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Motivation and self-efficacy in the context of moderated drinking: Global self-report and ecological momentary assessment

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Abstract

Despite ample research demonstrating the role of motivation and self-efficacy in predicting drinking in the context of abstinence, little research explicitly explores their role in the context of moderation, and none have utilized daily diary methods. The purpose of this study was to (1) explore the concordance between global self-report and daily diary composite measures of motivation and self-efficacy and (2) compare the ability of each in predicting drinking outcomes in the context of a study of brief AUD treatments focused on controlled drinking. Problem drinkers (N=89) were assessed, provided feedback about their drinking, and randomly assigned to one of three conditions: two brief AUD treatments or a third group asked to change on their own. Global self-report (GSR) measures were administered at baseline and week 8 (end of treatment). Daily diary composites (DDC) were created from data collected via an Interactive Voice Recording system during the week prior to baseline and the week prior to week 8. Findings revealed some concordance between GSR and DDC at both baseline and week eight, indicating the two methods capture some of the same construct; however, their respective relationships to drinking differed. DDC for both baseline and week eight significantly predicted week eight drinking outcomes, whereas only change in GSR significantly predicted drinking outcomes. Findings suggest that motivation and self-efficacy are important to moderated drinking, and that both GSR and daily diary methods are useful in understanding mechanisms of change in the context of moderation. Daily diary methods may provide significant advantages. Limitations and arenas for future research are discussed.

Keywords

moderation; controlled drinking; alcohol; problem drinkers; motivation; self-efficacy; global self-report; ecological momentary assessment

According to Kazdin and Noch (2003), mechanisms of change are the “processes or events that lead to and cause therapeutic change” (p. 1117). Despite a wide range of research

investigating both predictors of moderated drinking (e.g., Heather & Robertson, 1981; Miller & Munoz, 2005; Rosenberg, 1993) and mechanisms underlying abstinence based treatments of substance use disorders (e.g., Apodaca & Longabaugh, 2009; Kelly, Magill, & Stout, 2009; Longabaugh & Magill, 2011), research on mediators and moderators of controlled drinking is limited. Two commonly hypothesized mechanisms of change within the abstinence literature are motivation for change and self-efficacy (Apodaca & Longabaugh, 2009; Kelly et al., 2009); however, only a few studies examined these variables with respect to controlled or moderated drinking (e.g., Miller & Munoz, 2005; Rosenberg, 1993).

Motivation is characterized by a readiness for, desire, reason, need, intention or commitment to change (DiClemente, Schlundt, & Gemmell, 2004). Due in part to its multifaceted nature, it is operationalized many ways in the alcohol use disorder (AUD) literature. Most often motivation is captured as readiness to change via traditional, global self-report questionnaires in which subjects report on their current or recent levels of readiness (Apodaca & Longabaugh, 2009). In other studies, in-session client speech (e.g., change talk, number of utterances regarding commitment to change) is used as an index of motivation (e.g., Amrhein, Miller, Yahne, Palmer, & Fulcher, 2003). While these distinct measures attempt to capture at least a similar construct, some studies have demonstrated limited association between readiness to change (as measured by the University of Rhode Island Readiness to Change Assessment) and both first session client change talk (Hallgren & Moyers, 2011) and commitment to abstinence (Blanchard, Morgenstern, Morgan, Labouvie, & Bux, 2003). Furthermore, readiness to change demonstrates variable predictive validity of drinking outcomes in both abstinence (e.g., Blanchard et al., 2003; Carbonari & DiClemente, 2000; DiClemente et al., 2004; Litt, Kadden, Cooney, & Kabela, 2003; Project MATCH Research Group, 1997, 1998) and moderation based studies (e.g., Capone & Wood, 2009; Kaysen, Lee, LaBrie, & Tollison, 2009; Matwin & Chang, 2011; Williams, Horton, Samet, & Saitz, 2007). In general, commitment to change (measured as part of change talk) demonstrates a more consistent relationship to reduction in alcohol and drug use than global self-reported readiness to change (Aharonovich, Amrhein, Bisaga, Nunes, & Hasin, 2008; Amrhein et al., 2003; Campbell, Adamson, & Carter, 2010), and may therefore operate as a more efficient proxy for motivation.

