Motivation to Change as a Mediator for the Longitudinal Relationships of Gender and Alcohol Severity With One-Year Drinking Outcome

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ABSTRACT. Objective: We examined whether motivation to change mediated the relationships between gender and baseline alcohol severity with drinking outcome at 12-month follow-up in a longitudinal community sample. **Method:** Data were from baseline and 12-month interviews from the Rural Alcohol Study, a probability sample of rural and urban at-risk drinkers ($N = 733$) from six southern states. At-risk drinkers were identified through a telephone-screening interview. Measures of motivation (problem recognition and taking action) were the resultant two factors derived from the Stages of Change Readiness and Treatment Eagerness Scale. Items on social consequences of drinking measured alcohol severity. Structural equation models examined relationships between baseline alcohol severity and motivation with drinks per drinking day at 12 months. **Results:** We identified significant, direct paths

between drinking at 12 months and alcohol severity and taking action with an unstandardized estimate of 0.116 ($p < .05$), alcohol severity and problem recognition (0.423, $p < .01$), and each of the two “motivation” latent constructs—problem recognition (1.846, $p < .01$) and taking action (-0.660, $p < .01$). Finally, the combined direct and negative effect of gender on alcohol consumption at 12-month follow-up was statistically significant, with an unstandardized estimate of -0.970 ($p < .01$). **Conclusions:** The current study offers evidence for motivation to change as a viable mechanism through which alcohol severity is associated with subsequent drinking outcomes. More research is needed to further explore the persistence of motivation to change on drinking outcomes over time. (*J. Stud. Alcohol Drugs*, 73, 504–513, 2012)

MOTIVATION TO CHANGE IS A CRUCIAL component of any drinking-reduction strategy, and a number of theory-based measures and predictors of change have been used to describe how individuals modify their alcohol and substance use (Brug et al., 2005; Drieschner et al., 2004; Prochaska and DiClemente, 1982; Ryan and Deci, 2008). The transtheoretical model of change (TTM) by Prochaska and DiClemente (1982) is a well-established theory of change that describes behavioral change across a wide range of behaviors. The TTM is divided into two components—stages of change and the processes of change. One widely used measure of the stages of change component is the University of Rhode Island Change Assessment (URICA) scale (Carey et al., 1999; DiClemente and Hughes, 1990; DiClemente and Prochaska, 1998; DiClemente et al., 1999).

The URICA contains five scales: precontemplation (not thinking about change), contemplation (considering change but not taking action), preparation (planning for action), ac-

tion (making a change in one's behavior), and maintenance (DiClemente et al., 1999; Prochaska and DiClemente, 1982; Prochaska et al., 1992). The Stages of Change Readiness and Treatment Scale (SOCRATES) is a self-administered 19-item scale that is based on the URICA scale and is used to measure motivation to change among individuals who misuse alcohol (Miller et al., 1999). The SOCRATES contains three scales: taking steps (a combination of all action and maintenance items on the URICA scale), problem recognition (a combination of precontemplation and determination items on the URICA scale), and ambivalence (all contemplation items on the URICA scale).

Research is inconclusive regarding the influence of gender or alcohol severity on motivation to change and eventual drinking reduction (Salloum et al., 1998). The majority of studies report no gender differences on measures of motivation to change (Blume et al., 2006; Demmel et al., 2004; Rumpf et al., 1999; Satre et al., 2011; Shealy et al., 2007).

In contrast, however, Laudet and Stanick (2010), in a study of motivation to change framed as “commitment to abstinence,” found that male gender was a negative correlate of motivation to change (Laudet and Stanick, 2010). In the subanalysis, female gender was correlated with treatment history, end of treatment experience, quality-of-life satisfaction, and the outcome variable commitment to abstinence

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(Laudet and Stanick, 2010). In a study that examined early intervention for alcohol use, Freyer et al. (2004) also found that women reported higher preparedness to seek help relative to male counterparts. In a subsequent study, Freyer et al. (2005), in their study of general and alcohol-specific readiness for change, found that women were more motivated than men to change their drinking. Women were also more likely to be found in "ready for help-seeking" groups than in the "not ready for help-seeking" group (Freyer et al., 2005). Similarly, Simpson and Joe (1993), in their examination of motivation for drug use change and predictors of early treatment dropout from methadone maintenance, found that heterosexual women with partners tended to have elevated scores on drug use problem, desire for help, and readiness for treatment scales.

