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Evaluating Alcohol Demand, Craving, and Depressive Symptoms among Women in Alcohol Treatment

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Abstract

Background.—Depression and alcohol craving predict drinking and relapse rates among alcohol treatment seekers. Alcohol demand, or one's valuation of alcohol may be another determinant of drinking. There is little known about alcohol demand and its association with depression, craving, and drinking among treatment-seeking adults.

Method.—Participants were 71 women with elevated depressive symptoms seeking outpatient treatment for alcohol use disorder (AUD). At baseline, participants self-reported daily drinking amount, alcohol craving, depressive symptoms, and alcohol demand assessed with the alcohol purchase task (APT; a task requesting participants to make hypothetical purchases of drinks at escalating prices). Baseline associations among alcohol demand, depressive symptoms, alcohol craving, and drinking severity were assessed.

Results.—Participants averaged 40.68 ($SD = 11.78$) years of age, consumed 8.84 ($SD = 5.14$) drinks per drinking day and reported 15.45 ($SD = 7.51$) heavy drinking days in the past 30 days, and had an average PHQ-9 depression score of 13.00 ($SD = 4.28$). Results suggest that the alcohol demand metrics of intensity (consumption level when drinks are free) and O_{max} (maximum expenditure on alcohol) were associated with drinks per drinking day, whereas craving and depressive symptoms were not significantly associated with drinking. The number of heavy drinking days were not significantly associated with demand, craving, or depressive symptoms.

Conclusions.—These results suggest that demand may reflect unique risk for drinking relative to craving or depressive symptoms. These findings provide support for the utility of the APT within a clinical setting to assess individualized valuation of alcohol.

Keywords

Alcohol Demand; Behavioral Economics; Alcohol Use Disorder; Alcohol Treatment

Alcohol Use Disorder (AUD) represents a substantial public health problem. Approximately 88,000 people in the United States die each year from alcohol-related causes (CDC, 2013) and alcohol use costs the US upwards of \$249 billion annually (Sacks et al., 2015). Though men drink more frequently and heavily on average than women, women display a quicker progression from use to dependence and are at greater risk of experiencing AUD-related health consequences, such as liver disease, reproductive concerns, heart disease, breast cancer, and neurotoxicity (Hernandez-Avila et al., 2004; for review see Nolen-Hoeksema, 2004). Women are less likely than men to seek treatment for AUD (Greenfield et al., 2007) and those who decide to seek AUD treatment report greater social, family, and medical impairments (Hernandez-Avila et al., 2004). Additionally, women with AUD exhibit higher rates of psychiatric comorbidity (Conway et al., 2006; Goldstein et al., 2012), particularly depressive and anxiety disorders (Khan et al., 2013), are more likely to report drinking alcohol to cope with stress and negative affect (McHugh et al., 2018), and may be more likely to relapse in response to negative emotional states (McKay et al., 1996).

Individuals with comorbid AUD and depression drink more heavily, report greater mental health vulnerabilities, and tend to relapse much more quickly than individuals without comorbid depression (Burns & Teesson, 2002; Burns et al., 2005; Conner et al., 2009; Cornelius et al., 2004). Furthermore, among men and women, symptoms of depression have been shown to influence alcohol craving, which plays an important role in the development, maintenance, and relapse of AUD (Breese et al., 2011). Experimental studies indicate that craving increases in response to depressed mood and negative affect among both recreational and heavy drinkers in experimental settings (Berquist et al., 2010; Fox et al., 2012). Among patients in outpatient and inpatient treatment settings, craving levels have been shown to predict past month alcohol use, alcohol dependence symptoms, and relapse (Bottlender & Soyka, 2004; Oslin et al., 2009; Yoon et al., 2006). Thus, increased depression may contribute to increased alcohol craving and could confer additional risk for heavy drinking and relapse during and after treatment. Given the evidence that women face greater barriers than men before and during AUD treatment, in addition to the physical, mental, and social consequences associated with AUD among women, it is critical to better understand depression and alcohol craving among depressed women seeking AUD treatment within the context of novel theoretical approaches.

