Full length article

The role of craving in the treatment of alcohol use disorders: The importance of competing desires and pretreatment changes in drinking

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ABSTRACT

Background: The current study aimed to contribute to the understanding of the session to session relationship between craving and drinking during the course of treatment via the incorporation into the analysis of both a) motivation to avoid alcohol and 2) pretreatment change, given that half of all individuals entering treatment change their drinking prior to the first session.
Methods: Sixty-three treatment-seeking participants received 12 weeks of CBT for alcohol dependence and completed assessments of approach inclinations, avoidance inclinations and drinking behaviors at the end of each session.
Results: Consistent with our hypothesis, motivations to avoid alcohol and pretreatment change significantly interacted with craving to predict both number of drinking days and heavy drinking days during the interval between sessions. Specifically, among lower pretreatment changers, motivation to avoid alcohol moderated the effect of craving on number of drinking days and number of heavy drinking days, such that craving positively predicted drinking among those lower on motivations to avoid only. In contrast, among higher pretreatment changers, cravings positively predicted drinking among those higher on motivations to avoid alcohol.
Conclusions: These findings highlight the importance of measuring both desire to consume and desire to avoid consuming alcohol simultaneously, and suggest that ambivalence may function differently depending on whether one is initiating (low pretreatment change) versus maintaining change (high pretreatment change).

1. Introduction

Craving plays prominent roles in theoretical models regarding the development, maintenance, and reinstatement of alcohol use disorder (AUD; Marlatt and Witkiewitz, 2005; Tiffany and Conklin, 2000), and is assumed to be positively related to alcohol consumption and relapse. However, the literature is far from convincing, as it fails to yield strong associations between craving and drinking (Drummond et al., 2000; Sayette, 2016;). Part of the difficulty in studying craving is that most theoretical models a) fail to capture the competing motivations and "ambivalence" often present in drinking situations (i.e., "I want to" and "I don't want to"), and b) do not adequately account for craving as a function of recovery (Breiner et al., 1999; Sayette et al., 2000; Stritzke et al., 2007; Tiffany, 1990), including changes in drinking prior to treatment initiation. With the growing recognition that significant changes in drinking occurs in some individuals prior to receiving

treatment (e.g., Stasiewicz et al., 2013), greater attention on the initiating versus maintaining influences of potential mechanisms of behavior change (MOBC) is needed (Noyes et al., 2018). The current study examined the role of craving during the course of treatment for AUD, and investigated both motivations to avoid alcohol and pretreatment change as moderators of the predictive relationship between craving and drinking.

1.1. Ambivalence: craving and motivation to avoid alcohol

Ambivalence about use, defined as the simultaneous desire to use and to not use psychoactive substances, has been identified as a hallmark feature of addiction, and is central to many clinical formulations of substance use disorders (e.g., Heather, 1998; Orford, 2001). For example, motivational theories of alcohol use hypothesize that people are continually making choices between drinking and alternative

actions (e.g., Cox and Klinger, 1988). Further, Tiffany's (1990) cognitive processing model of craving posits that the subjective experience of craving may occur when the immediate gratification of urges to use are impeded by internal motivations to abstain (i.e., abstinence promotion). Consistent with this notion is that alcohol cues have been shown to activate both appetitive and aversive reactions (e.g., Franken et al., 1999; Sinha et al., 2000; Smith-Hoerter et al., 2004), as well as competing affective states (Nosen et al., 2012). More recently, craving and competing desires have been applied to the study of attentional biases, such that desires to remain abstinent may attenuate biases towards alcohol cues (see Field and Cox, 2008 for review). However, despite the importance of competing desires (Kavanagh et al., 2013; Breiner et al., 1999; Anton, 1999; Tiffany, 1990), ambivalence is often overlooked in the study of craving.