In a study of at-risk drinkers, drinking ambivalence/problem recognition (two cognitive dimensions of motivation) and taking action were correlated with gender (female) (Maisto et al., 1999). In a longitudinal study of women with alcohol use disorders and drinking outcomes, Hunter-Reel et al. (2010) found that taking action and maintaining steps to reduce drinking (two behavioral measures of motivation to change) were influenced by social support networks that encourage sobriety. In the same report, motivation to change at 3-month follow-up was found to play a mediational role in social support for drinking and drinking frequency at 9-month follow-up. Although the generalizability of this report is limited by the sample being women with partners and relatively high incomes, the study highlights the importance of the behavioral components of motivation to change—namely, taking action to reduce drinking and taking action to maintain drinking goals. However, in the related substance misuse literature, female out-of-treatment crack users were found to be less ready to change than their male counterparts (Zule et al., 2003).

Similarly, alcohol severity also is thought to be associated with motivation to change and, as is the case with gender, the reported findings are mixed (DiClemente et al., 2009; Isenhardt, 1997; Isenhardt and Van Krevelen, 1998). A number of studies report no relationship between alcohol severity and motivation to change (Freyer et al., 2005; Miller and Rollnick, 2003; Vik et al., 2000). Nonetheless, alcohol severity is considered an important predictor of change (Blume and Schmalting, 1996). Greater numbers of adverse consequences such as loss of job, family fights, and loss of child custody have predicted greater motivation to change (Blume and Schmalting, 1996; Blume et al., 2006). For instance, in a cross-sectional study of non-treatment-seeking medical inpatients with unhealthy alcohol use ($n = 337$, 76% alcohol dependent), Bertholet et al. (2009) found that severity of alcohol-related consequences was strongly correlated with problem recognition. In a longitudinal community sample of non-treatment-seeking individuals who misused alcohol (according to the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition*

[DSM-IV]; American Psychiatric Association, 1994), greater intrapersonal alcohol-related consequences were found to be predictive of higher contemplation stage scores, lower precontemplation scores, and greater contemplation control scores at 3-month follow-up (Blume and Schmalting, 1996). In a study of hospital inpatients screened for alcohol use and classified as being either heavy episodic drinking only, at-risk drinking, or at-risk/heavy episodic drinking, researchers found that individuals with at-risk/heavy episodic drinking had a higher odds ratio of taking action to reduce drinking at baseline (Coder et al., 2009).

The overall objective of the present study was to examine the relationships among gender, initial alcohol severity, motivation to change, and subsequent drinking at 12-month follow-up among a large community probability sample of at-risk drinkers. In our conceptual framework, we proposed that motivation to change mediates the relationship between gender and baseline alcohol severity with drinking outcome at 12-month follow-up.

Method

Participants

In this study, we used baseline ($N = 733$) and 12-month ($n = 605$) follow-up data from a four-wave longitudinal telephone interview study of rural and urban at-risk drinkers from six southern states: Alabama, Arkansas, Georgia, Louisiana, Mississippi, and Tennessee (Booth et al., 1999). The study was approved by the University of Arkansas for Medical Sciences Institutional Review Board and by the institutional review board of the study's survey subcontractor (Temple University). The purpose of this study was to examine rural/urban differences in the course of drinking and alcohol service use. In this study, *rural* was defined as living outside a metropolitan statistical area.

