	.124**	.077*	.103**	.098**	.251**
Q20 Aware I can choose to overcome	.240**	.219**	-.214**	-.204**	-.121**	-.212**	-.093**	-.199**	-.206**	-.145**	-.182**
Q21 Society changes in ways that help me	.173**	.130**	-.186**	-.163**	-.113**	-.146**	-.058	-.123**	-.161**	-.095**	-.101**
Q22 Feeling of how drinking has hurt others	.155**	.155**	-.096**	-.062*	.144**	-.016	.170**	-.003	-.019	.022	.145**
Q23 Disappointed when depend on alcohol	-.055	-.077*	.074*	.108**	.106*	.115**	.151**	.130**	.104**	.122**	.274**
Q24 Look for info on problem drinking	.034	.018	-.016	.020	.008	-.007	.023	-.007	-.007	-.021	.135**
Q25 Use reminders to not drink	.174**	.169**	-.143**	-.119**	.001	-.071*	.065	-.057	-.083**	-.042	.030
Q26 Do something else to deal with tension	.334**	.288**	-.284**	-.273**	-.130**	-.230**	-.099**	-.234**	-.241**	-.187**	-.225**
Q27 Don't let self have fun when drinking	-.003	-.006	.019	.022	.109*	.049	.143**	.118**	.049	.131**	.186**
Q28 Have someone I can count on	.215**	.197**	-.151**	-.165**	-.015	-.141**	.040	-.107**	-.148**	-.079**	-.119**
Q29 Newspaper stories affect me emotionally	.086**	.061*	-.065*	-.044	.026	.000	.041	.007	-.016	.007	.089**
Q30 Tell self if I try hard I can keep from drinking	.185**	.183**	-.169**	-.163**	-.069	-.126**	-.028	-.121**	-.125**	-.111**	-.102**
Q31 Think drinking causes problems for others	.101**	.101**	-.018	-.013	.149**	.016	.191**	.046	.011	.056	.197**
Q32 Feel competent when decide not to drink	.260**	.231**	-.198**	-.206**	-.024	-.154**	-.037	-.164**	-.170**	-.143**	-.112**
Q33 Seek groups who increase awareness	.216**	.210**	-.134**	-.119**	.051	-.114**	.143**	-.083**	-.130**	-.042	.028
Q34 Stay away from drinking related places	.260**	.232**	-.178**	-.174**	.003	-.138**	.060	-.098**	-.146**	-.058	-.046
Q35 Do things as substitute for drinking	.280**	.258**	-.231**	-.243**	-.088*	-.205**	-.102**	-.211**	-.217**	-.167**	-.197**
Q36 People reward me for not drinking	.229**	.196**	-.181**	-.169**	-.033	-.139**	-.029	-.159**	-.152**	-.140**	-.073*
Q37 Make commitments to self to not drink	.291**	.273**	-.235**	-.224**	-.122**	-.215**	-.049	-.208**	-.228**	-.168**	-.168**
Q38 See TV ads how society helps people not drink	.114**	.107**	-.094**	-.092**	-.001	-.069*	.019	-.058	-.083**	-.058	-.009
Q39 Think about type of person I will be	.117**	.113**	-.086**	-.098**	-.013	-.056	-.002	-.074*	-.067*	-.062*	.039
Q40 Think about info on benefits of quitting	.148**	.151**	-.105**	-.115**	.019	-.071*	.054	-.071*	-.080**	-.053	.021

Note. PDA = Percent days abstinent. PHD = Percent heavy drinking days. DDD = Drinks per drinking day. MXD = maximum drinks in a day. * $p < 0.05$ ** $p < 0.01$.

Table 3

Fit Statistics for Class Solutions 1 through 6 for Latent Class Analysis

Fit Statistics	Number of Classes					
	1	2	3	4	5	6
AIC	128593.747	120637.022	116677.467	114669.244	113621.000	112887.470
BIC	129394.383	122243.297	119089.382	117886.799	117644.195	117716.305
Adjusted BIC	128886.185	121223.725	117558.435	115844.478	115090.499	114651.235
Lo-Mendell- Rubin test	-----	8271.390	4277.761	2327.578	1368.844	1075.537
	-----	$p < 0.01$	$p < 0.01$	$p = .812$	$p = .7667$	$p = .7636$
Entropy	-----	0.945	0.950	0.953	0.952	0.954