Self-efficacy is characterized by the belief in one's ability to change or confidence to change (Bandura, 1982) and is widely demonstrated to influence outcomes in studies on drug and alcohol use in the context of abstinence based treatments (T. G. Brown, Seraganian, Tremblay, & Annis, 2002; Kelly et al., 2009; Litt et al., 2003; Project MATCH Research Group, 1997, 1998). Despite the prominent role of changes in self-efficacy in predicting reductions in drinking, few studies have examined self-efficacy as related to controlled drinking (Rosenberg, 1993), and those that have relied almost exclusively on global self-report measures, whether multi- or single-item measures (Sitharthan, Job, Kavanagh, Sitharthan, & Hough, 2003; Sitharthan & Kavanagh, 1990; Sitharthan, Kavanagh, & Sayer, 1996; Williams et al., 2007). Although these studies present some evidence for the predictive validity of global self-reports of self-efficacy for moderated drinking with respect to drinking outcomes (Campbell et al., 2010; Williams et al., 2007), results are mixed (e.g., Kavanagh, Sitharthan, & Sayer, 1996).

In addition to the relative dearth of empirical literature on motivation and self-efficacy in a moderation specific context, measurement of these constructs is limited by a general reliance on global self-report measures. Global self-report measures are often administered at a single time point (e.g., at admission or an initial site visit) and ask the respondent to provide a retrospective account of his or her psychological state. Across theories of addiction and behavior change, such as self regulation theory (J. M. Brown, 1998), self determination

theory (Deci & Ryan, 1985), the Transtheoretical Model (Prochaska & DiClemente, 1984; Prochaska, DiClemente, & Norcross, 1992) and social learning theory (Bandura, 1977, 1982), both motivation and self-efficacy are seen as context-specific and dynamic—each fluctuating as a person progresses through the change process in an ever-changing environment. Global self-report measures that remain anchored in time potentially provide an invalid or inadequate frame of reference for measurement. Furthermore, retrospective reports are known to have systematic bias (Bradburn, Rips, & Shevell, 1987) and rely heavily on mental heuristics which over value peak and end values of an experience, such as in the case of emotion or pain (Gross & Thompson, 2007; Shiffman, Stone, & Hufford, 2008; Tversky & Kahneman, 1973). In such cases, global report measures may not provide accurate knowledge about how fluctuations or the context of the heat of the moment predicts subsequent behavior. The dependency of motivation and self-efficacy on ever-changing internal and environmental cues highlights the need for real-time repeated assessments. Ecological momentary assessment (EMA) can address this limitation.

EMA is a methodology defined as “repeated collection of real-time data on subjects’ behavior and experience in their natural environment” (Shiffman et al., 2008, p. 3), and the term is used here to encompass all methods that fall under what we term daily process or micro-longitudinal designs in which constructs are assessed daily (or more intensely) in daily life. This unique approach has the ability to capture the dynamism of motivation and self-efficacy during the process of change. Despite an ever-increasing interest in EMA, our review of the literature revealed few outcome studies examining motivation and self-efficacy related to drinking using EMA. To our knowledge, there are no studies reporting the use of single item commitment to change assessments in alcohol moderation or abstinence studies. Although several studies have examined self-efficacy using EMA in the smoking literature (Gwaltney, Shiffman, & Sayette, 2005), there are no studies examining self-efficacy using EMA for individuals attempting to change their alcohol use in isolation of smoking cessation or that looked at reduction in drinking in a context of moderation. Given their prominent role in outcomes research and their dynamic nature, the absence of research on motivation and self-efficacy using EMA is surprising. Moreover, the role of motivation and self-efficacy measured using multiple methods in reduction of drinking requires further examination in the context of problem drinkers interested in moderation.

To begin to address these gaps in the literature, this study explored the convergent validity of global self-report and the daily diary measures of motivation and self-efficacy using data from a study of problem drinkers receiving a moderation-based, brief intervention for AUD. In addition, we examined how changes in motivation and self-efficacy over the course of the seven-week treatment predicted drinking outcomes. Based on existing literature related to abstinence, it was hypothesized that both motivation and self-efficacy would be associated with drinking outcomes, regardless of the method of measurement. Mediation and moderation of treatment was not explored, as it was beyond the scope of this present analysis; however, this study is an important first step to exploring those relationships.

METHOD

In a pilot study, 89 problem drinkers interested in moderation were recruited to participate in a randomized controlled trial for a brief intervention for AUD. A detailed account of procedures are reported elsewhere (Morgenstern et al., in press) but reviewed here briefly. The original aim of the pilot was to disaggregate Motivational Interviewing (MI) into its relational (client-counselor relationship with unique therapist stance) and directive (technical strategies) elements, as described by Miller and Rose (2009). As such, there were three treatment conditions to which participants could be assigned: MI, Spirit Only MI (SOMI), and Self Change (SC), described further below.

Participants

Recruitment—General advertising online and in local media was used to recruit 89 participants seeking treatment to reduce but not stop drinking. Advertisements emphasized client choice and a moderation approach. Participants were screened on the phone and then, if eligible, were scheduled for an in-person screen assessment.