To identify a cohort of at-risk drinkers, the initial data collection consisted of a brief screening telephone interview with a stratified random sample of more than 12,000 households (oversampled for rural residents) located in the six states. Using the DSM-IV criteria for alcohol abuse and dependence, at-risk drinkers were identified through a screening interview that queried potential participants on their current drinking behaviors (Booth et al., 1999). An at-risk drinker was defined as an individual who had evidence of lifetime alcohol abuse or dependence and exhibited problematic drinking behaviors such as episodic or regular heavy drinking in the past year (Booth et al., 1999). Individuals were invited into the study if they reported at least one lifetime DSM-IV criteria for alcohol misuse or dependence plus at least one of the following within the past 12 months: (a) any current misuse/dependence criteria reported as experienced during their lifetime; (b) significant heavy episodic drinking, defined as at least 8–12 drinks on an occasion for

men or 8–10 drinks on an occasion for women; or (c) “frequent heavy drinking” according to the Berkeley Alcohol Research Group Definition, or five or more drinks (men) or three or more drinks (women) on a typical drinking day and drank on at least 21 days of the past 28 days. Approximately 8% of the community respondents (960 of 12,348) screened positive for at-risk drinking, and 76% (733) of the eligible respondents participated in the baseline interview (Greenfield et al., 2006; Kerr et al., 2006).

Subsequent interviews were conducted by phone at 6-month, 12-month, and 18-month follow-up. At the completion of each interview, participants were paid \$50. For each follow-up interview, we maintained a follow-up rate of 90% at each wave, and 605 individuals completed the 12-month interview (82% of baseline). Full descriptions regarding study procedures, methods, and instruments are described in earlier reports (Booth et al., 2000).

The baseline sample has been well described (Booth et al., 2000). On average, study participants were relatively young at baseline ($M_{\text{age}} = 32$ years for men, 31 for women), White (80%), and high school educated (86%). Two thirds

of the study participants had been employed in the past year, and 39% reported that they were married. At baseline, the average number of reported drinks per drinking day within the last 6 months was five drinks for men and four drinks for women. Almost one half of the study participants reported a recent (within the past 6 months) alcohol disorder, and 40% reported experiencing at least one alcohol-related social consequence in the past 6 months. Current drinking was measured by self-report of number of drinks on an average drinking day and number of drinking days in the past 6 months. Diagnosis of recent alcohol drinking disorder (past 6 months) was measured by a structured diagnostic interview for DSM-IV abuse and dependence criteria using the Composite International Diagnostic Interview–Substance Abuse Model (Cottler et al., 1989).

Conceptual model

In our model of drinking outcome, we leveraged the TTM developed by Prochaska and DiClemente (1982) by adding two individual-level characteristics—gender and alcohol

FIGURE 1. Theoretical model. To simplify the figure, not all error terms are illustrated. For a list of the latent and manifest variables and indicators shown here and their definitions, see Table 1.

severity. Our measure of motivation to change is conceptualized as having two interconnected dimensions: a cognitive component called *problem recognition* and a behavioral component called *taking action* (Figure 1). Together, these interconnected components were thought to mediate the individual-level characteristics and lead to a reduction in drinking.

Measures

Alcohol severity was conceptualized as a latent variable, including self-reported alcohol use and the number of negative social, occupational, and recreational consequences of alcohol use (Table 1). Number of drinks per drinking day at baseline and at 12-month follow-up was assessed with the count variable "DRKNUM," asking "On days when

you drank an alcoholic beverage at any time during the last 6 months, on average how many drinks would you have in a 24-hour period?" Number of drinking days was assessed with the variable "DRKDAY," asking participants to report on the number of days they drank in past 6 months. Included in the alcohol severity latent variable were items from a baseline measure of alcohol severity and related social consequences from the alcohol outcomes module (Rost et al., 1996). The alcohol outcomes module is a self-administered module with demonstrated agreement with structured interview assessments of diagnosis ($\kappa = .81$), readmission ($\kappa = .83$), and change in severity of alcohol-related problems ($r = .66$ to $.86$). The module asks individuals to report on their experience with any social consequence such as fighting, injuries, arrests, legal problems, marital breakups, and family hardships in the past 6 months (Rost et al., 1996).