Symptoms of depression have also been associated with elevated alcohol demand (Murphy et al., 2013). Demand is based in behavioral economic theory and provides an index of an individual's valuation of a commodity. Demand is determined by assessing the amount of a commodity purchased by an individual at different price levels. Demand measures, such as the hypothetical Alcohol Purchase Task (APT), are time and cost-efficient and have been

used in clinical research to assess participants' hypothetical rate of consumption across a range of prices (Heinz et al., 2012; MacKillop & Murphy, 2007; Murphy & MacKillop, 2006). From the APT, five unique indices of demand can be generated. These indices are conceptually related yet empirically discrete and include intensity (consumption level when drinks are free), breakpoint (the price that suppresses consumption to zero), $O_{\max}$ (maximum expenditure on alcohol), and $P_{\max}$ (price associated with maximum expenditure). Individual differences in sensitivity to changes in price can be quantified by measuring elasticity of demand, which can range from elastic (sensitive to price) to inelastic (insensitive to price) and may reflect the "essential value" of the commodity (Hursh & Roma, 2013; Hursh & Silberberg, 2008).

Although increases in price typically lead to decreases in demand, there are important individual differences reflected in the demand indices that may provide a unique measure of substance use severity. Elevated alcohol demand has been associated with more severe alcohol use, including increased alcohol consumption (Murphy & MacKillop, 2006), impulsivity (Kiselya & Borders, 2013), drinking to cope (Yurasek et al., 2011), craving (MacKillop et al., 2010), increased alcohol problems (Murphy et al., 2009; Skidmore et al., 2014), depression and posttraumatic stress symptoms (Murphy et al., 2013; Tripp et al., 2015), driving after drinking (Teeters & Murphy, 2015; Teeters et al., 2014) and poor response to intervention (MacKillop & Murphy, 2007). Additionally, alcohol demand has been shown to mediate the relation between depressive symptoms and alcohol problems among heavy drinking college students (Soltis et al., 2017). Although a large body of research has linked elevated demand with alcohol-related problems (see Kiselya et al., 2016 for meta-analysis), the majority of published research examining alcohol demand have been conducted with university students or in non-clinical community samples (Kaplan et al., 2018). To the best of our knowledge, only one study has examined alcohol demand in a treatment seeking population (Meshesha, et al., 2020). Meshesha et al., evaluated an adjunctive intervention specifically targeting behavioral economic mechanisms of change and found that the intervention reduced alcohol demand at follow-up compared to an active health education control.

Little is known about alcohol demand and its association with drinking outcomes among treatment-seeking women. Given the increased risk of drinking-related consequences among depressed women with AUDs, it is critical to examine novel predictors of drinking levels, such as alcohol demand, in this population. The purpose of the present study was to examine whether depressive symptoms, alcohol craving, and alcohol demand were associated with drinking among women with elevated depressive symptoms seeking AUD treatment. Based on the robust literature linking depression and craving with increases in drinking during and after treatment, we hypothesized that levels of depressive symptoms and craving would be associated with amount (drinks per drinking day) and frequency of drinking (heavy drinking days). Additionally, we aimed to examine whether alcohol demand is associated with drinking in this sample. We hypothesized that alcohol demand would be associated with greater drinking amount and frequency.

