THE IMPACT OF GENDER AND TRADITIONAL NORM ADHERENCE ON EVENT-

LEVEL ALCOHOL OUTCOMES

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by

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The undersigned, appointed by the Associate Vice Chancellor of the Office of Research and Graduate Studies, have examined the thesis entitled

THE IMPACT OF GENDER AND TRADITIONAL NORM ADHERENCE ON EVENT-LEVEL ALCOHOL OUTCOMES

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and hereby certify that, in their opinion, it is worthy of acceptance.

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THE IMPACT OF GENDER AND TRADITIONAL NORM ADHERENCE ON EVENT-
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ABSTRACT

Men consume more alcohol than women, both globally and within the United States specifically, experience different patterns of social problems from drinking, and differ in their risk for developing alcohol use disorder (AUD). Research has explored whether these differences are attributable to a number of factors that differ between men and women, including biological differences, personality traits, mood, and drinking motives. Multiple studies (McCreary et al., 1999; Neve et al., 1997) have demonstrated that traditional gender norms may partially account for gender differences in drinking – with adherence to traditional masculine norms associated with increased alcohol consumption among men, and traditional feminine norms associated with lower consumption among women. The current study used an ecological momentary assessment (EMA; Shiffman, 2009) design to test an event-level model by which gender norms may influence drinking and alcohol-related problems. Specifically, we tested the hypothesis that gender norms moderated both momentary mood and drinking motives.

The Impact of Gender and Traditional Norm Adherence on Event-level Alcohol

Outcomes

Alcohol Use: Discrepancies across gender

It is well documented that men consume higher quantities of alcohol than women

both in the United States and globally (Nolen-Hoeksema, 2004; WHO, 2014). A review

of current research on sex and gender differences in alcohol use concluded that across

countries and continents, men drink more, drink more often, and are more likely to be

hazardous drinkers than are women (Erol & Karpyak, 2015). These findings, observed in

such diverse locations as Ethiopia, Spain, Croatia, Russia, South Korea, Scotland,

Norway, China, and Canada, suggest that culture broadly may not be wholly responsible

for differences in use across gender. Instead, consideration of specific gender-related

psychosocial factors within culture is required in order to understand their role as

explanatory mechanisms in alcohol consumption.

In the United States, differences exist between men and women with respect to

drinking patterns, styles, and the consequences of alcohol consumption. Men begin

drinking at an earlier age (Miller & Cervantes, 1997) and nearly twice as many men

(33%) than women (17%) report binge drinking (SAMHSA, 2014). Men experience more

alcohol-related problems (Agabio et al., 2017; SAMHSA, 2002); men report engaging in

alcohol-impaired driving more frequently and requiring emergency medical attention for

alcohol-related injuries more often than women (Azofeifa et al., 2015; Chou et al., 2006;

McDonald et al., 2004). Men also experience higher lifetime prevalence of AUD than

women (36% to 22.7%; NESARC; Grant et al., 2015). The gender gap in in alcohol

consumption has narrowed since the 1970s. Women report a decrease in abstinence and

increase in frequent binge drinking (Keyes et al., 2008; Wilsnack et al., 2006) but despite these changes, considerable gender differences in consumption remain (Holmila & Raitasalo, 2005).

Men and women have contrasting experiences with social problems and clinical treatment resulting from alcohol use. Perpetrators of forceful sexual assault who are men are more likely to be intoxicated during assaults than either perpetrators who used other tactics or non-perpetrators during consensual sexual interactions (Lyndon et al., 2007). Daily diary studies demonstrate that women are more likely to report sexual victimization on days of heavy drinking. Similarly, verbal and physical aggression between intimate partners with perpetration by either gender is significantly more likely under intoxication (Testa & Derrick, 2014; Parks et al., 2008). Following the development of alcohol-related problems and AUD, women enter treatment approximately 4 years earlier than men (Lewis & Nixon, 2014); however, men are significantly more likely than women to utilize any alcohol treatment services, a pattern demonstrated across the lifespan (Gilbert et al., 2019; Chartier & Caetano, 2011).