TABLE 1. Latent and manifest variables and their definitions

Latent factor	Manifest variable	Indicators	Definition
	Gender	—	Indicator variable for male, female
Problem recognition		Q1	Do you think this problem deserves special notice from you or your family, the kind you give someone who is ill?
		Q3	Sometimes I wonder if I am an alcoholic.
		Q4	If I don't change my drinking soon, my problems are going to get worse.
		Q7	Sometimes I wonder if my drinking is hurting other people.
		Q8	I am a problem drinker.
		Q11	I want help to keep from going back to drinking problems that I had before.
		Q12	I have a serious problem with drinking.
		Q13	Sometimes I wonder if I am in control of my drinking.
		Q16	I know that I have a drinking problem.
		Q17	There are times when I wonder if I drink too much.
		Q18	I am an alcoholic.
Taking action		Q5	I have already started making some changes in my drinking.
		Q6	I was drinking too much at one time, but I've managed to change my drinking.
		Q9	I'm not just thinking about changing my drinking, I'm already doing something about it.
		Q10	I've already changed my drinking; I am looking for ways to keep from slipping back to my old patterns.
		Q14	My drinking is causing a lot of harm.
		Q19	I am working hard to change my drinking.
Alcohol severity		G81	Drinking caused problems with family.
		G82	Drinking caused problems with friends.
		G83	Drinking caused problems with work or school.
		G84	Drinking caused problems by getting into physical fights.
		G85	Drinking caused problems by having a traffic accident.
		G91	Drinking caused being arrested for disturbing the peace.
		Traffa1y	Driving while intoxicated
		G10	Accidentally injured yourself while drinking
		G11	Being high from drinking in a situation where it increased your chances of getting hurt
		G12	Keeps you from chores or taking care of children
		G12A	Lose a raise, miss work, lose a promotion, or get fired
		G12B1	Drinking caused you to perform poorly in school, be suspended, or miss school.
		DRKNUM_B	On days when you drank an alcoholic beverage at any time during the last 6 months, on average how many drinks would you have in a 24-hour period?
		DRKDAY_B	Number of drinking days in the past 6 months; the categories were 0, 5, 12, 39, 91 and 180.
12-month report of drinks	DRKNUM_12		On days when you drank an alcoholic beverage at any time during the last 6 months, on average how many drinks would you have in a 24-hour period?

Notes: DRKNUM_B = number of drinks per drinking day at baseline; DRKDAY_B = number of drinking days at baseline; DRKNUM_12 = number of drinks per drinking day at 12-month follow-up.

Motivation to change was understood to be a set of cognitive (thought process) and behavioral actions or reactions that lead to a change in drinking. The SOCRATES–Short Form (Version 8) is a measure of TTM specifically developed to measure alcohol-related motivation to change (Miller and Tonigan, 1996). The 19-item short form version measures motivation to change in alcohol use on a 5-point Likert scale. The SOCRATES scale has high test–retest reliability ($.87 \leq \alpha \leq .96$) and a good internal consistency ($.60 \leq \alpha \leq .85$).

To identify the simplest structure of the SOCRATES measure, we began the analysis with a factor analysis. Items that loaded .40 or more on a factor were considered significant (Kim and Mueller, 1978). An individual item was retained in the final scale if it loaded significantly on only one factor. The result of the factor analysis extracted two factors with Eigen values of 1 or more with items loading of .40 or more on one factor following varimax rotation (Guttman, 1954; Kaiser, 1960). “Factor 1” consisted of items from ambivalence and problem recognition scales, and we labeled the scale as problem recognition (Miller and Tonigan, 1996). “Factor 2” consisted of items from Miller and Tonigan (1996) taking action scale and is so labeled. This finding is consistent with the two-component solution proposed by Bertholet et al. (2009) in their study of non-treatment-seeking individuals with unhealthy alcohol use (76% alcohol dependent). Other researchers also confirm this finding (Hewes and Janikowski, 1998; Maisto et al., 1999).

Gender was scaled as a 0, 1 indicator variable with “1” indicating being female.