Measurement of competing desires to avoid alcohol in conjunction with craving has several clinical and methodological advantages (see Stritzke et al., 2007 for review). Importantly, it is argued that measuring "craving" without consideration of desires to avoid alcohol may misrepresent a motivational disposition that is a combination of both, thereby significantly diminishing the utility of the information obtained (Breiner et al., 1999). Further, evaluation of both dimensions over time allows for the assessment of craving and motivation to avoid as a function of both substance use patterns and recovery status of those seeking or receiving treatment. For example, increases in motivation to avoid alcohol and the subsequent state of ambivalence are important for initiating change (e.g., changing drinking, seeking treatment), and resolving such ambivalence and transitioning to a state characterized by higher avoidance are important for maintaining change (e.g., Miller and Rollnick, 2013; Breiner et al., 1999). In contrast, continued levels of ambivalence after initiating change may be associated with potential lapses (e.g., Miller and Rollnick, 2013; Stritzke et al., 2007), particularly as one continues to exert self-control to maintain such change (e.g., Schlauch et al., 2015a). Indeed, research has shown that inclinations to avoid alcohol buffers the effect of craving on drinking (Schlauch, Rice et al., 2015; Schlauch et al., 2013a, 2013b), is incrementally related to taking steps to make a change (Klein et al., 2007; Schlauch, 2013a, 2013b; Schlauch, Breiner et al., 2013), are associated with treatment initiation and engagement (Schlauch et al., 2012, 2015a, 2015b), and may be more predictive of relapse among individuals with AUD than increases in approach inclinations (Stritzke et al., 2007). These findings are important because they suggest that once internal or external cues trigger urges to use, competing desires can be instrumental in resisting these urges (Tiffany, 1990). Therefore, the incorporation of motivations to avoid alcohol may provide a framework for which alcohol use is not inevitable when craving is activated, but rather is contingent on competing desires and stage of recovery.

1.2. Pretreatment changes in alcohol use

As the search for MOBC continues, greater attention needs to be paid to when changes in drinking are occurring (e.g., Witkiewitz et al., 2015). Significant decreases in drinking have been observed across clinical trials prior to the first treatment session (e.g., Connors et al., 2016; Stasiewicz et al., 2013; Epstein et al., 2005; Kaminer et al., 2008; Penberthy et al., 2007; Morgenstern et al., 2007), with approximately 50% of participants demonstrating a rapid change in drinking that is sustained by the end of treatment (Stasiewicz et al., 2013). Preliminary findings suggest that pretreatment change may be related to broader motivational constructs, including the action/maintenance stages of behavior change (Stasiewicz et al., 2013; Noyes et al., 2018). This is important as changes made prior to the first treatment session may significantly impact the relationships between MOBC and drinking, such that variables related to initiating change may be different than those maintaining change (e.g., Rothman, 2000). For example, in the original study from which the current data are drawn, Connors et al.

(2016) found that previous session therapeutic alliance ratings predicted drinking outcomes only among those who *had not* initiated change upon entering treatment (i.e., lower pretreatment change). In contrast, Noyes et al. (2018) found that previous self-efficacy predicted drinking only among those who *had changed* prior to entering treatment (i.e., higher pretreatment change). Together, these findings suggest that careful consideration must be given to changes in drinking prior to treatment in the analysis of process variables, and how mechanisms may differ for initiating versus maintaining change.

Conceptualizing pretreatment change within the broader stages of change literature may provide insight on the moderating effect of pretreatment change on MOBC, including ambivalence. For example, the contemplation stage, which is often characterized by high levels of "ambivalence," is the stage people are getting ready to initiate change (Engle and Arkowitz, 2006; Connors et al., 2013). In contrast, those in the maintenance stage are posited to have the least ambivalence, suggesting that continued levels of ambivalence may represent a risk for lapses if not resolved (e.g., Miller and Rollnick, 2013). Indeed, health behavior research demonstrates that ambivalence's relationship with the five stages of change is curvilinear with the least amount of ambivalence demonstrated at both the pre-contemplation and maintenance stages (Armitage et al., 2010). Furthermore, ambivalence has been shown to be associated with treatment initiation (Schlauch et al., 2015a, 2015b), highlighting its importance for initiating change.