Study eligibility—Participants were considered eligible if they were: (1) between the ages of 18 and 65; (2) consumed an estimated weekly average of greater than 15 or 24 standard drinks per week for women and men, respectively, during the prior 8 weeks, and (3) had a current AUD. Participants were excluded if they had: (1) a substance use disorder (for any substance other than alcohol, marijuana, nicotine) or were regular (greater than weekly) drug users; (2) a serious psychiatric disorder or suicide or violence risk; (3) physical withdrawal symptoms or a history of serious withdrawal symptoms; (4) a legal mandate to substance abuse treatment; (5) social instability (e.g., homeless); (6) a desire to achieve abstinence at baseline; or (7) a desire or intent to pursue additional substance abuse treatment during the eight-week study period.

Procedures

One week after the in-person screen assessment, eligible participants completed the in-person baseline assessment and were then randomized to one of three conditions: MI, SOMI, or SC. Participants assigned to either MI or SOMI received four sessions of psychotherapy over seven weeks. Those in the SC condition were encouraged to change on their own, and, at the end of the seven-week treatment period, they were offered four sessions of MI. All participants completed a week eight (end of treatment) assessment.

Daily Diary: Daily Interactive Voice Recording Survey

In addition to standard assessments, participants responded to a daily survey delivered via interactive voice recording (IVR) at the end of each day for a total of eight weeks—one week prior to the baseline assessment/randomization through the end of the seven week treatment period. Research assistants provided initial training on the IVR system, gave participants a written copy of all the questions they would be answering on a daily basis, and clarified any confusion about the questions or the process. Participants were provided a toll-free phone number and were asked to complete the survey between 4:00 pm and 10:00 p.m. If participants failed to call into the system by 8:00 p.m., an automated reminder call was made. The daily surveys took about 2 to 5 minutes to complete.

Study Interventions

All participants received normative feedback from a member of the research staff during their baseline assessment immediately prior to randomization. Feedback included an estimated average weekly consumption of alcohol and their score from the Alcohol Use Disorder Identification Test (AUDIT, Babor, Higgins-Biddle, Saunders, & Monteiro, 2001) with a description of AUDIT risk categories. They were then assigned to one of the conditions described below. For each of the conditions, there was high fidelity, and there was also clear discriminability between conditions (Morgenstern et al., in press). While treatment was not a focus of the present study, we provide a description of each of the conditions below.

Motivational Interviewing (MI)—The MI protocol was adapted from the motivational enhancement therapy used in Project MATCH (Miller, Zweben, DiClemente, & Rychtarik, 1992; Project MATCH Research Group, 1993) and included structured personalized

feedback. All in-session discussions regarding goals were geared towards moderation rather than abstinence.

Spirit only MI (SOMI)—The SOMI protocol consisted of the relational elements of MI, specifically including therapist stance (warmth, genuineness, egalitarianism), emphasis on client responsibility for change, extensive use of reflective listening skills (e.g., open ended questions, simple reflections), and avoidance of MI-inconsistent behaviors (advise, confront, take expert role, interpretation). Technical or directive elements (e.g., amplified or double-sided reflections, decisional balance, etc.) were proscribed to avoid the selective reinforcement of change talk. Reflective listening was focused on experiential or affective content consistent with client-centered experiential treatments (Bohart, 1995).

Self Change (SC)—The SC protocol emphasized personal responsibility for change. Research staff met with participants to outline the components of the condition. Participants were asked to attempt to change on their own; told that research demonstrated that some individuals could reduce their drinking without professional help; and told that completion of the IVR and the research interviews might be helpful. Participants were offered treatment (four sessions of MI) at the end of the eight week study period.

Measures

Sociodemographics—A self-report, demographic questionnaire collected data on age, gender, educational and occupational information, race and ethnicity, medical history, family psychiatric and substance abuse history, and the participant's substance abuse treatment history.

Screening and substance use diagnosis—The Alcohol Use Disorders Identification Test-C (AUDIT-C) was used to determine preliminary eligibility for the study in regards to quantity and frequency of drinking, and it has demonstrated adequate psychometric properties (Bush, Kivlahan, & McDonell, 1998). The Composite International Diagnostic Instrument, Substance Abuse Module (Cottler, Robins, & Helzer, 1989) was used to evaluate substance dependence exclusion criteria and the number of AUD criteria a participant satisfied. It is a well-established diagnostic interview with excellent reliability and validity (Wittchen et al., 1991).