Method

Participants

Study participants were adult women with elevated depressive symptoms seeking treatment for AUD at an alcohol and drug partial hospitalization program. All participants were recruited based on their interest in enrolling in a technology-supported physical activity intervention (see Abrantes et al., 2017). Participants were study eligible if they were: female, between ages 18-65 years of age, currently enrolled in the treatment program, scored 5 or above for depressive symptoms on the Patient Health Questionnaire-9 (PHQ-9; Kroenke et al., 2001), endorsed low levels of physical activity, and owned a smartphone/had internet access via computer. Participants were excluded if they: met criteria for DSM-5 diagnosis of anorexia, bulimia, or moderate to severe substance use disorder other than alcohol, had a history of psychotic disorder, had current psychotic symptoms or mania, endorsed suicidal or homicidal ideation, current pregnancy or planning pregnancy in the next 3 months, or no medical clearance to participate in a physical activity trial. Participants (N = 159) were screened for study eligibility, and of these, 48 chose not to participate, 13 reported high engagement in physical activity, 10 scored lower than 5 on the PHQ-9, 6 did not have internet access, 4 left alcohol treatment, 3 were not medically cleared, and 2 endorsed recent manic episodes. The remaining 73 participants met the inclusion criteria, of these, two participants displayed inconsistent responding on the APT and were subsequently excluded. Of note, 26 participants reported zero alcohol demand (i.e., did not purchase drinks across all price points) but were retained when computing alcohol demand. The final sample consisted of 71 participants.

Procedures

All procedures were approved by the Institutional Review Board of an academic research hospital in Southern New England. Potential participants were approached within the first one to three days of treatment admission and provided information about the study; typical patient stay in the program ranged from 5-10 days. Interested participants were further screened for inclusion/exclusion criteria, and those eligible provided consent prior to study enrollment. All analyses reported herein use data collected at baseline, prior to physical activity intervention delivery.

Measures

Substance use.—The timeline follow-back calendar (TLFB; Sobell & Sobell, 1995) was administered at baseline to assess for quantity and frequency of alcohol use over the previous 90 days. Current analyses utilized drinking patterns in the past 30 days in order to capture a more proximal alcohol use window that is better aligned with the state-oriented alcohol purchase task, past week alcohol craving, and past two weeks of depressive symptoms. The following alcohol use variables were computed: drinks per drinking day, heavy drinking days (4 or more drinks per day), and total drinking days. Additionally, number of past month tobacco, cannabis, and other illicit drug use days were computed.

Alcohol demand.—Alcohol demand indices were generated using a state-oriented APT (MacKillop et al., 2010). The following instructional set was presented to participants,

“Imagine that you could drink RIGHT NOW. The following questions ask how many drinks you would consume if they cost various amounts of money. The available drinks are standard size domestic beer (12 oz.), wine (5 oz.), shots of hard liquor (1.5 oz.), or mixed drinks containing one shot of liquor. Assume that you would consume every drink you request; that is, you cannot stockpile drinks for a later date or bring drinks home with you.”

Participants were then asked to make hypothetical purchases of standard alcohol drinks at 19 escalating prices (\$0.00, \$0.01, \$0.05, \$0.13, \$0.25, \$0.50, \$1.00, \$2.00, \$3.00, \$4.00, \$5.00, \$6.00, \$11.00, \$35.00, \$70.00, \$140.00, \$280.00, \$560.00, \$1,120.00). Four observed indices (intensity, breakpoint, O_{max} , and P_{max}) were generated from the APT.

Approximately 35.2% of the sample reported zero demand, therefore in order to retain this population in the APT analyses, Elasticity was not derived (two or more points of demand are required to compute Elasticity).

Alcohol craving.—The Penn Alcohol Craving Scale (PACS; Flannery et al., 1999) is a 5-item measure designed to assess for recent alcohol craving. Participants were asked to rate their craving over the past week on a scale of 0 (low) to 6 (high), and items were summed to create a total score. Alpha reliability coefficient was excellent ($\alpha = 0.93$).

Depressive symptoms.—The Patient Health Questionnaire-9 (PHQ-9; Kroenke, Spitzer, & Williams, 2001) was used as a self-report measure of depressive symptoms. Participants answered on a scale of 0 (not at all) to 3 (nearly every day) the frequency in which they experienced 9 symptoms of depression over the previous 2 weeks. Scores of 5, 10, 15, and 20 are the cut off points for mild, moderate, moderately severe, and severe depression, respectively (Kroenke, Spitzer, & Williams, 2001). Alpha reliability coefficient was acceptable ($\alpha = 0.70$).