Table 4

Predictors of Class Membership

Variable	Class 1 (Narrow Repertoire)			Class 2 (Moderate Repertoire)		
	OR	95% CI	B (SE)	OR	95% CI	B (SE)
Age	.9880	0.968, 1.007	- 0.012(0.010)	0.989	0.973,1.004	- 0.011(0.008)
Received CBI	0.684	0.324, 1.045	- 0.379(0.184)*	0.876	0.580,1.172	- 0.132(0.151)
Married	0.600	0.153,1.047	- 0.510(0.228)*	0.829	0.496,1.162	- 0.187(0.170)
Female	0.936	0.546,1.326	- 0.066(0.199)	0.813	0.500,1.127	- 0.206(0.160)
Years of Education	1.000	0.921,1.078	- 0.000(0.040)	1.010	0.949,1.070	0.010(0.031)
Total Yearly Income	1.047	0.857,1.237	0.046(0.097)	0.966	0.827,1.106	- 0.034(0.071)
Non-White	0.757	0.277,1.237	- 0.278(0.245)	0.623	0.247,1.000	- 0.472(0.192)*
Baseline Readiness	0.677	0.548,0.807	- 0.389(0.066)**	0.734	0.630,0.838	- 0.309(0.053)**
Baseline PHD	1.000	0.994,1.006	0.000 (0.003)	0.998	0.992,1.004	- 0.002(0.003)
Baseline ADS	0.923	0.893,0.952	- 0.080 (0.015)**	0.985	0.963,1.097	- 0.015(0.011)

Note. Class 3 (Broad Class) is reference class for the regression. OR = odds ratio. CI = Confidence Interval.

CBI = Combined Behavioral Intervention; PHD = Percent heavy drinking days; ADS = Alcohol Dependence Scale scores. * $p < 0.05$ ** $p < 0.01$.

Table 5

Mean comparisons among latent classes on drinking outcomes

	Means			Comparisons		
	Class 1: Narrow	Class 2: Moderate	Class 3: Broad	1 vs. 2 χ^2	1 vs. 3 χ^2	2 vs. 3 χ^2
PDA wk 16	70.038	71.171	87.521	0.128	32.866**	66.357**
PDA wk 26	63.869	64.451	80.49	0.034	28.049**	53.389**
PHD wk 16	18.291	16.279	6.205	0.541	21.632**	40.577**
PHD wk 26	23.029	23.083	10.730	0.000	21.760**	44.729**
DDD wk 16 (non-drinkers excluded)	7.302	6.813	6.737	0.577	0.580	0.021
DDD wk 26 (non-drinkers excluded)	7.301	8.134	7.714	2.618	0.436	0.664
DDD wk 16 (non-drinkers included)	3.451	3.754	2.085	0.467	9.666**	29.375**
DDD wk 26 (non-drinkers included)	4.360	5.097	2.982	2.412	8.986**	33.454**
MXD wk 16	4.147	4.562	2.365	0.560	10.792**	35.174**
MXD wk 26	7.471	8.809	5.819	3.449	4.726*	26.045**
DrInC wk 26	18.596	20.100	13.218	0.468	6.245*	23.962**

Note. PDA = Percent days abstinent. PHD = Percent heavy drinking days; DDD = Drinks per drinking day; MXD = maximum drinks in a day. At week 16 there were 567 non-drinkers and at week 26 there were 318 non-drinkers. * $p < 0.05$ ** $p < 0.01$.