1.3. Current study

The present study examined the predictive relationship between craving and drinking during the course of treatment for AUD with a focus on the moderating effect of both, motivation to avoid alcohol and pretreatment change. Using data from an observational clinical study (Connors et al., 2016), we hypothesized that previous session ratings of desires to avoid alcohol use would moderate the effect of craving on drinking during the interval between sessions, and that such a relationship would vary by pretreatment change. Based on both motivational and craving theories of alcohol use, which suggest that increases in motivation to avoid and the resulting ambivalence experienced are important for initiating change, we expected that motivation to avoid alcohol would attenuate the effect of craving on drinking outcomes among those lower on pretreatment change. In contrast, we expected that among those attempting to maintain change (higher on pretreatment change), ambivalence would demonstrate an increased risk for drinking.

2. Materials and methods

2.1. Participants

Sixty-three participants (female $n = 20$) seeking outpatient treatment for AUD were recruited from the community. Inclusion criteria required all participants to (a) be between 18 and 65 years of age; (b) meet DSM-IV criteria for current Alcohol Dependence; (c) live within commuting distance of the program site; and (d) have a minimum 6th grade reading level. Exclusion criteria were (a) meeting criteria for a current organic mental disorder or a psychotic disorder; (b) present with gross neurocognitive impairment; or (c) have been in substance abuse treatment over the previous 12 months (except for self-help groups).

Participants were predominantly Caucasian (74.6%; 20.6% African American, 3.2% American Indian/Alaska Native, and 1.6% Hispanic American) with a mean age of 48.27 (*SD* = 10.64) years. Approximately 53% reported part-time or full-time employment (21.7% unemployed; 10% disabled; 14.3% retired). Thirty-five percent reported being married, and 36.7% reported receiving previous outpatient treatment for alcohol problems. During the 6-month period prior to the baseline assessment, participants reported and average of

31.7% ($SD = 28.7$) days abstinent and 59.0% ($SD = 29.7$) heavy drinking days (defined as 5 or more standard drinks for men and 4 or more for women; National Institute on Alcohol Abuse and Alcoholism, 1995).

2.2. Measures

Demographic characteristics, marital status, employment and substance abuse treatment history were obtained using a comprehensive background questionnaire administered during the initial baseline assessment.

Alcohol Urge Questionnaire (AUQ; Bohn et al., 1995). The AUQ is a unidimensional measure of alcohol craving (8-item) assessing desire to use alcohol. Participants rated their agreement during the past 24 h with each statement on a 7-point Likert scale (1 = strongly disagree to 7 = strongly agree). The AUQ has demonstrated good psychometric properties in alcohol dependent samples (Bohn et al., 1995; Drummond and Phillips, 2002).

Client Session Report (CSR; Project MATCH Research Group, 1993). Item 5 of the CSR, "How motivated are you to avoid alcohol in the upcoming week" was used as an indicator of motivation to avoid alcohol. Participants rated this item on a 5-point Likert scale (1 = not at all motivated to 5 = completely motivated).

Timeline Follow-back (TLFB; Sobell and Sobell, 1992). The TLFB is a calendar-based retrospective recall interview of daily alcohol use. The TLFB was used to estimate number of drinking days and number of heavy drinking days over the 6-month period prior to the baseline assessment and through the 12-week treatment period (including baseline to treatment session 1, i.e., "gap data"). Specifically, drinking during treatment was assessed at the end of each treatment session following TLFB procedures. Further, gap drinking data (i.e., interval between baseline assessment and first treatment session) was obtained after the first treatment session. The reliability and accuracy of the TLFB measure have been consistently demonstrated for both alcohol use (e.g., Ehrman and Robins, 1994; Sobell and Sobell, 1992, 1996).