There are a number of potential explanatory processes for the gender differences in alcohol use and consequent problems observed in the literature. At the biological level, there is evidence suggesting that men metabolize alcohol more efficiently than women. Alcohol is distributed in a smaller volume of water in women than in men and gastric enzyme activity is lower in women; women have higher blood alcohol concentration (BAC) than men at the same dose of alcohol (Frezza et al., 1990; Lieber, 1997). One of the most pronounced metabolic impacts on the subjective effects of alcohol consumption is the ALDH2*2 genotype, which is linked to low tolerance of alcohol due to the

unpleasant effects of the physiological flushing syndrome (Luczak et al., 2006). The onset age of AUD in women with inactive ALDH2 is significantly lower than in those with the active genotype; interestingly, there is no age of onset difference in men with inactive and active ALDH2 (Kimura et al., 2011). Other biologically-linked differences include the impact of oral contraceptives and menstruation on women's metabolism of alcohol (e.g., prolonged peak BAC when taking oral contraceptives and during the week prior to menstruation; Jones & Jones, 1984).

Women also experience a different course of AUD and higher rates of comorbidity of AUD with other types of psychopathology. Specifically, women are more susceptible to accelerated psychiatric and medical consequences of heavy alcohol consumption compared to men, a phenomenon known as "telescoping" (Randall et al., 1999). Heavy drinking and alcohol dependent women are more likely to have comorbid psychiatric disorders and experience higher morbidity rates and prevalence of alcohol-attributed cardiovascular diseases and diabetes. Further, given the same duration and intensity of drinking patterns, these women are at greater risk of developing breast cancer, severe alcoholic liver problems, brain atrophy, and cognitive dysfunction when compared to men (Fillmore et al., 1997; Hanna et al., 1997; Mann et al., 2005).

There are personality factors that are associated with alcohol use that may differ across gender. Individual personality characteristics related to heavy alcohol consumption and alcohol-related problems include impulsivity, extraversion, and neuroticism (Sher et al., 1999). Individuals high in impulsivity, both men and women, are at elevated risk for experiencing alcohol-related problems (Caspi et al., 1997; Lejuez et al., 2010; Schuckit, 1998). Men score higher on most measures of impulsivity compared to women (Cyders et

al., 2011; Stoltenberg et al., 2008); however, the relationship between impulsivity, alcohol use, and gender is complex. While some studies have found that the relationship between impulsivity and problem drinking is stronger for women than for men (Weafer & de Wit, 2014), other studies suggest that sensation seeking and behavioral undercontrol are associated with heavy drinking in men but not in women (Costa et al., 2001; Rutledge & Sher, 2001). Neuroticism is also associated with increased consumption, and delinquency, antisociality, and other personality pathology have been demonstrated as predictors of alcohol use and consequences (Maclean & French, 2014; Tice et al., 2001). Despite associations between several personality characteristics and alcohol outcomes, research has largely been limited to gender differences in impulsivity; while it is possible that some of the observed differences in drinking patterns between men and women are due to personality, the findings are inconsistent.

Mood and Drinking Motives

There is an established literature linking mood and drinking motives to drinking behavior at the between-subjects level. Generally, negative mood is associated with increased consumption among both men and women (Dvorak & Simons, 2014). This pattern is posited to negatively reinforce alcohol use as a strategy for coping with emotional distress and has been associated with problematic alcohol use (Colder & Chassin, 1993). Existing research has focused on conditions under which negative mood may promote alcohol use; indeed, high arousal negative moods, such as stress and anxiety, have been linked to the development and continuation of alcohol dependence through coping (Crum et al., 2013). In daily diary studies, aggregate daytime negative mood has been associated with increased nighttime alcohol use the same day (Simons et

al., 2005). Specific to men, negative mood is associated with increased self-administration of alcohol in lab and real-life settings and higher acute AUD symptoms (Cyders et al., 2016; Dvorak et al., 2015; Rutlege & Sher, 2001).

Drinking motives reflect alcohol consumption as a strategic behavior in which individuals choose to drink based on the anticipated affective changes produced by drinking (Cooper, 1994). The affect-regulation model of alcohol use posits that individuals use alcohol to regulate negative affective experiences, conceptualized as coping motives (Sher & Grekin, 2007). Coping motives have been directly associated with excessive alcohol use, alcohol-related problems, and risky behaviors (Kuntsche & Cooper, 2010; Merrill & Read, 2010). It is unclear, however, whether individuals who use alcohol to cope with negative mood actually experience alleviated distress. Several studies have found that despite reporting perceptions of alleviated negative mood immediately following consumption, individuals do not subsequently report an alcohol-induced change in mood at later timepoints (Gorka et al., 2017; Treloar & McCarthy, 2012).