Psychiatric and cognitive impairment exclusion criteria—Two screening tools, the Structured Clinical Interview for DSM-IV, Psychotic Screening and Mood Disorders sections (First, Spitzer, & Gibbon, 1996; First, Spitzer, Gibbon, & Williams, 2001), and the Mini-Mental Status Examination (Folstein, Folstein, & McHugh, 1975) were used to screen for serious psychiatric symptoms and cognitive impairments, respectively.

Alcohol use patterns—For this analysis, alcohol use patterns were measured using the Timeline Followback interview (TLFB, Sobell et al., 1980). It assessed frequency and quantity of alcohol use during the nine weeks prior to baseline/randomization, and it was also administered at the end of treatment assessment (at week eight). The TLFB has demonstrated good test-retest reliability (Carey, Carey, Maisto, & Henson, 2004), agreement with collateral reports of alcohol (Dillon, Turner, Robbins, & Szapocznik, 2005), convergent validity, and reliability across mode of administration (i.e., in person or over the phone) (Vinson, Reidinger, & Wilcosky, 2003). For this analysis, TLFB data was aggregated into summary variables that described frequency and intensity of drinking. Aggregate variables included sum of standard drinks (SSD), drinks per drinking day (DDD), and number of drinking days (NDD). These variables were used to facilitate greater ease of comparison with guidelines for safe drinking from the National Institute on Alcohol Abuse and

Alcoholism (NIAAA) and for specificity with respect to the aspect of drinking patterns that changed—information particularly important in the context of moderation. Baseline variables were weekly means generated across the nine weeks prior to the baseline assessment, referred to as baseline drinking. Week eight drinking variables are values generated from data collected for the last week of treatment.

Motivation to Change

Global, self-report: The Readiness to Change Questionnaire, Treatment Version (RCQ, Heather & Rollnick, 2000) is a 12-item instrument for measuring “stage of change” reached by an excessive drinker, and it was utilized as the global self-report measure of motivation to change. The RCQ has demonstrated good psychometric properties including predictive validity. RCQ composite scores were generated by adding values from contemplation and action items together and subtracting precontemplation item values. In addition, in order to specifically capture commitment-- the same component of motivation captured by the daily diary--the RCQ action subscale was utilized in the analysis. The RCQ was administered at baseline and at the week eight assessment.

Daily diary measure: Two items on the daily diary IVR questionnaire measured motivation via commitment to change. The first was “How committed are you not to drink heavily (that is, not to drink more than 5 drinks) over the next 24 hours?”, and the second was “How committed are you not to drink at all over the next 24 hours?” The response set for the items ranged from 0 “not at all” to 4 “completely.” Commitment items were used both as daily predictors of drinking and as a composite across 7 days prior to both the baseline and the week eight assessments, described further below.

Self-efficacy to resist heavy drinking

Global, self-report: The Situational Confidence Questionnaire (SCQ, Annis & Davis, 1988) is a 39-item questionnaire that measures self-efficacy related to drinking behavior, specifically the ability to resist the urge to drink heavily. For this analysis, a total composite score was utilized by summing the scores of each of the items. The SCQ was administered both at the baseline and week eight assessments.

Daily diary measure: One item on the daily diary IVR questionnaire measured self-efficacy. The participant was asked “How confident are you that you can resist drinking heavily (that is, resist drinking more than 5 drinks) over the next 24 hours?” The response set ranged from 0 “not at all” to 4 “completely.” The confidence item was used both as a daily predictor of drinking and as a composite across the seven days prior to both the baseline and week eight assessments, described further below.

Analytic Plan

There were several steps to our analyses. First, we examined the association between the daily diary and the traditional self-report measures of motivation and self-efficacy at baseline and at week eight to assess for convergent validity. Daily reports of confidence to resist heavy drinking, commitment not to drink heavily and commitment not to drink at all were each aggregated across the week prior to the baseline assessment to form three mean level composites for each person. Composites were created in order to reduce error and increase reliability of the measures. Composites were then generated for the week prior to the week eight assessment (referred to here as week eight), in the same fashion. Descriptive statistics, reliability estimates, and correlation coefficients were generated. Reliability estimates were computed using procedures outlined by Raudenbush and Bryk (2002) as a part of the hierarchical linear modeling approach. This index is analogous to an internal

consistency estimate. They represent the proportion of the total variance in the average level of interest (i.e., commitment, confidence) that is due to true score versus error. Stated in other words, for the repeated assessments, this approach assumes that the between person variance in parameters (intercepts or mean levels) is considered systematic (true score), and the variance around each estimate is considered error. Interpretation of the coefficient's value is similar to an alpha coefficient. Inter-correlations of the outcome variables were also examined.