Data analyses

To examine the proposed structural equation model (Figure 1), we used the Mplus statistical package, Version 6.1 (Muthén and Muthén, 2010). All analyses were conducted using the robust weighted least squares estimator in Mplus. The weighted least squares approach is recommended for analysis of data with mixed measurement levels, which includes binary and ordinal indicators (Flora and Curran, 2004; Muthén, 1984; Muthén et al., 1997). Here, Mplus uses a multistep approach for binary and ordinal indicator variables that make use of tetrachoric and polychoric correlation rather than a matrix of covariances.

Before testing the hypothesized model, we followed the Anderson and Gerbing (1988) two-step procedure for testing structural equation models, in which the first step is to perform a confirmatory factor analysis to assess the relationships among our three latent constructs: problem recognition, taking action, and alcohol severity. This first step is typically referred to as the measurement model. Here, the latent variables are allowed to freely correlate. In this analysis, we used various indices to assess model fit: Bentler’s comparative fit index (CFI) values greater than .95, Tucker–Lewis index

(TLI) values greater than .95, and root mean square error of approximation (RMSEA) values less than .06 (Hu and Bentler, 1998). The model chi-square test was examined also but was not used in model assessment because of its unsatisfactory properties, such as inflation with large sample sizes (Kline, 1998; Tanaka, 1993). Once the measurement model was examined for adequate fit given the data, we proceeded to examine the hypothesized structural relations among our three latent construct variables (alcohol severity, taking action, and problem recognition) and gender (a manifest variable) with the observed measure of alcohol consumption at 12-month follow-up, depicted in Figure 1.

Results

A three-factor model (i.e., alcohol severity, problem recognition, taking action) was tested using confirmatory factor analysis without specifying relations among the latent constructs. This initial measurement model did not fit well statistically, $\chi^2(431) = 1,440, p < .001$; however, it did fit reasonably well as a descriptor (CFI = .969, TLI = .967, and RMSEA = .057, 90% CI [0.053, 0.60]). All standardized factor loadings were generally large and statistically significant for both problem recognition (values ranged from .622 to .951) and taking action (values ranged from .663 to .961). Thus, these two latent variables appear to have reliable indicators. By contrast, alcohol severity had several low to moderate loading values (values ranged from .336 to .885). In particular, DRKNUM and DRKDAY were the two lowest at .336 and .346, respectively, suggesting that they may be unreliable indicators of alcohol severity. More important, the interfactor correlation was large and statistically significant with correlations between problem recognition with taking action at .658 ($p < .001$), problem recognition with alcohol severity at .629 ($p < .001$), and taking action with alcohol severity at .419 ($p < .001$).

Next, we tested the hypothesized model in Figure 1. We note that the initial hypothesized structural model did not adequately fit the data statistically as expected, $\chi^2(488) = 1,916, p < .001$; however, it did provide a moderate fit descriptively (CFI = .958, TLI = .955, RMSEA = .063, 90% CI [0.060, 0.066]). Given that alcohol severity had several small loading coefficients ($\leq .42$), which included DRKNUM, DRKDAY, G11, and G12B1, we modified the proposed model by removing these indicators of alcohol severity. This resulted in a moderate improvement, $\chi^2(370) = 1,078, p < .001$; CFI = .978; TLI = .976; RMSEA = .051, 90% CI [0.048, 0.055]. The modification indices suggested loading an indicator on multiple latent constructs. In particular, it recommended loading Q19 (*I am working hard to change my drinking*) onto both taking action and problem recognition to improve model fit; however, rather than having a complex variable, we removed Q19 from the model.

FIGURE 2. Final model of drinking reduction: Unstandardized (standardized) path coefficient estimates. To simplify the figure, not all error terms or loading coefficient estimates are illustrated. For a list of the latent and manifest variables and indicators shown here and their definitions, see Table 1.
* $p < .05$; ** $p < .01$.