Data analysis plan.—Chi-square or T-tests were used to compare persons who reported demand for alcohol at baseline ($n = 46$) to those who did not ($n = 25$) on age, income, depressive symptoms, alcohol craving, and substance use variables. Data cleaning procedures for APT data were applied to the full sample ($N=71$) and followed the recommendations of Stein et al., (2015). Raw data were examined for outliers using standard scores, with a criterion of $Z = 3.29$ to retain maximum data. A small number of outliers were detected (9 outlying data points; 0.01%). Of the outliers, 1 occurred in data from a single participant (\$0.01), 2 occurred in data from another participant at 2 consecutive prices (\$35 - \$70), 1 occurred in data from another participant (\$140), and 5 occurred in data from a final participant at 5 consecutive prices (\$11 - \$280). Original raw data at these prices were 30, 4, 3, 1, 10, 6, 3, 2, 2. The outliers were determined to be legitimate high-magnitude values and were recoded as one unit higher than the next lowest non-outlying value as follows: 21, 4, 3, 1, 9, 5, 3, 2, 1 (Tabachnick and Fidell, 2019). The distribution for breakpoint and O_{max} variables were kurtotic thus square root transformations were used to obtain normal distributions. The outcome drinking variables demonstrated normal distribution.

Two Pearson correlation analyses were conducted among the outcome variables of total past month drinking days, drinks per drinking day, heavy drinking days, alcohol demand indices, depression, alcohol craving, and income. The first correlation analysis included the full sample ($N=71$), the second included a subset of the sample who reported alcohol demand (n

= 46). Bonferroni-Holm (Holm, 1979) correction was applied to correlation models to correct for multiple comparisons.

Among the participants who reported alcohol demand, we conducted multiple regression models with the demand indices (intensity, $O_{\max}$) that were significantly associated with the drinking outcome variables (heavy drinking days and drinks per drinking day). Multiple regression models were not computed for past month total drinking days as total drinking days and heavy drinking days were highly correlated ($r = .941$), with majority of reported past month drinking days meeting criteria for heavy drinking days (4 or more drinks per day). A total of four multiple regression models were conducted. Two models evaluated the outcome of drinks per drinking day with predictors including one of the two alcohol demand indices (intensity, $O_{\max}$), depressive symptoms, and alcohol craving. Another two models evaluated heavy drinking days as an outcome with predictors including one of two alcohol demand indices (intensity, $O_{\max}$), depressive symptoms, and alcohol craving. Bonferroni-Holm (Holm, 1979) correction was applied to multiple regression models to correct for multiple comparisons. Analyses were conducted with SPSS Version 25.

Results

Demographic, depressive symptoms, alcohol craving, substance use variables, and alcohol demand indices are presented in Table 1.

Compared to the 25 participants who did not report alcohol demand, the 46 participants who reported demand did not differ on age ($t(66) = -1.07, p = .288$), income ($t(65) = -0.66, p = .514$), depression ($t(69) = -1.22, p = .225$), total drinking days ($t(69) = .281, p = .780$), heavy drinking days ($t(69) = -0.24, p = .981$), drinks per drinking day ($t(69) = -1.32, p = .193$), smoking status ($\chi^2(1, N = 71) = .366, p = .257$), average daily cigarettes among smokers ($t(27) = -0.80, p = .427$), cannabis use days ($t(69) = -0.55, p = .581$), or other drug use days ($t(69) = 1.27, p = .207$). However, there were statistically significant differences in alcohol craving ($t(69) = -2.44, p = .017$) with individuals with demand reporting higher alcohol cravings ($M = 13.35$ ($SD = 7.88$)) compared to those without demand ($M = 8.68$ ($SD = 7.38$)).

Correlation results with the full sample indicated that heavy drinking days were significantly associated with alcohol cravings, however, there were no significant association between the drinking outcome variables and depressive symptoms or alcohol demand (Table 2). When evaluating correlations with the subset of participants who reported alcohol demand, we observed drinks per drinking day was positively correlated with intensity and $O_{\max}$, and heavy drinking days were associated with intensity, $O_{\max}$, and alcohol craving (see Table 3).