2.3. Procedure

Radio and newspaper advertisements were used to recruit community members who were seeking treatment for alcohol use disorders. All respondents were screened and provided a description of the treatment program. Eligible participants were scheduled for a baseline appointment, during which informed consent was obtained, alcohol dependence diagnosis was assessed, and additional questionnaires were completed.

All participants received 12-weeks of standard Cognitive Behavioral Therapy (CBT; Kadden et al., 1992). All treatment sessions were administered within an outpatient clinical research clinic by therapists with a minimum of 5 years of experience in treating patients with AUD. Therapists were trained on the study protocol and were supervised weekly, including reviews of audiotaped sessions to ensure compliance with the treatment manual. At the end of each treatment session, participants completed several assessments, including craving and motivations to avoid alcohol. Drinking was assessed at both baseline and at the end of each session via TLFB. For more details see Connors et al., 2016.

2.4. Data analytic strategy

To provide a description of change during the course of treatment and to examine the main hypotheses, multi-level (measures within person) growth curve models and multilevel time-lagged regressions were conducted using HLM 7.0 (Raudenbush et al., 2011). All parameters were estimated using restricted penalized quasi-likelihood (for count drinking outcomes) or restricted maximum-likelihood estimation (for continuous outcomes) with robust standard errors.

Data included craving, motivation to avoid, and drinking collected at the end of each treatment session. The TLFB were summed (i.e., number of drinking days, number of heavy drinking days) based on the number of days between treatment sessions, and therefore intervals varied both within and between-person. To examine our main hypothesis, reports of drinking outcomes were predicted from previous session craving, motivation to avoid, and their interaction, controlling for the time (treatment session number) and the previous session reports of drinking. Craving and motivation to avoid (as well as the interaction) were entered into the models centered on the person's own mean to examine how changes around the person's own mean predicted drinking outcomes, whereas time and the previous session reports of drinking where grand-mean centered. All predictors were entered as fixed effects to permit convergence and estimated with an over-dispersed Poisson distribution with variable exposure (i.e., number of days between sessions). The variable exposure function permits modeling of both the within and between-person variability in number of days between sessions and provides estimates of drinking rates per day (roughly interpreted as percent days drinking).

All models were examined with pretreatment change as a level two moderator (grand mean centered). Percent change in both drinking days and heavy drinking days were calculated using an average history of drinking (rates of drinking for weeks 5 through 17 prior to treatment) and rate of drinking 1 week prior to treatment session 1. These time points were selected based on previous work suggesting that individuals may begin to change their drinking approximately one month prior to their first treatment session (see Stasiewicz et al., 2013). Specifically, average history of drinking was subtracted from drinking the week prior to treatment session 1 and then divided by history of drinking. Therefore, negative values represented decreases in drinking during this one month period and positive numbers represented increases (-1.0 = 100% decrease/abstinence). Finally, all interactions were probed and graphs plotted (predicted values) using high (85th percentile) and low (15th percentile) values for both, motivation to avoid and pretreatment change. Correlations and descriptive statistics are presented in Table 1.

3. Results

3.1. Description of change during treatment

Description of changes in drinking during treatment has been previously reported in Connors et al. (2016). To summarize, significant decreases in number of drinking days and number of heavy drinking days were observed during the course of treatment. Furthermore,

Table 1
Descriptive Statistics and Bivariate Correlations.