Subsequently, we tested the reduced model and observed that it was a satisfactory fit to the data (CFI = .982; TLI = .980; RMSEA = .046, 90% CI [0.042, 0.050]). The chi-square test of model fit remained statistically significant ($p < .001$); however, the relative chi-square (chi-square/degree of freedom ratio) was 2.5. All three latent constructs had highly significant loading coefficients ($p < .001$) with unstandardized (standardized) values ranging from 0.744 to 1.021 (.681 to .924) for taking action, 1.00 to 1.517 (.628 to .914) for problem recognition, and 0.602 to 1.00 (.538 to .893) for alcohol severity, respectively. Furthermore, the composite reliability values, an analog to the coefficient alpha, which reflects the internal consistency reliabilities, were exceedingly high, with .94 for taking action, .97 for problem recognition, and .93 for alcohol severity.

We identified significant direct paths between alcohol severity and taking action with an unstandardized estimate of 0.116 ($p < .05$) and between alcohol severity and problem recognition (0.423, $p < .01$) (Table 2 and Figure 2). Significant direct paths were also found between each of the two

“motivation” latent constructs and drinking at 12 months: problem recognition (1.846, $p < .01$) and taking action (-0.660, $p < .01$). Individuals who recognized their problems with alcohol were drinking more heavily at 12 months, but those with higher scores on taking action drank less at 12 months. On the other hand, direct paths between gender and the two “motivation” latent constructs were not significant.

In this final model (Table 2 and Figure 2), the total effect of alcohol severity on alcohol consumption at 12-month follow-up comprising all indirect paths was statistically significant with unstandardized estimate of 0.484 ($p < .01$). The final model also identified a number of significant paths between the latent constructs, including between alcohol severity → problem recognition → alcohol consumption (-0.219, $p < .01$), problem recognition, and taking action (0.781, $p < .01$). Individuals with greater alcohol severity were more likely to recognize that they had problems with alcohol and take action. However, the path between alcohol severity → taking action → alcohol consumption ($p = .092$) was not significant. Furthermore, the total indirect effect of problem

TABLE 2. SEM effects decomposition of motivation to change, gender, and alcohol severity with 1-year drinking outcome

Causal variable	Endogenous variables											
	Alcohol severity			Problem recognition			Taking action			Alcohol consumption at 12-month follow-up		
	Unst.	SE	St.	Unst.	SE	St.	Unst.	SE	St.	Unst.	SE	St.
Gender												
Direct effect	-0.217*	0.085	-0.114	-0.044	0.048	-0.033	0.091	0.066	0.047	-0.970**	0.342	-0.124
Total indirect effects	—	—	—	-0.092*	0.057	-0.068	-0.132*	0.050	-0.067	-0.224*	0.096	-0.029
Total effect	-0.217*	0.085	-0.114	-0.136*	0.057	-0.101	-0.040	0.078	-0.021	-1.193**	0.346	-0.152
Alcohol severity												
Direct effect	—	—	—	0.423**	0.040	0.600	0.116*	0.057	0.114	—	—	—
Total indirect effects	—	—	—	—	—	—	0.332**	0.037	0.324	0.484**	0.112	0.118
Total effect	—	—	—	0.423**	0.040	0.600	0.448**	0.043	0.437	0.484**	0.112	0.118
Problem recognition												
Direct effect	—	—	—	—	—	—	0.785**	0.082	0.540	1.846**	0.348	0.316
Total indirect effects	—	—	—	—	—	—	—	—	—	-0.518*	0.195	-0.089
Total effect	—	—	—	—	—	—	0.785**	0.082	0.540	1.327**	0.255	0.228
Taking action												
Direct effect	—	—	—	—	—	—	—	—	—	-0.660**	0.232	-0.165
Total indirect effects	—	—	—	—	—	—	—	—	—	—	—	—
Total effect	—	—	—	—	—	—	—	—	—	-0.660**	0.232	-0.165

Notes: SEM = structural equation model; st. = standardized; unst. = unstandardized.