Prior studies suggest that men report drinking to cope with distress and drinking to escape more often than women (Nolen-Hoeksema & Harrell, 2002). Additionally, drinking to cope predicted increased alcohol-related problems over one year in men but not women (Rutledge & Sher, 2001; Timko et al., 2005). This pattern of men consuming more alcohol specifically in order to alleviate negative mood may be explained as a function of adherence to traditional gender norms.

Gender Norms

Gender norms are messages, attitudes, and beliefs about what it means to be a man or a woman. These norms are formed at an early age through social learning and influence a range of behaviors across the life span. Of particular importance to the current study are traditional masculine norms and their role in the individual trajectory of alcohol use. Manhood is described in the literature as a precarious group status that is earned by repeatedly performing prototypical masculine behaviors (Vandello et al., 2008). Such behaviors in Western society include beer drinking, competitive drinking, getting drunk, and public drunkenness (de Visser & McDonnell, 2012; Borsari & Carey, 2001). Traditional masculine norms are associated with alcohol consumption, while traditional feminine norms are associated with higher rates of abstinence and lower consumption among women, potentially as a result of increased social sanctions for women's drinking and societal views of alcohol use as opposite desirable feminine traits (McCreary et al.,1999; Neve et al., 1997). Existing studies assessing the relationship between gender norms and alcohol use demonstrate that the masculine norm domains of playboy, risk-taking, winning, and self-reliance are risk factors for alcohol-related problems, while the domains of primacy of work and heterosexual presentation serve as protective against problem drinking (Iwamoto et al., 2011). Gender role ideologies have been suggested as mediators of gender differences in drinking to intoxication as well as demonstrated to partially mediate gender differences in quantity consumed, frequency of heavy drinking, and drinking problems (Huselid & Cooper, 1992).

Additionally, there is a lack of research into the mechanisms by which the influence of gender norms is felt at the event level. Current work suggests that men report more problem-focused coping and more emotional inhibition than women (Matud, 2004)

and manipulation studies find that when masculinity is threatened in a social context, men consume more alcohol (Fugitt & Ham, 2018); however, the interaction of gender norms with momentary mood and drinking motives has not yet been examined.

The Current Study

Given the evidence that traditional masculine norms both promote and protect against heavy alcohol use and related problems (Iwamoto et al., 2011), a logical next step was to investigate the moderational mechanisms by which this occurs. The primary aim of the current study was to examine the extent to which men and women's adherence to gender norms impacted associations between their day-level mood and event-level drinking motives, reported mood change across a drinking event, and resulting alcohol use using ecological momentary assessment.

The design of the current study provides several advantages over that of laboratory or survey studies. To our knowledge, it is the first to examine gender norms and their interaction with mood and drinking motives at the event level. Existing research on the influence of gender norms has been at the between-subjects level, and is therefore unable to specify temporal relationships between gender norms, in-the-moment drinking influences, and alcohol outcomes. The current study, through a within-subjects design, has increased ecological validity for inferences about the processes by which norms influence drinking. The current study also provided the opportunity to identify event-level processes by which men are at increased risk for alcohol-related negative behaviors, including sexual assault and interpersonal violence perpetration. The use of ecological momentary assessment allowed us to capture real time fluctuations of mood and motives,

which permits examination of momentary distress, weakness, and other affective states experienced by men that may influence the decision to drink to cope.

Given the gaps in the literature (depicted in Figures 1 and 2) and in order to develop preliminary hypotheses, exploratory analyses were conducted on archival data. Results indicate different conclusions for men and women. Over the course of an alcohol session, men higher in several masculine norm domains experienced more negative mood; conversely, women higher in the feminine norm domain Invest in Appearance experienced more positive mood. Overall, the data suggest that adherence to gender norms may have different implications for men and women with regard to who drinks and under what conditions they may drink in order to achieve a desired shift in affect. Thus, we hypothesized that at the between-person level, men high in adherence to certain gender norm domains (playboy, winning, self-reliance, and risk-taking) would report more drinking to cope and at the within-person level, men would report higher quantity and more consequences on days when they reported more drinking to cope. Additionally, we hypothesized that men high in traditional gender norm adherence would report alleviated post-drink negative evening mood on days when they reported more negative daytime mood.