Behavioral Processes of Change	Cognitive Processes of Change
Contingency Management Subscale Q1 Do something nice for myself for making efforts to change Q9 Reward myself when I don't give in to my urge to drink Q27 Don't let myself have fun when I drink Q36 Spend time with people who reward me for not drinking	Consciousness Raising Subscale Q15 Read newspaper stories that may help me quit drinking Q24 Look for information related to problem drinking Q33 Seek groups who increase my awareness about the problem drinking Q40 Think about information on the benefits of quitting drinking
Counter Conditioning Subscale Q8 Calm myself when I get the urge to drink Q17 Think about other things when begin to think about drinking Q26 Do something else instead of drinking to deal with tension Q35 Find that doing things is a substitute for drinking	Dramatic Relief Subscale Q3 Get upset when I think about illnesses caused by drinking Q11 Warnings about health hazards of drinking have emotional effect on me Q19 Stories about alcohol/effects upset me Q29 Read newspaper stories that affect me emotionally about my drinking
Helping Relationships Subscale Q2 Can talk to at least 1 special person about drinking experiences Q10 Have someone to talk with who understands my alcohol problems Q18 Have someone who listens when I want to talk about my drinking Q28 Have someone I can count on to help me with problem drinking	Environmental Re-evaluation Subscale Q5 Think about how my drinking is hurting people Q14 People around me would be better off without my problem drinking Q22 Strong feeling about how much my drinking has hurt people I care about Q31 Stop and think my drinking is causing problems for others
Self Liberation Subscale Q12 Use will power to stop from drinking Q20 Make myself aware that I can choose to overcome my drinking Q30 Tell myself if I try hard enough, I can keep from drinking Q37 Make commitments to myself not to drink	Self Re-evaluation Subscale Q6 Feeling good about myself includes changing my drinking behavior Q23 Disappointed with myself when I depend on alcohol Q32 Feel more competent when I decide not to drink Q39 Think about the type of person I will be if I control my drinking
Stimulus Control Subscale Q7 Remove things from my home or work that remind me of drinking Q16 Avoid situations that encourage me to drink Q25 Use reminders to help me not to drink Q34 Stay away from places associated with my drinking	Social Liberation Subscale Q4 See signs helping people not drink Q13 People with alcohol problems making known desire not to be pressed to drink Q21 Society changing in ways that helps me overcome my drinking Q38 See advertisements of TV how society helps people not to drink

Figure 1. Items in alcohol version of the 40-item process of change questionnaire. The instructions of the PCQ were: "How often did you make use of a particular situation or thought to help you not drink alcohol in the past week?" Response options included: 1 = Never, 2 = Seldom, 3 = Occasionally, 4 = Frequently, 5 = Repeatedly.