Next, associations between both measurement types of motivation and self-efficacy and TLFB drinking variables at baseline and week eight were examined. Baseline daily diary composites were examined as predictors of week eight TLFB drinking controlling for baseline TLFB drinking. We estimated nine multiple regression models predicting each of the three treatment drinking outcomes from the three daily diary composites and the corresponding baseline drinking measure. Although composites were created for baseline and week eight, two covariates were added to each model to control for the number of days in each of those weeks a participant responded to the IVR. This was an attempt to understand any undue influence greater or lesser compliance with the IVR might have on model results. In order to understand how changes in motivation and self-efficacy over the course of the treatment period may have impacted week eight drinking outcomes, week eight daily diary composites were entered as a second step to the nine models above. Changes in r^2 are reported.

Finally, it is important to note that despite the fact that this study was a treatment study, treatment condition was not included in our analyses. While mediation and moderation analyses are beyond the scope of this present study, this is an initial step in understanding those relationships.

RESULTS

Associations between Daily Diary Aggregates and Traditional Self-Report Measures

Table 1 shows the baseline descriptive statistics, correlations and reliabilities for the aggregate daily commitment and confidence composites and the global self-report measures for motivation and self-efficacy. Baseline daily diary composites were based on a mean of 5.27 ($SD = 2.00$; Median = 6.00) reporting days per person in the week prior to baseline. All baseline composites had satisfactory reliability (analogous in this case to internal consistency). Mean confidence to resist drinking heavily and mean commitment not to engage in heavy drinking were highly correlated; this association was considerably stronger than their associations with mean commitment not to engage in any drinking. The three baseline daily diary composites were significantly and moderately related to the baseline SCQ, the RCQ Action subscale and the RCQ composite scores. Baseline mean confidence to resist drinking was more strongly correlated with the baseline SCQ score, than the baseline RCQ Action subscale and the baseline RCQ composite. Only the baseline RCQ composite score was unrelated to baseline mean confidence to resist heavy drinking.

Table 2 shows the week eight descriptive statistics, correlations and reliabilities for the aggregate daily commitment and confidence composites and the global self-report measures for motivation and self-efficacy. Daily diary composites at week eight were based on a mean of 4.15 ($SD = 2.3$, Median = 4.0) reporting days per person in the week prior to the week eight assessment. All week eight composites had satisfactory reliability (analogous to internal consistency). Again, mean confidence to resist drinking heavily and mean commitment not to engage in heavy drinking were highly correlated; this association was considerably stronger than their associations with mean commitment not to engage in any drinking. Week eight SCQ score was significantly moderately correlated with all three week

eight composites, demonstrating the strongest relationship with confidence to resist heavy drinking. These relationships were weaker than the associations found at baseline. Interestingly, only commitment not to engage in heavy drinking was significantly, moderately correlated with the RCQ Action subscale or the RCQ composite score. No other relationships emerged between the global self-report and IVR measures.

Table 3 shows the inter-correlations of the drinking outcomes at both baseline and week eight.

Predictors of Week Eight Drinking

The standardized regression coefficients for the daily diary composites are shown in Table 4. All three daily diary composites independently and significantly predicted change in drinking from baseline with the exception of confidence and commitment to resist heavy drinking predicting NDD. There was no significant effect for baseline or week eight number of days responded to the IVR in any of the models. Also shown in Table 4 are the coefficients for the week eight daily diary composites and the respective r^2 change. Inclusion of these values tests for whether the change in commitment or confidence levels from baseline to week eight are related to changes in drinking outcome (Finkel, 1995). For SSD, a change in both confidence to resist heavy drinking and commitment to no drinking significantly predicted week eight drinking outcomes, when controlling for baseline drinking. For DDD, changes in all three daily diary composites predicted week eight drinking outcomes, when controlling for baseline. Finally, only change in commitment to no drinking predicted week eight NDD. All relationships were in the expected directions. Again, there was no effect for number of days responded to the IVR for either baseline or week eight.

Table 5 shows the standardized regression coefficients for the global self-report measures. None of the baseline global self-report measures predicted week eight drinking. When controlling for baseline drinking, change in SCQ score and the Action subscale both significantly predicted week eight SSD and DDD. Only the Action subscale significantly predicted NDD when controlling for baseline drinking.

DISCUSSION

This is the first study to measure motivation and self-efficacy using both global self-report and daily diary methods to examine their respective impact on drinking outcomes among problem drinkers in a study of brief moderation-oriented interventions for AUD. Overall, the hypotheses were supported. First, there was convergent validity between the two measures at both baseline and week eight. Second, changes in motivation (conceptualized primarily as commitment) and self-efficacy (conceptualized primarily as confidence), regardless of measurement method, predicted week eight drinking outcomes. Given the findings, it appears that self-efficacy and motivation were most associated with reduction in drinking intensity rather than the frequency of drinking in a given week.