Method

Participants

Eighty-three participants were recruited from the University of Missouri area via MU Info listserv emails and flyers located on campus and at surrounding businesses. Inclusion criteria included being aged 21-29, consuming alcohol at least twice per week, and reporting one binge drinking episode within the past six months. Participants were

excluded if they reported trying to limit or quit drinking. Participants were paid up to

$100 for participation in the study. Only participants who achieved 60% compliance were

included in data analyses for this project.

Measures

  Demographic information. Age, gender, sexual orientation, race, ethnicity, Greek

status, socioeconomic status, and residential status was assessed with a computer-based

questionnaire prior to ecological momentary assessment session completion.

  Gender norms.

  Conformity to Masculine Norms. Adherence to masculine gender norms was

assessed with the Conformity to Masculine Norms Inventory (CMNI; Mahalik et al.,

2003). The CMNI consists of 11 subscales that measure masculine norms common in

masculinity literature and in American cultural beliefs and attitudes. Sample items

include, "It bothers me when I have to ask for help," and "I try to avoid being perceived

as gay." The participants were asked to rate, on a scale from 0 (strongly disagree) to 3

(strongly agree), 94 items assessing their own actions, feelings, and beliefs.

  Conformity to Feminine Norms. Adherence to feminine gender norms was

assessed with the Conformity to Feminine Norms Inventory (CFNI; Mahalik et al., 2005).

The CFNI consists of 8 subscales that measure feminine norms reflective of the dominant

culture in the United States. Sample items include, "I regularly wear makeup," and "I

actively avoid children." The participants were asked to rate, on a scale from 0 (strongly

disagree) to 3 (strongly agree), 84 items assessing their own endorsement of both

traditional and non-traditional feminine gender norms.

  Alcohol consumption and consequences.

Drinking motives. Motives for consuming alcohol were assessed using the Drinking Motives Questionnaire Revised (DMQ-R; Cooper, 1994). The DMQ-R consists of 4 subscales that measure positive reinforcement motives (social and enhancement) and negative reinforcement motives (coping and conformity). Social motives include drinking to obtain social rewards; enhancement motives include drinking to increase positive affect. Coping motives include drinking to ease negative affect; conformity motives include drinking to avoid negative evaluation. At the baseline questionnaire, participants were asked to rate, on a scale from 1 (never/almost never) to 5 (almost always/always), 20 items assessing how often they consume alcohol for each reason. Momentary drinking motives were assessed using items from the DMQ-R relative to the current drinking event (e.g., "Why are you drinking RIGHT NOW?")

Alcohol consumption. Current drinking was assessed using a dichotomous yes/no option. If participants indicated that they were currently drinking, the number of standard drinks they had consumed up to that point was assessed. Previous night's drinking was assessed using a dichotomous yes/no option. If participants indicated that they drank the previous night, the total number of standard drinks they consumed for the night was assessed.

Alcohol-Related Consequences. Problems resulting from alcohol consumption were assessed with the Young Adult Alcohol Consequences Questionnaire (YAACQ; Read et al., 2006). The YAACQ consists of 8 subscales that measure social-interpersonal problems, impaired control, diminished self-perception, poor self-care, risky behavior, academic/occupational problems, physiological dependence, and blackout drinking.

Participants were asked to rate, dichotomously, 20 items assessing whether or not they experienced each problem as a result of drinking the previous day.

Mood. Mood was assessed using the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988). The PANAS consists of 2 subscales that measure positive affect and negative affect. The positive affect subscale includes the adjectives attentive, excited, proud, and strong. The negative affect subscale includes the adjectives distressed, angry, fearful, guilty, and nervous. Participants were asked to rate, on a scale from 1 (very slightly or not at all) to 5 (extremely), 20 items assessing how they had felt within the past 15 minutes.

Personality traits.