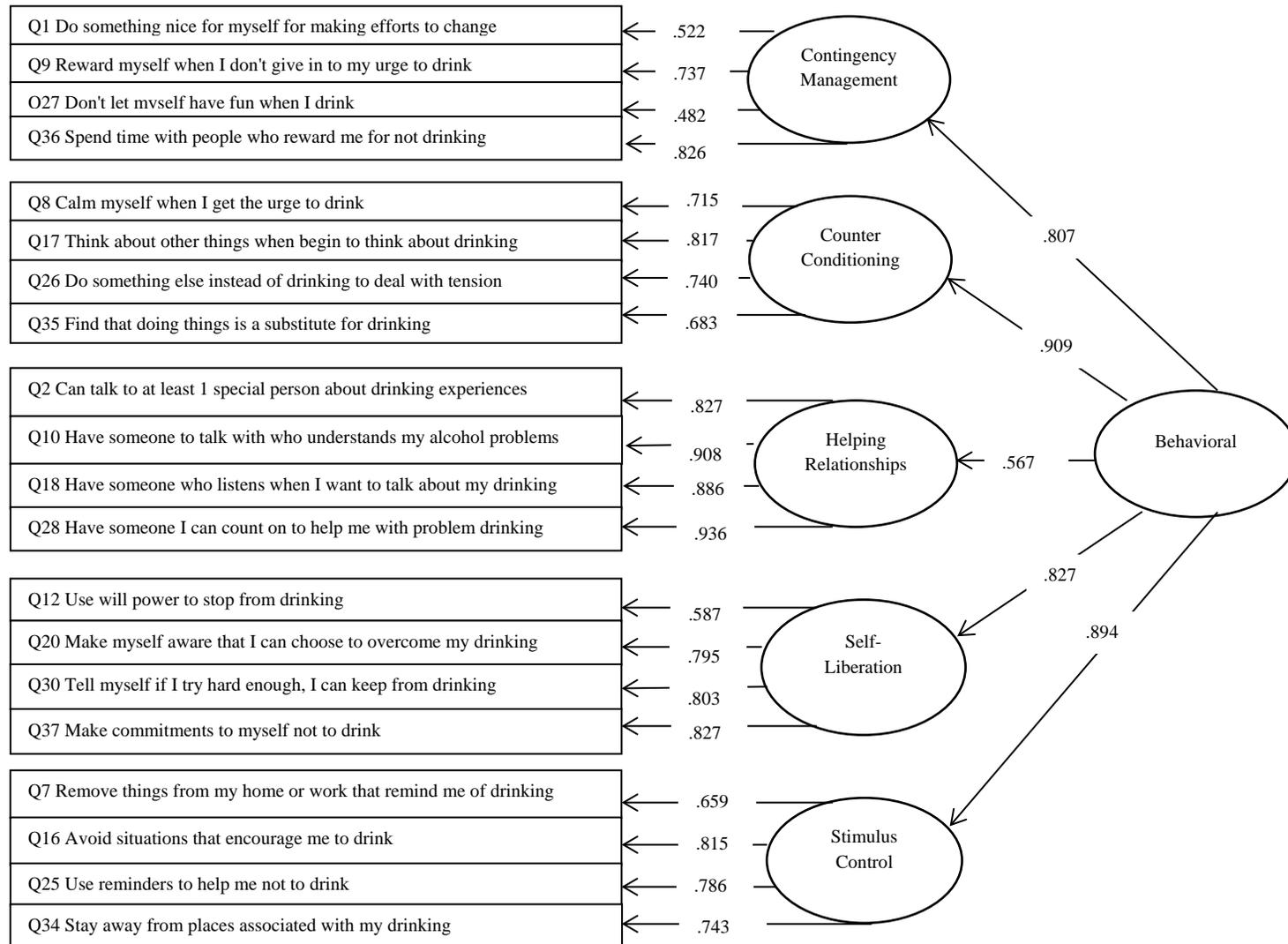


Figure 2. Standardized factor loadings for behavioral processes of change.