Multiple regression models indicated that intensity was associated with drinks per drinking day, whereas alcohol craving and depressive symptoms were not. $O_{\max}$ was associated with drinks per drinking day, whereas alcohol craving and depressive symptoms were not. Finally, neither intensity nor $O_{\max}$ were significantly associated with heavy drinking days (Table 4).

Discussion

The current study evaluated the association between alcohol demand, depressive symptoms, alcohol craving and drinks per drinking day and heavy drinking days among a sample of women seeking treatment for AUD. Our results suggest that participants who report demand were more likely to have higher alcohol craving compared to participants who did not report demand. Alcohol demand indices of intensity and $O_{\max}$ were significantly associated with drinks per drinking day above and beyond depressive symptoms and alcohol craving. Further, intensity and $O_{\max}$ were not significantly associated with heavy drinking days.

Our results extend the findings of Murphy et al., 2013 to a clinical sample. Murphy et al. found that drinks per week and heavy drinking episodes, but not depression, was associated with intensity, $O_{\max}$, and elasticity among non-treatment seeking college students. Although we did not find significant associations with heavy drinking days, our results and Murphy et al.'s both indicate that Intensity and $O_{\max}$ are associated with consumption, suggesting that both initial demand for alcohol (intensity) and maximum expenditure ($O_{\max}$) may be indicators of greater valuation of alcohol and may ultimately impact treatment outcomes. Indeed, MacKillop and Murphy (2007) found that intensity and $O_{\max}$ predicted poor treatment response to a brief intervention among college drinkers. Furthermore, a recent report (Meshesha et al., 2020) suggests that an intervention targeting behavioral economic mechanisms of change demonstrated a reduction in alcohol demand among treatment seeking adults.

AUD and depression often co-occur, thus it is critical to understand the various components that contribute to persistent drinking for individuals with co-occurring AUD and depression. It is possible that depression was not significantly associated with drinking in our results due to a restricted range in depressive symptoms. Participants with a PHQ-9 score of 5 (mild depression) or higher were included in the study, limiting an assessment of a full range of depressive symptoms. Nevertheless, this sample reported a wide range of depressive symptoms (5-23 on the PHQ-9) and of these individuals with mild to severe depressive symptoms, our results suggest that depression was not significantly associated with drinking level. Similarly, alcohol craving was not a significant correlate of drinking level in this sample although previous studies suggest craving is associated with drinks per week among treatment seekers (Flannery et al., 2003). These results reveal the potential utility of alcohol demand measures within a clinical setting as an assessment tool to measure the value of alcohol for an individual and further evaluate the level of risk which may be distinct from craving. In this regard, Soltis et al. (2017) found that demand intensity mediated the association between stress and alcohol problems, while craving mediated the association between depression and alcohol problems in a sample of heavy drinking college students. Future investigations specific to a treatment-seeking samples are needed to evaluate specific paths and potential mechanisms leading to drinking level.

This is the first study to investigate alcohol demand within a treatment seeking sample without administering an intervention specifically targeting behavioral economic variables (Meshesha et al., 2020). Although our results suggest that alcohol demand may have clinical utility, our findings raise important topics of consideration for future studies administering

the APT within a treatment-seeking sample. Of note, approximately 35.2% ($n = 25$) of participants did not report alcohol demand at baseline. This elevated number of drinkers reporting no demand for alcohol is likely unique to treatment-seeking samples who plan to change their alcohol consumption. Thus, they may be more likely to refrain from purchasing hypothetical drinks, even at zero cost, as their present goal pertains to cutting down or ceasing alcohol consumption. Initially, this may appear to be in conflict with their recent self-reported drinking level, which was not significantly different from individuals who did report demand for alcohol at baseline. However, a state version of the APT was used in the current investigation, thus participants were asked about their desire to purchase and consume alcohol *right now*, during the baseline session. It is possible that if a more general trait APT had been administered, more participants would have reported general trait-level demand for alcohol. Still, individuals who reported zero demand were significantly different from those with active alcohol demand in terms of alcohol craving, further reinforcing the fact that they were likely not placing value on alcohol at the time of study entry. Future research should investigate best practices for administering this measure within a treatment-seeking sample, as key components of such a study design must be considered, such as assessment of how alcohol demand may be suppressed over time during treatment. While the goal of alcohol treatment is often cessation of alcohol consumption, suppression to zero demand eliminates the ability to assess elasticity of demand, which requires at least two data points for curve-fitting (Stein et al, 2015). For this current manuscript, we elected to retain the individuals with zero demand and forgo computing elasticity as zero demand is likely a frequently occurring and legitimate value in this population. Future studies may need to focus their investigation on the observed indices only, as these are impervious to analytical requirements of various demand equations.