Impulsivity. Dimensions of trait impulsive behavior was assessed with the UPPS-P Impulsive Behavior Scale (UPPS-P; Cyders et al., 2007). The UPPS-P consists of 59 items that measure five dimensions of impulsive behavior: premeditation (lack of), urgency, sensation seeking, and perseverance (lack of). Participants were asked to rate, on a scale from 1 (agree strongly) to 4 (disagree strongly), their behaviors and attitudes within the last 6 months. State impulsivity was assessed using four items from the UPPS-P (saying things without thinking, spending more money than intended, feeling impatient, and making "spur of the moment" deicisions) relative to the time that had elapsed since the previous prompt.

Procedure

Due to the COVID-19 pandemic, study participation occurred entirely online between June and November 2020. Particpants first completed a Qualtrics informed consent form. Participants were given opportunity to ask questions, which were answered

by trained research staff by email or telephone. After participants provided informed consent, they completed a Qualtrics questionnaire assessing demographic information such as age, assigned sex, gender, race, ethnicity, fraternity/sorority involvement, etc. Participants also provided information about typical/recent alcohol and substance use. Next, participants completed computerized versions of the Conformity to Masculine Norms, Conformity to Feminine Norms, Drinking Motives, and UPPS-P questionnaires. Following completion of questionnaires, participants received emailed instructions regarding how to use the smartphone app and received a document reviewing expectations of the next portion of the study.

Following the online portion of the study, participants used the TigerAware smartphone application to complete ten scheduled reports and three random reports per day. Participants were instructed to complete one morning report and nine evening reports. Participants were prompted to complete full evening reports at 6 p.m., 8 p.m., 10 p.m., 12 a.m., and 2 a.m. Participants were prompted to complete mood assessments and drink reports at 7 p.m., 9 p.m., 11 p.m., and 1 a.m. Participants were instructed to make a note on the application if they ended the drinking event or retired for the evening prior to the 2 a.m. report in order to put the app to sleep for the day. The evening reports assessed current mood, current drinking motives, and current drinking behavior. The morning report was scheduled to be completed at noon each day. The morning report included a retrospective report on drinking quantity, alcohol use motives, and mood the previous day, including drinking location(s) and social context. Social context included information about drinking companions. The morning report also included completion of the YAACQ and assessment of intentions to drink for the current day. In addition to the

scheduled morning and evening reports, participants were prompted randomly throughout the day between 1 p.m. and 5 p.m. to complete an assessment of their current mood and craving for alcohol.

Data Analytic Strategy

Multilevel modeling was conducted using PROC MIXED and PROC GENMOD in SAS 9.4. The assumption of normally distributed residuals was tested for both drinking quantity and consequences, and was met for drinking quantity but not for consequences. To test predictors of drinking quantity, we conducted analyses using 2-level multilevel models with repeated measures nested within participants. To test predictors of drinking consequences, we conducted generalized estimating equations with a negative binomial distribution with repeated measures nested within participants.

In order to disaggregate within- and between-person variance, we centered the variables of interest (e.g., positive and negative mood, coping and enhancement motives, CMNI/CFNI scores) on the sample mean to produce person-level scores (between-person components). To assess within-subject effects, we centered variables on the person mean in order to produce day-level scores. Further, we centered variables on the person day-level mean in order to produce momentary scores. In all models, we included either gender or gender norm adherence as moderating variables.

Results

Descriptive Statistics

There were 4,156 observations over 580 study days. Participants reported having drank the previous night on 45% of study days; only days that participants reported consuming alcohol were included in the analyses. Typical drinking behaviors (e.g.,

frequency, quantity) are reported in Table 1. Frequency, quantity, and number of binge

drinking episodes in the past month did not significantly differ by gender. Similarly,

masculine norm (CMNI) and feminine norm (CFNI) total scores did not significantly

differ by gender.

Associations Between Gender Norm Adherence and Alcohol Outcomes

We first tested whether the hypothesized norms, specifically, the masculine

domains of playboy, risk-taking, winning, and self-reliance, were associated with

consumption and consequences over and above any effect of mood and/or drinking

motives. We ran separate models with each norm score (CMNI total score, domain

scores) as a predictor of alcohol outcomes. Model predictors included between-person

CMNI total and domain scores and biological sex (female = reference) entered as a

covariate.