* $p < .05$; ** $p < .01$.

recognition on alcohol consumption through taking action was significant with unstandardized estimates of -0.518 ($p < .01$). Individuals who recognized that they had a drinking problem were more likely to take action and, in turn, were drinking less at their 12-month follow-up. However, despite this negative relationship between problem recognition and drinking through taking action, the overall total relationship between problem recognition and alcohol consumption at 12-month follow-up was positive, with an unstandardized estimate of 1.327 ($p < .01$). Thus, individuals who recognized that they had a drinking problem were still drinking more at the 12-month follow-up unless they had taken action.

Finally, the combined direct and negative effect of gender on alcohol consumption at 12-month follow-up was statistically significant, with an unstandardized estimate of -0.970 ($p < .01$), with women drinking less than men. Additionally, both the total indirect effect of gender → alcohol severity → problem recognition → taking action → drinking at 12 months and the overall effect of gender were significant, with unstandardized estimates of -0.224 ($p < .05$) and -1.193 ($p < .01$), respectively. Women tended to have lower alcohol severity scores and at the same time had more difficulty recognizing that they had a drinking problem.

Discussion

Unraveling the mechanisms of change is an important step toward understanding how individuals move toward long-term positive drinking outcomes. Specifically, with regard to gender, the central findings of this study are three-fold: first, female gender was associated with both lower alcohol severity at baseline and lower reported use of alcohol

at 12-month follow-up, as anticipated. This finding is not surprising, and a number of behavioral and physiological models have been put forth to explain differences in alcohol consumption between men and women. Women face a heightened vulnerability to the adverse social, physiological, and psychological effects of alcohol and experience greater symptom severity over a short duration compared with male problem drinkers (Boyd, 2003; Chander and McCaul, 2003; Emanuele et al., 2002; Grant and Harford, 1995; Henskens et al., 2005; Lau-Barraco et al., 2009; Weisner, 1992).

The second, albeit disappointing, central finding relating to gender is that gender did not directly predict motivation to change. This finding is consistent with the majority of studies that report no gender differences on measures of readiness to change (Blume et al., 2006; Demmel et al., 2004; Rumpf et al., 1999; Shealy et al., 2007). In a sample of heavy drinkers, Satre and colleagues (2011) also found that gender did not predict alcohol problem recognition. A variety of explanations have been offered, including the possibility that women who drink may have very different appraisals of their alcohol-related symptoms, which may affect the interpretation of drinking-related problems (Mulia et al., 2008; Schober and Annis, 1996; Weisner, 1992). For example, Weisner (1993) found gender differences in the relationship between drinking-related social consequences and motivation for treatment (as a form of problem recognition). In two early studies by Thom (1986, 1987), women were significantly less likely than men to feel that alcohol dependence was their main problem. Thom (1987) also found gender differences in reasons for seeking help (a form of taking action) that included feeling powerless, spousal violence, and difficulty in coping.

Our third and final finding is that gender did indirectly predict lower levels of self-reported drinking at 12-month follow-up through alcohol severity and problem recognition. This finding is consistent with the general idea that greater problem severity may lead to the realization of the need to reduce drinking (Field et al., 2007; Shealy et al., 2007; Stoddard Dare and Derigne, 2010).

Looking beyond gender differences in self-reports of drinking at 12-month follow-up, a major finding of this study suggests that problem recognition and taking action mediate the relationship between baseline alcohol severities with reported drinking 1 year later. This finding provides strong empirical support for TTM of change, which insists on the presence of both a cognitive and a behavioral component of change to modify drinking or substance misuse outcomes (Prochaska et al., 1992). In addition, our finding raises new questions regarding the sequencing of the facets of the motivational construct.

There is considerable cross-sectional evidence that problem recognition and taking action are correlated with drinking severity and drinking outcomes (Bertholet et al., 2009; Demmel et al., 2004). However, although some of these studies reported that high scores on the ambivalence/problem recognition factor was a significant correlate of abstinence, number of drinks, number of drinks per drinking day, number of heavy drinking days, and number of negative drinking consequences, most studies were not able to model levels of alcohol severity on dimensional measures of motivation to change and subsequent drinking behavior over time (Maisto et al., 1999). The major contribution of this current report is that we were able to determine the direction of the relationship between alcohol severity and motivation to change along two dimensions of change with reference to later outcomes in a non-treatment-seeking population.