There are some limitations worth noting when interpreting these findings. First, the cross-sectional design of the study limited observation of the association between alcohol demand, depression, craving, and drinking across time. Future longitudinal studies are needed to follow these variables through the progression of treatment and its association with alcohol consumption and treatment outcomes. Second, although participants were recruited between 1-3 days of treatment admission, we did not collect data on treatment days prior to data collection. This limited our ability to assess for individual differences due to length of treatment receipt. Lastly, our study sample was limited demographically in that it was primarily composed of Caucasian women. Future research with more racially and ethnically diverse samples of both women and men will be important to gauge the generalizability of our findings. Nevertheless, the population investigated in this study, AUD treatment seeking women with depressive symptoms, is at heightened risk and need focused attention.

In conclusion, alcohol demand was associated with drinks per drinking day in a population of treatment seeking women with elevated depressive symptoms. However, neither depressive symptoms nor alcohol craving were significantly associated with drinking variables. Although alcohol demand has been well investigated among young adults and non-treatment seekers, this was one of the first investigation to report on alcohol demand among treatment seekers. These results support the utility of the hypothetical APT within a clinical setting as a tool to assess individualized value of alcohol, independent of alcohol craving.

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Table 1.

Demographic, depressive symptoms, alcohol craving, substance use, and alcohol demand variables of full sample (N = 71) and the subset of participants who reported demand (n = 46) and no demand (n = 25).

Variable	Total Sample Mean (SD) or N (%)	Yes Demand Mean (SD) or N (%)	No Demand Mean (SD) or N (%)
Age	40.68 (11.78)	39.51 (12.02)	42.68 (11.31)
Ethnicity			
Latino	3 (4.2%)	3 (6.5%)	0 (0.0%)
Non-Latino	65 (91.5%)	40 (87.0%)	25 (100.0%)
Not Reported	3 (4.2%)	3 (6.5%)	--
Race			
Caucasian	65 (91.5%)	41 (89.1%)	24 (96.0%)
Minority	3 (4.2%)	2 (4.3%)	1 (4.0%)
Race Not Reported	3 (4.2%)	3 (6.5%)	--
Annual Household Income			
\$0 - \$25,000	14(19.7%)	9 (19.6%)	5 (20.0%)
\$25,000 - \$50,000	11(15.5%)	9 (19.6%)	2 (8.0)
\$50,000 - \$75,000	21 (29.6%)	12 (26.1%)	9 (36.0%)
\$75,000 - \$100,000	5 (7.0%)	2 (4.3%)	3 (12.0%)
\$100,000 +	16 (22.5%)	10 (21.7%)	6 (24.0%)
Not Reported	4 (5.6%)	4 (8.7%)	--
PHQ-9	13.00 (4.28)	12.54 (4.42)	13.84 (3.96)
PACS	11.70 (7.98)	13.35 (7.88)	8.68 (7.38)
Drinks per Drinking Day	8.84 (5.14)	8.25 (4.13)	9.92 (6.57)
Heavy Drinking Days	15.45 (7.51)	15.43 (7.37)	15.48 (7.92)
Total Drinking Days	16.75 (7.61)	16.93 (7.30)	16.40 (8.31)
Percent Cigarette Smokers	29 (40.8%)	17 (36.9%)	12 (48.0%)
Cigarettes per day	12.60 (15.25)	10.67 (9.75)	15.34 (20.96)
Cannabis Days	2.70 (7.30)	2.35 (6.67)	3.36 (8.48)
Other Drug Use Days	0.17 (0.83)	0.26 (1.02)	0.00 (0.00)
Intensity	6.03 (5.68)	9.30 (4.37)	--
Breakpoint	28.83 (38.20)	44.35 (39.52)	--
O _{max}	27.82 (36.16)	42.94 (37.06)	--
P _{max}	408.16 (259.84)	21.28 (46.73)	--