	Mean	SD	1	2	3	4	5
Level 1 variables							
1. AUQ	20.56	10.86	–				
2. CSR	3.94	.81	−.483[*]	–			
3. # Drinking Days	1.96	6.67	.256[*]	−.270[*]	–		
4. # Heavy Drinking Days	1.15	6.04	.238[*]	−.227[*]	.940[*]	–	
5. # Days between sessions	8.31	9.93	.059	−.151[*]	.891[*]	.879[*]	–
Level 2 variables							
1.PreTreatment Change – Drinking Days	−.20	.71	–				
2.PreTreatment Change – Heavy Drink Days	−.37	.67	.636[*]	–			

Note: CSR = Client Session Report item 5 (motivation to avoid alcohol); AUQ = Alcohol Urge Questionnaire. Negative values for pretreatment change represent percent decrease in drinking during the pretreatment interval. # Drinking Days and # Heavy Drinking days represents the raw counts between treatment sessions and excludes the pretreatment change intervals.

  * $p < .001$.

changes in drinking were moderated by pretreatment change. Individuals demonstrating greater pretreatment change had significantly fewer drinking days and heavy drinking days than individuals with lower pretreatment change at the start and end of treatment, and demonstrated little change beyond their initial pretreatment change. In contrast, lower pretreatment change was associated with greater decreases in drinking during the course of treatment.

With regard to craving, results indicated significant decreases ($b = -1.09$, $SE = .136$, $p < .001$) over the course of 12 sessions. In addition, motivation to avoid alcohol demonstrated significant increases at the beginning of treatment (linear effect; $b = .123$, $SE = .030$, $p < .001$) but began to slow later in treatment (quadratic effect; $b = -.006$, $SE = .003$, $p = .018$). Further, these changes were not significantly moderated by pretreatment change (p-values > .41), nor was pretreatment change related to craving ($b = .413$, $SE = .087$, $p = .790$) or motivation to avoid ($b = .223$, $SE = .127$, $p = .123$) at the beginning of treatment.

3.2. Previous craving predicting drinking: moderation by motivation to avoid and pretreatment change

Results indicated significant Craving X Motivation to Avoid X Pretreatment Change interactions for both number of drinking days and heavy drinking days (Table 2; Figs. 1 and 2 for plotted interactions). Follow-up analyses revealed a significant Craving X Motivation to Avoid interaction for number of drinking days among those demonstrating lower pretreatment change ($b = -.030$, $SE = .008$, $p < .001$). Specifically, greater craving predicted a higher number of drinking days among those lower on motivation to avoid ($b = .018$, $SE = .005$, $p < .001$), but were not related to number of drinking days in those higher on motivation to avoid ($b = -.012$, $SE = .007$, $p = .127$). A significant Craving X Motivation to Avoid interaction was also observed among those demonstrating greater pretreatment change ($b = .036$, $SE = .013$, $p = .005$), such that higher craving predicted number of drinking days among those higher on motivation to avoid ($b = .043$, $SE = .010$, $p < .001$), but not those lower on motivation to avoid ($b = .006$, $SE = .012$, $p = .597$).

With regard to number of heavy drinking days, follow-up analyses revealed a significant Craving X Motivation to Avoid interaction among those demonstrating lower pretreatment change ($b = -.040$, $SE = .010$, $p < .001$), but not for those higher on pretreatment change ($b = .014$, $SE = .014$, $p = .302$). Specifically, among those with lower pretreatment change greater craving predicted fewer heavy drinking days among those higher on motivation to avoid ($b = -.042$, $SE = .014$, $p = .003$), but not among those lower on motivation to avoid ($b = -.001$,

Table 2
Summary of Results for Craving Predicting Drinking Outcomes (full models).

	# Drinking Days			# Heavy Dinking Days		
	b	SE	p	b	SE	p
Intercept	−1.721	.126	< .001	−2.466	.188	< .001
X Pretreatment Change	1.019	.143	< .001	1.080	.157	< .001
Time	−.035	.016	.035	−.049	.031	.119
X Pretreatment Change	−.016	.009	.059	.068	.016	< .001
Previous Drinking	.008	.015	.593	−.039	.042	.356
X Pretreatment Change	.003	.025	.909	.109	.036	.003
Previous AUQ	.012	.007	.062	.008	.012	.502
X Pretreatment Change	−.013	.004	< .001	−.045	.006	< .001
Previous CRS	−.201	.131	.128	−.478	.122	< .001
X Pretreatment Change	−.066	.074	.376	−.171	.094	.069
Previous AUQ X Previous CRS	−.002	.007	.805	−.013	.011	.224
X Pretreatment Change	−.047	.011	< .001	−.043	.007	< .001

Note: b = unstandardized estimate; SE = standard errors; p = p-values; AUQ = Alcohol Urge Questionnaire (i.e., craving); CSR = Client Session Report Item 5 (i.e., competing desire to avoid alcohol).