Results of these analyses indicated a significant association between the playboy

domain and both quantity and consequences (see Table 2). The masculine domains of

risk-taking, winning, and self-reliance, as well as the CMNI and CFNI total scores, were

not associated with alcohol use outcomes. Tests of gender norms x gender interactions

were not significant for quantity or consequences in either set of models.

Mood Predicting Quantity

In order to test within- and between-person associations between mood and

quantity, and whether gender and/or gender norm adherence moderated this association,

we ran parallel two-level multilevel models with repeated measures nested within

participants. Separate models including daytime mood (prospective of the evening's

drinking) and evening mood (concurrent to drinking) as predictors were run. The final

models included main effects of between-person and within-person mood (positive and negative) and biological sex (female = reference).

Tests of the main effects of mood on quantity suggested that within-person negative evening mood positively predicted quantity (b =0.24, SE =0.10, CI = [0.03, 0.44], t(198) = 2.25, p = .03; Table 2), but there were no significant associations between between-person negative daytime or positive daytime mood and quantity, nor between within-person negative daytime, positive daytime, or positive evening mood and quantity. However, these results were qualified by several significant interactions, including between-person positive daytime mood x gender (p < .001), between-person positive evening mood x gender (p <.001), and within-person negative evening mood x gender (p = .04; Table 3).

In order to understand the mood x gender interactions on quantity, we ran separate models by gender. For women, between-person positive daytime and evening mood were positively associated with quantity (positive daytime mood: b =0.42, SE =0.13, CI = [0.16, 0.68], t(25.3) = 3.29, p < .01; positive evening mood: b =0.49, SE =0.13, CI = [0.23, 0.75], t(25.5) = 3.85, p < .001). For men, positive daytime mood was negatively associated with quantity (b = -0.28, SE =0.12, CI = [-0.53, -0.03], t(23.4) = -2.33, p = .03). Positive evening mood was not significantly associated with quantity for men.

We next probed within-person mood x gender interactions. For women, negative evening mood was positively associated with quantity (b =0.41, SE =0.14, CI = [0.13, 0.69], t(108) = 2.91, p < .01). Negative evening mood was not significantly associated with quantity for men.

Testing mood x gender norm interactions indicated significant mood x masculine norm and mood x feminine norm domain interactions at the between-person level (Table 3). Probing these interactions indicated a positive association between positive evening mood and quantity for participants with CMNI total scores one standard deviation above the sample mean (b =0.39, SE =0.14, CI = [0.11, 0.68], $t(42.6)$ = 2.84, $p < .01$). Positive evening mood was not significantly associated with quantity for participants with CMNI total scores one standard deviation below the sample mean (b =-0.26, SE =0.13, CI = [-0.53, 0.01], $t(44.3)$ = -1.94, $p = .06$). Further, there was a marginal positive association between positive evening mood and quantity for participants with playboy scores one standard deviation above the sample mean (b =0.21, SE =0.11, CI = [-0.01, 0.43], $t(45.3)$ = 1.91, p =.06). Positive evening mood was negatively associated with quantity for participants with playboy scores one standard deviation below the sample mean, although the association was nonsignificant (b =-0.20, SE =0.13, CI = [-0.46, 0.06], $t(41.2)$ = -1.55, p =.13). Probing the significant between-person positive evening mood x CFNI total interaction indicated that there was a marginal positive association between positive evening mood and quantity for participants with CFNI total scores one standard deviation below the sample mean (b =0.20, SE =0.11, CI = [-0.01, 0.41], $t(41.9)$ = 1.89, p =.07). Positive evening mood was negatively associated with quantity for participants with CFNI total scores one standard deviation above the sample mean, although this association was nonsignificant (b =-0.27, SE =0.16, CI = [-0.59, 0.05], $t(47.2)$ = -1.71, p =.09).

Mood Predicting Consequences

In order to test within- and between-person associations between mood and consequences, and whether gender and/or gender norm adherence moderated this association, we again ran parallel models with daytime mood (prospective of the evening's drinking) and evening mood (concurrent to drinking) as repeated measures nested within participants. The final models included main effects of between-person and within-person mood (positive and negative) and biological sex (female = reference).