Medium to strong correlation coefficients between the two types of measurement of motivation and self-efficacy support the notion that some convergent validity exists between them; however, differences between the measure types and their relationships to drinking point to both shared and distinct qualities in the way they measure the target constructs. The daily diary composites were more consistent predictors of outcomes than global self-reports at baseline and week eight; while only the week 8 global self-reports predicted week 8 drinking. It may be that the daily diary composites had stronger validity than global self-reports—capturing the salient components of motivation and self-efficacy that specifically drive drinking. Indeed, increased validity is a widely discussed advantage of EMA over

global self-report (Shiffman et al., 2008). The fact that week eight global self-reports also predicted this relationship when baseline global self-reports did not may be explained by a heightened awareness of confidence in coping and commitment on the part of the participant due to either study participation and/or the experience of cumulative efforts over time to moderate.

There appears to be a role for both EMA and global self-report measures when investigating mechanisms in studies on moderated drinking among problem drinkers. Findings in aggregate suggest that EMA measures of mechanisms may provide more information and reveal more consistent relationships to drinking than global self-reports; however, the important drawbacks of daily diary approaches are the costs associated with data collection, encouraging consistent compliance over time, and more complicated data management and analysis. These drawbacks may be minor when compared to the gains in research. Global self-reports, on the other hand, also provide indicators of influences on drinking and are less overall burden on the participant.

Findings point to an ongoing need within mechanisms research for a greater understanding of the impact of research methods and measurement decisions, specifically the tools that measure the constructs of interest (including their strengths, weaknesses, and their respective burden on participants) and the purposes for which we use them. For example, how exactly do the SCQ (a measure that provides numerous examples of situations in which a person may or may not find difficult to resist drinking) and a single item question about confidence to resist drinking that particular day differ in their ability to capture self-efficacy? Both appear to be face valid measures of self-efficacy in their own right but may capture different aspects of it. Due to the global nature of the SCQ (both in content and measurement), the change in the score by the end of the treatment period may reflect a truly global evaluation of one's self-efficacy—across situations and contexts. On the other hand, the daily diary question about confidence asks only about that day—at a time in which the participant may be: able to anticipate a specific drinking situation in the immediate future; able to evaluate multiple variables (including present mood, stress level, exhaustion) that may impact that drinking situation; or already drinking. A greater understanding of how and when to use each measure for both the maximum benefit for research and for the least cost to the participant will be important to establish.

Previous literature in other fields (Shiffman et al., 2008), such as pain management, conclude that both global self-reports and EMA are important—and provide different information. Global self-report measures in pain management have been shown to be better predictors of decision-making and subsequent behavior because it is the perceptions and beliefs that a person has of oneself that are crucial. It is important to note that daily reports and global measures of pain have not necessarily shown concordance with one another. Also, research on alcohol and substance abuse are challenged with constructs and concepts that may be less concrete than pain. More studies are needed to compare these measurement types and their respective roles in predicting drinking and drug use.

Limitations

There are limitations to this study. Sample size and resulting lack of power limit the interpretation of a number of our analyses. For example, the mean number of days on which week eight composite scores were based were fewer than those at baseline. It is also possible that only those individuals who had an increase in motivation and self-efficacy were those that had available daily data at week eight. There were at least 19 individuals missing some of the daily data at week eight, and they were excluded from the analyses as a result. While we attempted to control for this with the covariates for IVR days responded in during the

weeks we used data, it remains unknown exactly how our results may change given more complete data.

There are limitations to using a single item for a measure of any construct, and there are limited psychometrics that can be performed to validate and verify its reliability. We attempted to address these limitations by assessing for convergent validity for the single item measures with the existing standard of global self-reports. We also calculated reliability estimates utilized in hierarchical linear modeling that are analogous to internal consistency. The daily diary composites demonstrated satisfactory reliability. There are also inherent limitations to EMA in the context of using mood altering substances, as there is always a risk that individuals are completing the survey under the influence. Given the reliability scores, we can at least glean that the composites were completed in a consistent manner. Exploration of the differences between reliability or validity of a measure when a person is in the moment and under the influence versus recalling retrospectively and employing biased mental heuristics to respond to questions remains an important yet unexplored area of research.