Another important finding, which is somewhat counterintuitive, is that high levels of alcohol severity and high scores on problem recognition alone (without taking action) predicted higher levels of drinking at 12-month follow-up. It may be that individuals who are experiencing high levels of negative drinking-related consequences may be overwhelmed and thus consume more alcohol to cope (Field et al., 2007). Also, some individuals believe that experiences of certain consequences are part of the normative drinking experience, and thus those consequences may not be motivational to take steps to change drinking (Vik et al., 2000). It may also be that negative drinking-related consequences may not be sufficient to warrant a change of drinking.

A final finding of note is that the indirect path from alcohol severity → taking action → subsequent report of drinking was found to be statistically nonsignificant. This finding was unanticipated because the idea of “taking steps” reflects efforts to change or modify drinking behavior. The finding might be indicating that actions that lack cognitive support may not be particularly efficacious in reducing drinking

outcomes. Another possible explanation is that a number of unmeasured environmental variables may (fully) mediate taking action. For instance, in a study of women who met the criteria for alcohol abuse or dependence, social support for drinking predicted the development of less motivation to change (Hunter-Reel et al., 2010).

There are some limitations to this study. This is a regional study, and our findings may not generalize to nonsouthern U.S. populations. Only self-reported data for measures of drinking, drinking severity, and motivation to change were included in this study, and the authors have no external validation of these self-reported data. Others have determined that self-report of alcohol use is relatively reliable and valid, especially when collected under conditions of anonymity (Aquilino, 1992, 1994; Midanik, 1988). Although field studies of illegal drug use have been shown to be subject to response effects, self-report of alcohol use tends to be less biased (Aquilino, 1994; Aquilino and Lo Sciuto, 1990).

On the other hand, the study has several important strengths, including a strong conceptual framework that served to ground the analyses. The study provides evidence for how motivation to change alcohol use can be associated with subsequent drinking behavior in a nonclinical population. In addition, the study was based on a population representative sample of urban and rural at-risk drinkers with longitudinal data that allowed us to examine the natural course of drinking (only 7% of the sample obtained alcohol treatment during the course of 12 months; Booth et al., 2000).

Future directions

The present study examined the relationship among gender, alcohol severity, motivation to change, and subsequent drinking outcomes. A number of concerns must be addressed to enhance our understanding of drinking outcomes among individuals at risk for drinking problems. The relationship between alcohol severity and motivation needs further exploration. The question is not whether alcohol-related social consequences influence motivation to change, but rather, how individuals, in particular women, use these negative consequences to initiate and sustain motivation to change to affect drinking outcomes over time. The answer to this question is of particular importance to individuals who struggle to remit from problem drinking without formal treatment. Among women, lack of insight or failure to recognize problem drinking is of equal importance. Understanding the trajectory of motivation to change within the context of a nontreatment setting is an important first step in a line of research that will create a dynamic model of behavior change.

In summary, our findings provide general support for the TTM's conceptualization of motivation to change. Although our principal components analyses failed to confirm the presence of a three-factor solution that included ambivalence,

our data did confirm a two-factor solution: taking action and problem recognition. Although our study used a longer period (12 months), the findings challenge the findings of other researchers who suggest that the SOCRATES is not predictive of alcohol outcomes (Campbell, 1997; Hewes and Janikowski, 1998; Isenhardt, 1997). The findings from the study suggest that alcohol severity is predictive of motivation to change and subsequent reported drinking outcome. Moreover, our findings suggest that in the face of high alcohol severity, problem recognition, which was related to an increased level of reported drinking, was not sufficient in reducing the overall number of reported drinks at 12-month follow-up. The present study offers evidence for motivation to change as a viable mechanism through which alcohol severity is associated with subsequent drinking outcomes. More research is needed to further explore the relationships among alcohol severity, motivation to change, and drinking outcomes over time.

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