Note: PHQ-9 = Patient Health Questionnaire-9, PACS = Penn Alcohol Craving Scale. All substance use variables are past 30 days.

Table 2.

Bivariate correlations of outcome variables for full sample (N = 71)

	1	2	3	4	5	6	7	8	9	10
1. Drinks per Drinking Day	-									
2. Heavy Drinking Days	.322**	-								
3. Total Drinking Days	.211	.944**	-							
4. Intensity	.055	.187	.158	-						
5. Breakpoint	-.009	.114	.092	.664**	-					
6. O _{max}	.070	.213	.191	.752**	.912**	-				
7. P _{max}	.172	.007	-.033	-.784**	-.705**	-.735**	-			
8. PHQ-9	.031	.138	.083	-.001	-.079	-.178	.138	-		
9. PACS	-.031	.266*	.228	.361**	.345**	.332**	-.284*	.248*	-	
10. Income	-.189	-.142	-.063	-.133	-.019	-.023	.09	-.215	-.225	-

Note: A square root transformation was applied to Breakpoint and O_{max}. PHQ-9 = Patient Health Questionnaire-9 (depressive symptoms), PACS = Penn Alcohol Craving Scale*
p < .05**
p < .01

Table 3.

Bivariate correlations of outcome variables for participants with reported alcohol demand (n = 46)

	1	2	3	4	5	6	7	8	9	10
1. Drinks per Drinking Day	-									
2. Heavy Drinking Days	.444**	-								
3. Total Drinking Days	.320*	.941**	-							
4. Intensity	.449**	.390**	.277	-						
5. Breakpoint	.244	.219	.130	.200	-					
6. O _{max}	.457**	.425**	.334*	.376**	.800**	-				
7. P _{max}	.351*	.071	.022	.047	.652**	.624**	-			
8. PHQ-9	.160	.188	.113	.223	.051	-.126	-.131	-		
9. PACS	.124	.401**	.358*	.285	.257	0.23	-.053	.422**	-	
10. Income	.025	-.044	.007	-.142	.084	.084	.159	-.263	-.297	-

Note: A square root transformation was applied to Breakpoint and O_{max}. PHQ-9 = Patient Health Questionnaire-9 (depressive symptoms). PACS = Penn Alcohol Craving Scale

*
p < .05

**
p < .01

Table 4.

Multiple regression models of alcohol demand indices' association with drinks per drinking day among participants who reported alcohol demand (n = 46).

	<i>B</i>	<i>SE</i>	β	<i>t</i>	<i>p</i> Value
Outcome: Drinks per drinking day					
Intensity	.419	.137	.442	3.06	.004**
PACS	-.018	-.081	-.035	-0.22	.825
PHQ-9	.071	.143	.076	0.51	.621
$O_{\max}$	.825	.224	.516	3.67	.001**
PACS	-.057	.081	-.109	-0.71	.480
PHQ-9	.253	.141	.271	1.79	.079
Outcome: Heavy drinking days					
Intensity	.510	.238	.302	2.142	.038*
PACS	.300	.142	.321	2.119	.040
PHQ-9	-.025	.249	-.015	-.103	.919
$O_{\max}$	.071	.028	.355	2.564	.014*
PACS	.263	.141	.280	1.853	.071
PHQ-9	.200	.250	.120	.799	.429

Note: PHQ-9 = Patient Health Questionnaire-9 (depressive symptoms). PACS = Penn Alcohol Craving Scale

**
p<.01

*
p<.05