In addition, the true dynamic nature of motivation and self-efficacy were not captured, as we did not utilize an ongoing daily measure of each to predict drinking over the course of the eight weeks in this analysis. Time was also not controlled for in regression analyses as a covariate, as it would be in a more traditional longitudinal analysis, such as generalized estimating equations. Furthermore, the daily diary method was limited to one time point for data collection each day. More sophisticated methods of EMA measure constructs at multiple, random time points throughout the day. Such data could illustrate a different relationship between motivation, self-efficacy, and drinking.

Finally, there is a limitation to utilizing highly inter-correlated outcome variables in our separate regression analyses. The outcome variables used here were inter-correlated, and in some cases highly so. Based on these correlations, we recognize there is a potential for shared variance among them—that we are testing at least something similar in each regression analysis across drinking outcome variables. It is also noteworthy that each of the outcome variables yielded different relationships related to motivation and self-efficacy. There may be differential effects of motivation and self-efficacy on these respective types of drinking—intensity, quantity and frequency.

Future Research

Future research in this area should examine the continuous impact of motivation and self-efficacy on drinking—particularly over short time increments, such as over the course of a day. Daily diaries and other EMA methods capture an aspect of motivation and self-efficacy that cannot seem to be captured in either global self-report measures or analysis of client language in session. As such, EMA measures of these constructs should be utilized for future research. Further research is also needed to understand the interactions between motivation, self-efficacy and treatments—using both global self-reports and EMA. Questions remain about which method of measurement is the most important for: (1) understanding dynamic patterns of motivation and self-efficacy and how that affects drinking; (2) understanding what aspects of motivation and self-efficacy might be impacted by treatment and how that can be enhanced; and (3) understanding with increasing specificity the particular aspects of both motivation and self-efficacy that contribute to the greatest changes in drinking outcomes. A natural next step in our research will be to examine the moderating impact of motivation and self-efficacy on treatment. This is particularly important given that main effect findings of the original study (Morgenstern et al., in press) revealed that while conditions differentially affected change talk, with MI associated with significantly higher levels of commitment strength than SOMI, conditions

did not significantly differ in terms of drinking outcomes at end of treatment. Daily diary composites of motivation and self-efficacy may reveal a moderating impact on treatment, explaining the lack of difference in drinking outcomes. Finally, replication of these analyses comparing EMA to global self-report in the context of AUD and controlled drinking is needed.

Conclusion

Despite the above mentioned limitations, this study demonstrates the importance of examining motivation and self-efficacy in the context of moderated drinking. Both EMA and global self-report were useful in predicting drinking outcomes, and they demonstrate that they capture at least some of the same construct; however, EMA appears to provide an advantage over global self-report in revealing important and predictive relationships between both motivation and self-efficacy and moderated drinking.

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Table 1
Descriptive statistics and correlations for daily diary composites and traditional self-reports at baseline

	<i>M</i>	<i>SD</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>
1 BL Confidence mean	2.14	0.98	(.74)					
2 BL Commitment none mean	0.96	0.89	.39***	(.75)				
3 BL Commitment no heavy mean	2.26	0.97	.79***	.53***	(.76)			
4 BL SCQ-39	110.46	32.53	.54***	.27*	.35**	(.95)		
5 BL Action RCQ	14.21	3.20	.26*	.32**	.34**	.40***	(.81)	
6 BL RCQ composite	39.38	6.24	.18	.31**	.35**	.19	.81**	(.82)

Note. BL= Baseline; SCQ-39 = 39 item Situational Confidence Questionnaire; the sum score was used for this analysis. The average across items was $M = 2.89$ ($SD = .82$). RCQ = Readiness to Change Questionnaire, Treatment Version. Action RCQ = Action subscale on the Readiness to Change Questionnaire, Treatment Version. Reliabilities in parentheses and italics. $N = 84$ for mean composites.

* $p < .05$,

** $p < .01$,

*** $p < .001$

Table 2
Descriptive statistics and correlations for daily diary composites and traditional self-reports at week 8

	<i>M</i>	<i>SD</i>	<i>r</i>	2	3	4	5	6
1 W8 Confidence mean	2.42	1.16	(.83)					
2 W8 Commitment none mean	1.08	1.22	.59***	(.82)				
3 W8 Commitment no heavy mean	2.40	1.16	.91***	.62**	(.83)			
4 W8 SCQ-39	126.10	36.10	.43***	.24*	.32**	(.97)		
5 W8 Action RCQ	15.16	3.10	.20	.21	.25*	.26*	(.89)	
6 W8 RCQ composite	39.52	6.45	.20	.18	.27*	-.05	.73***	(.86)

Note. W8= Week 8. SCQ-39 = 39 item Situational Confidence Questionnaire; the sum score was used for this analysis. The average across items was $M = 3.27$ ($SD = .89$). RCQ = Readiness to Change Questionnaire, Treatment Version. Action RCQ = Action subscale on the Readiness to Change Questionnaire, Treatment Version. Reliabilities in parentheses and italics. $N = 72$ for mean composites. For global self-report measures, $N = 81$.