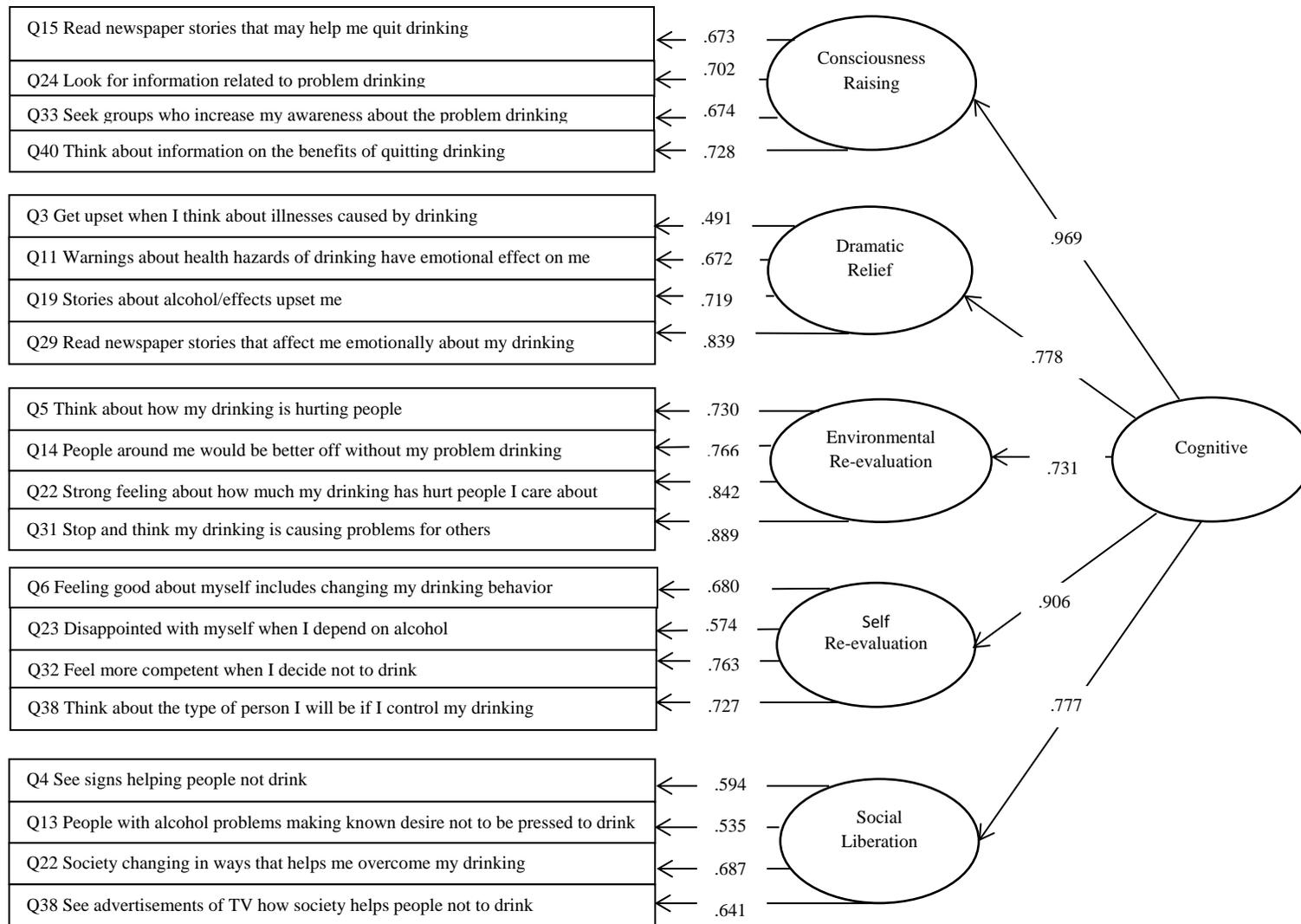


Figure 3. Standardized factor loadings for cognitive processes of change.

Probability of Endorsing Never or Seldom

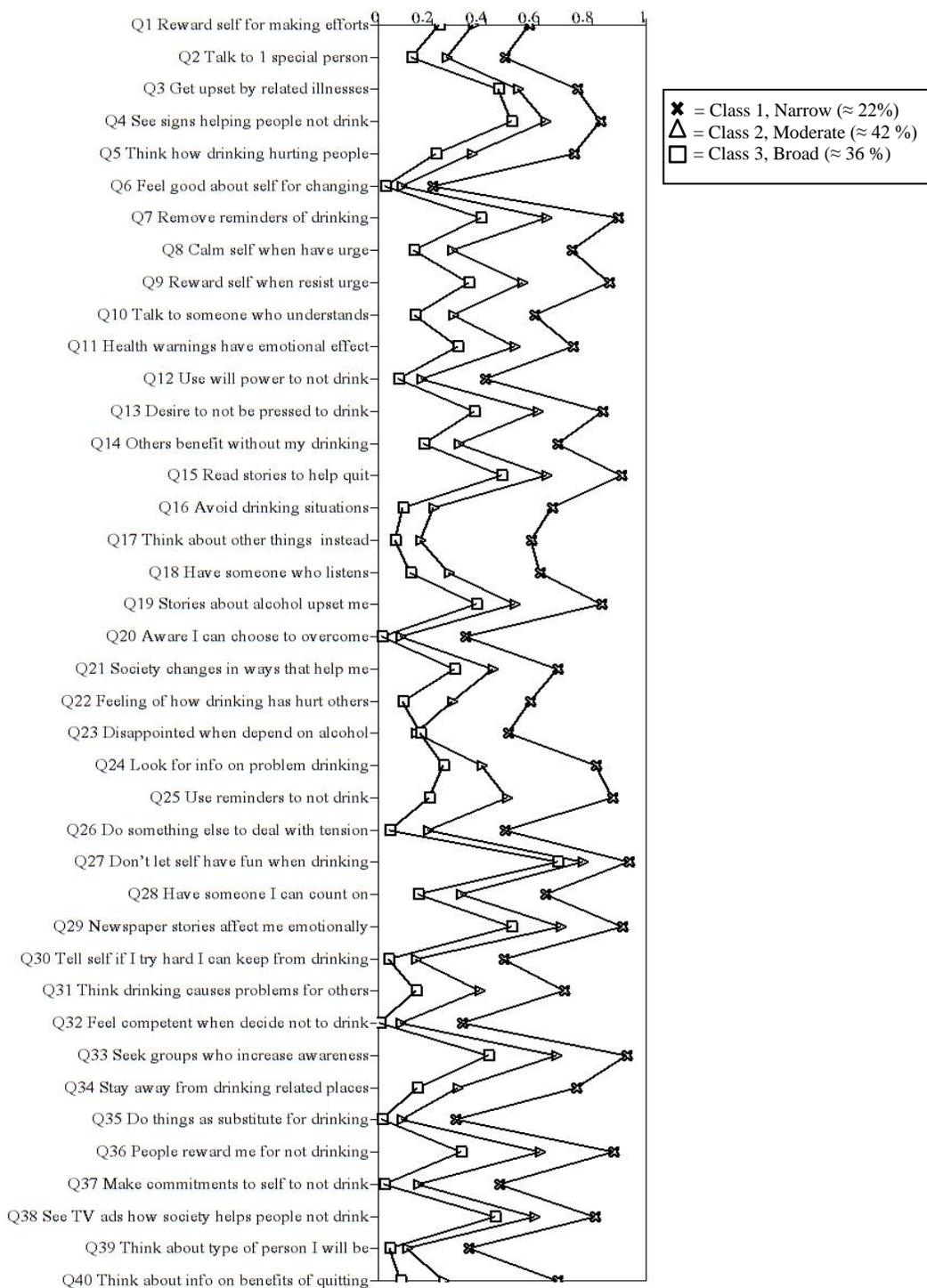


Figure 4. Latent class response probabilities for never or seldom.