$SE = .008$, $p = .878$). Further, among those with greater pretreatment change, there were significant main effects of both craving and motivation to avoid (i.e., after removing the interaction), such that craving positively predicted ($b = .039$, $SE = .015$, $p = .008$) and motivation to avoid negatively predicted number of heavy drinking days ($b = -.373$, $SE = .182$, $p < .001$).

4. Discussion

The current study aimed to contribute to the understanding of the relationship between craving and alcohol consumption during the course of treatment by incorporating both, motivation to avoid alcohol and pretreatment change into the analyses. Consistent with our primary hypothesis, craving and motivation to avoid significantly interacted to predict drinking between sessions among those who showed less change prior to their first treatment session (lower pretreatment change). Specifically, higher motivation to avoid alcohol attenuated the effect of craving on number of drinking days. Further, the lowest rates of heavy drinking were observed among those with higher craving and higher motivation to avoid alcohol. In contrast, craving significantly and positively predicted number of drinking days when individuals were concurrently low on motivation to avoid alcohol. Together, results suggest that among those who have yet to initiate changes prior to treatment entry, higher ambivalence may result in lower rates of drinking and greater moderation of drinking during the course of treatment.

In contrast, stronger cravings predicted a higher rate of drinking days during the subsequent interval among those with greater motivation to avoid alcohol and higher pretreatment change. Further, when experiencing ambivalence, those higher on pretreatment change had similar rates of drinking days and heavy drinking days when compared to those lower on pretreatment change. Surprisingly, craving did not predict return to drinking among those who had lower motivation to avoid use. It is possible that for these individuals, other factors such as engagement in alternative activities results in a decision not to drink (approach/approach conflicts). Indeed, such approach/approach motivations are consistent with the "lifestyle balance" prescription for relapse prevention (see Marlatt and Witkiewitz, 2005). Unfortunately, the current design did not contain assessments of competing approach tendencies. Nevertheless, findings from the current study suggest that strong motivational conflicts (i.e., high approach and high avoidance) may increase the risk of lapses during treatment among those exhibiting high levels of self-control prior to treatment entry.

Results from the current study have several theoretical, methodological, and clinical implications. Of particular note is how pretreatment change was related to the degree to which craving and motivation to avoid predicted drinking behaviors. While the mechanisms underlying pretreatment change are not well understood, it is clear that such changes prior to treatment have a significant impact on the study of alcohol treatment outcomes and MOBC (Stasiewicz et al., 2013; Noyes et al., 2018). Conceptualizing pretreatment change within the broader stages of change literature, future research may gain a greater understanding for how proposed MOBC influence drinking at different stages of recovery. Specifically, researchers need to pay closer attention to *when* change occurs, including the differences in initiating versus maintaining change. Indeed, recent recommendations for examining clinical trial data in alcohol treatment studies highlight the importance of the timing of assessments (Witkiewitz et al., 2015), especially in the period of time leading up to the first treatment session.