* $p < .05$,

** $p < .01$,

*** $p < .001$

Table 3

Inter-correlations for drinking variables

	<i>M</i>	<i>SD</i>	<i>r</i>	2	3	4	5
1 BL SSD	29.0	19.2					
2 BL NDD	5.3	1.9	.48***				
3 BL DDD	5.5	3.3	.74***	-.05			
4 WK8 SSD	22.4	15.2	.29**	.19	.18		
5 WK 8 NDD	4.5	2.2	.11	.42***	-.16	.66***	
6 WK 8 DDD	3.4	2.2	.27*	.17	.15	.96***	.60***

Note. BL= Baseline week; SSD = sum of standard drinks; NDD = number of drinking days; DDD = drinks per drinking day; WK 8 = Week 8; N = 84 for mean composites. Alphas are in parentheses.

* $p < .05$,

** $p < .01$,

*** $p < .001$

Table 4
Daily diary composites as predictors of changes in drinking from baseline to week 8

	Week 8 Drinking											
	SSD (N = 69)				DDD (N = 69)				NDD (N = 70)			
STEP 1	beta	p	R ²	beta	p	R ²	beta	p	R ²	beta	p	R ²
BL Confidence mean ^a	-0.395	.002	.220	-0.462	.000	.213	-0.099	.382	.211			
BL Commitment no heavy mean ^a	-0.442	.000	.256	-0.480	.000	.233	-0.144	.208	.221			
BL Commitment none mean ^a	-0.304	.009	.183	-0.369	.002	.141	-0.358	.003	.301			
STEP 2	beta	p	R ² Change	beta	p	R ² Change	beta	p	R ² Change			
Wk 8 Confidence mean ^b	-0.276	.040	.049	-0.317	.020	.063	-0.177	.203	.019			
Wk 8 Commitment no heavy mean ^{b,c}	-0.252	.057	.041	-0.272	.043	.047	-0.235	.080	.036			
Wk 8 Commitment none mean ^{b,c}	-0.238	.044	.050	-0.332	.007	.092	-0.371	.000	.118			

Note. Week 8 drinking aggregate variables are based on the week prior to the last session of treatment. SD = mean weekly sum of standard drinks; DDD = mean weekly drinks per drinking day; NDD = mean weekly number of drinking days. Baseline drinking refers to the corresponding baseline drinking variable (e.g., BL SSD for SSD at Week 8).

^a Baseline drinking was significant in this model (SSD and commitment to no drinking only; NDD for all composite variables).

^b Baseline drinking remained significant in step 2. (SSD and commitment to no drinking only; NDD for confidence and commitment to no heavy drinking).

^c Baseline composite value remained significant. (DDD and commitment to no heavy or no drinking; NDD and commitment to no drinking.)

Table 5

SCQ and RCQ as predictors of changes in drinking from baseline to week 8

	Week 8 Drinking											
	SSD (N = 80)			DDD (N = 80)			NDD (N = 81)					
STEP 1	beta	p	R ²	beta	p	R ²	beta	p	R ²	beta	p	R ²
BL SCQ score ^a	-.032	.766	.208	-.123	.286	.073	-.092	.364	.212			
BL Action subscale score ^a	.031	.762	.208	-.017	.876	.060	-.019	.853	.204			
BL RCQ score ^a	.020	.842	.207	.017	.877	.060	.029	.778	.204			
STEP 2	beta	P	R ² Change	beta	P	R ² Change	beta	p	R ² Change			
W8 SCQ score ^b	-.283	.020	.054	-.406	.002	.113	-.137	.250	.029			
W8 Action subscale score ^b	-.224	.031	.047	-.270	.016	.070	-.274	.007	.072			
W8 RCQ score ^b	-.099	.401	.007	-.087	.499	.006	-.195	.092	.014			

Note. Week 8 drinking aggregate variables are based on the week prior to the last session of treatment. SSD = mean weekly sum of standard drinks; DDD = mean weekly drinks per drinking day; NDD = mean weekly number of drinking days. Baseline drinking refers to the corresponding baseline drinking variable (e.g., BL SSD for SSD at Week 8).

^a Baseline drinking was significant in this model. The only exception was SCQ with DDD.

^b Baseline drinking remained significant in step 2. The only exception was SCQ with DDD.