Probability of Endorsing Occasionally, Frequently, Repeatedly

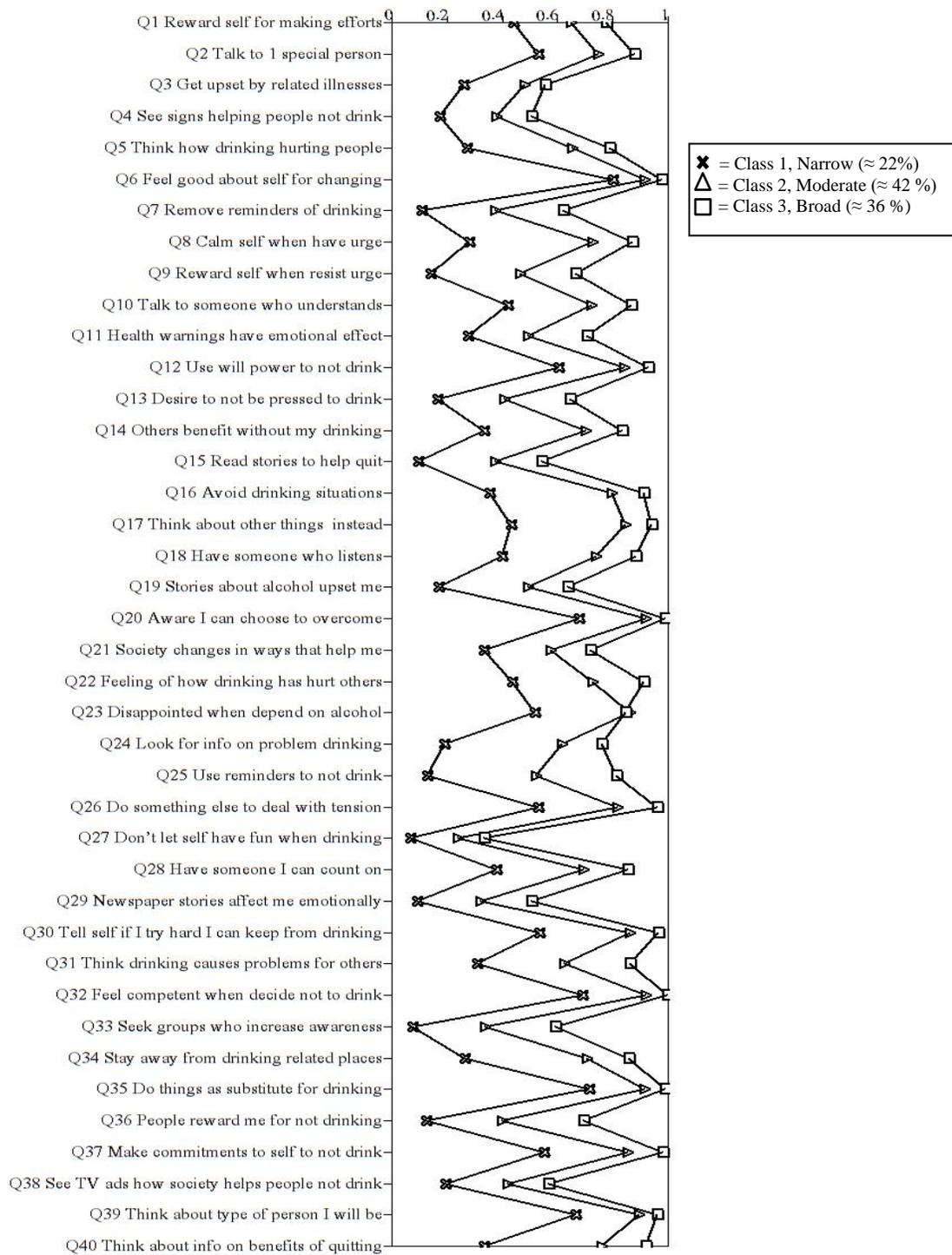


Figure 5. Latent class response probabilities for occasionally, frequently, or repeatedly.