Results also extend previous literature examining session to session associations between craving and drinking (e.g., McHugh et al., 2016) by identifying the conditions in which craving is likely to exhibit the greatest impact on drinking during treatment, as well as the growing body of literature highlighting the importance of competing desires. Specifically, the results are consistent with previous findings suggesting that motivation to avoid alcohol moderates the effect of craving on
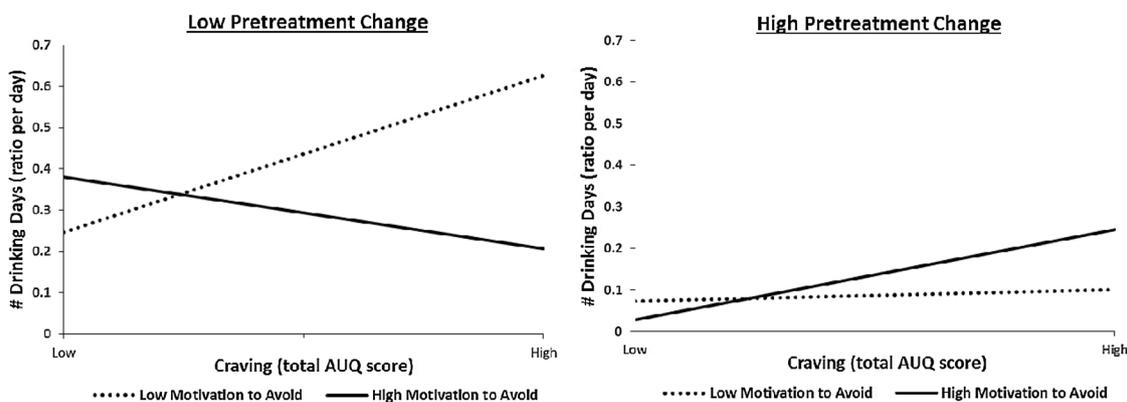
Fig. 1. Plotted predicted values for the Craving X Motivation to Avoid X Pretreatment Change interaction for Number of Drinking Days. Simple slopes of approach for high and low motivation to avoid alcohol by pretreatment change. High and low values were graphed at the 85th and 15th percentiles which are roughly equivalent to one standard deviation above and below the mean.

drinking behaviors in both clinical and non-clinical samples (e.g., Schlauch et al., 2015a, 2015b; Schlauch et al., 2013a, 2013b; Schlauch, Christensen et al. 2015), and expands these findings by identifying the ways in which changes in drinking prior to treatment might affect such relationships. Importantly, these findings suggest that studying craving within the context of motivational conflict may provide an explanation for why some people are able to successfully restrain drinking behaviors despite strong desires to use. Furthermore, the data are consistent with the notion that fluctuations in competing desires may be more important in the prediction of drinking during treatment than changes in craving (e.g., Stritzke et al., 2007), thereby elucidating a potentially important mechanism in drinking change.

Clinically, the construct of ambivalence remains central to the treatment of AUD and can represent a desirable outcome during treatment (e.g., Motivational Interviewing; Miller and Rollnick, 2013). Greater emphasis on techniques that enhance motivation to avoid alcohol may indirectly improve treatment outcomes by enhancing individuals' ability to weather acute rises in craving over the course of treatment, especially when cravings may be normative, strong, and automatic. Further, pretreatment change may also serve as an important predictor of treatment outcomes and inform treatment recommendations (e.g., Noyes et al., 2018). Specifically, pretreatment change status may help guide which process variables to target in treatment and how treatment might be adapted. For example, Motivational Interviewing may have a greater impact on motivations to avoid alcohol, and thus be a focus early on in treatment for those who have yet to initiate change. In contrast, for those trying to maintain change and experiencing approach-avoidant motivational conflicts,

treatments targeting cravings, including approach-bias retraining (e.g., Weirs et al., 2010) or pharmacological approaches such as Naltrexone, may help reduce motivational conflict that may place individuals at risk for lapsing (i.e., shift individuals from ambivalence to avoidant motivational profiles). Future research is needed to fully understand the effects of treatment modality on these relationships, and the effects of pretreatment change more broadly.

4.1. Limitations

The current study provides insight into the conditions and for whom craving has the greatest effect on drinking behaviors during treatment, but it is not without limitations. First, cognitive-behavioral therapy (CBT) was the only treatment approach used in treating patients enrolled in this study, and therefore it is unclear how craving and competing motivations may change in CBT relative to other approaches. In addition, ratings were made following each treatment session and it is unknown how the timing of these assessments may have affected ratings (i.e., immediately following a session), or how such desires may have fluctuated between sessions. Future research allowing for more dynamic assessments may help further elucidate the ways in which these desires change from pre to post session, as well as how daily fluctuations may impact drinking. Second, motivation to avoid alcohol was assessed using a single item from the client session report. Although single item assessments raise questions about their reliability issues, assessment of craving utilizing single-item measures is common in research settings and have demonstrated both high correlations with multi-item craving measures and sensitivity to change, thereby making
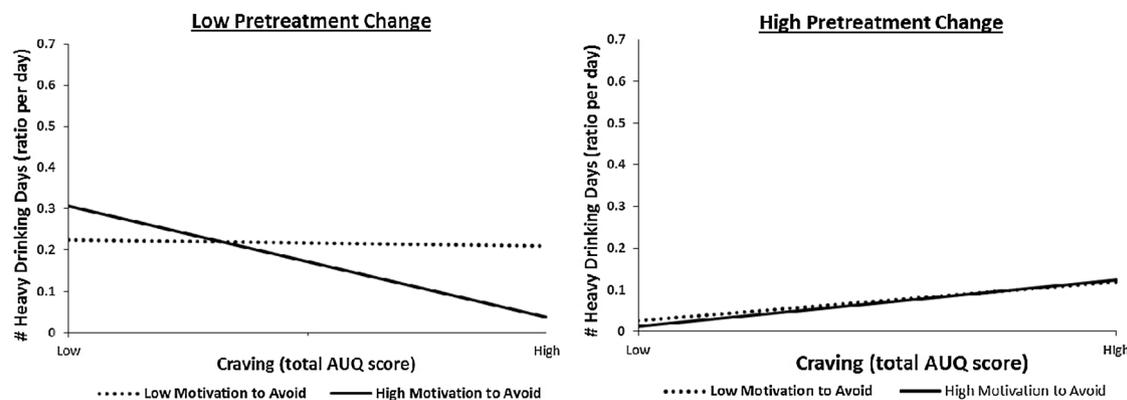

Fig. 2. Plotted predicted values Craving X Motivation to Avoid X Pretreatment Change interaction for Number of Heavy Drinking Days. Simple slopes of approach for high and low motivation to avoid alcohol by pretreatment change. High and low values were graphed at the 85th and 15th percentiles which are roughly equivalent to one standard deviation above and below the mean.

them ideal for designs calling for frequent and repeated measurement (see Rosenberg, 2009; Tiffany and Wray, 2012 for reviews). Third, although the primary focus of this study was on the within-person variations on craving/motivation to avoid and drinking outcomes, sample size is a consideration due to our interest in between-person differences in pretreatment change. Replication of this study's findings in larger samples is needed. Finally, the current study focused on drinking outcomes during the course of treatment, and the relations between craving/competing motivations and longer-term alcohol consumption are unknown. Future research examining these long-term relationships following treatment may provide insight regarding who may be at the greatest risk for a return to undesired levels of alcohol use.

In summary, the results of this study are consistent with literature highlighting the importance of assessing competing desires in the study of alcohol craving. In addition, investigation of treatment outcomes requires careful consideration of when drinking behavior changes, including the effects of this pretreatment change on potential treatment processes

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Contributors

Robert C. Schlauch and Cory A Crane conceptualized the manuscript and wrote the first draft of the manuscript, and Robert C. Schlauch conducted all statistical analyses. Gerard J. Connors, Stephen A. Maisto, and Ronda L. Dearing designed and wrote the protocol for the study. All authors contributed to and have approved the final manuscript.

Conflict of interest

No conflicts to declare.

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