Tests of main effects of mood on consequences indicated that between-person negative daytime and negative evening mood were positively associated with consequences (negative daytime mood: $b = 0.26$, $SE = 0.10$, CI = [0.07, 0.44], $p < .01$; negative evening mood: $b = 0.21$, $SE = 0.11$, CI = [0.00, 0.42], $p = .045$). There were no significant associations between between-person positive daytime or evening mood and consequences, nor between within-person negative daytime, negative evening, positive daytime, or positive evening mood and consequences. These results were qualified by significant interactions, including between-person negative evening mood x gender ($p=.045$), within-person negative daytime mood x gender ($p<.001$), and within-person positive evening mood x gender ($p<.01$; Table 3).

In order to interpret these significant interactions, we ran parallel models by gender. The results indicated that for women, between-person negative evening mood was positively associated with consequences ($b = 0.34$, $SE = 0.12$, CI = [0.11, 0.57], $p <.01$). Negative evening mood was not significantly associated with consequences for men.

Next, we examined within-person mood x gender interactions. Negative daytime mood and consequences were not significantly associated for women; however, for men,

there was a positive association between negative daytime mood and consequences (b =1.04, SE = 0.10, CI = [0.84, 1.24], p <.001). Further, positive evening mood and consequences were not significantly associated for women, but for men, there was a negative association (b = -0.45, SE = 0.09, CI = [-0.62, -0.28], p <.001).

Testing mood x gender norms interactions yielded a significant positive evening mood x risk-taking interaction at the within-person level (Table 3). Probing the significant interaction indicated a positive association between positive evening mood and consequences for participants with risk-taking scores one standard deviation below the sample mean (b = 0.13, SE = 0.05, CI = [0.04, 0.22], p <.01). Positive evening mood was not significantly associated with consequences for participants with risk-taking scores one standard deviation above the sample mean (b = 0.06, SE = 0.06, CI = [-0.07, 0.18], p =.37).

Drinking Motives Predicting Quantity

In order to test within- and between-person associations between drinking motives and quantity as well as whether the strength of the associations differed by timepoint at which motives were assessed, we ran separate models including retrospective (next morning) reports of the previous evening's motives and evening reports of motives (concurrent to consumption) as predictors. The final models included main effects of between- and within-person retrospective motives (enhancement and coping) with biological sex (female = reference) entered as a covariate.

Tests of the main effects of drinking motives on quantity indicated three significant associations. Between-person evening coping motives were negatively associated with quantity (b = -2.22, SE = 1.08, CI = [-4.39, -0.05], t(50.3) = -2.05, p

= .045). Within-person evening and retrospective enhancement motives were positively

associated with quantity (evening enhancement motives: $b = 1.04$, $SE = 0.37$, CI = [0.31,

1.77], $t(162) = 2.81$, $p < .01$; retrospective enhancement motives: $b = 1.78$, $SE = 0.33$, CI

= [1.14, 2.44], $t(197) = 5.44$, $p < .001$). There were no significant associations between

between-person evening or retrospective enhancement motives and quantity, nor between

within-person evening coping motives and quantity. Tests of drinking motives x gender

interactions predicting quantity were not significant, indicating that the associations

between motives and quantity did not differ by gender.

Significant interactions between motives and norms indicated that the results were

qualified by a significant within-person evening enhancement motives x CFNI total

interaction (Table 3). Probing this significant interaction indicated a positive association

between evening enhancement motives and quantity for participants with CFNI total

scores one standard deviation below the sample mean ($b =2.04$, $SE =0.61$, CI = [0.77,

3.31], $t(21.2) = 3.33$, $p < .01$). There was no significant association between evening

enhancement motives and quantity for participants with CFNI total scores one standard

deviation above the sample mean ($b =-0.28$, $SE =0.64$, CI = [-1.60, 1.04], $t(26.3) = -0.43$,

$p =.67$).

Drinking Motives Predicting Consequences

In order to test associations between drinking motives and consequences, and

whether gender and/or gender norm adherence moderated the main effects, we again ran

parallel models with concurrent and retrospective drinking motives as repeated measures

nested within participants. The final models included main effects of between-person and

within-person motives (coping and enhancement) and biological sex (female =

reference).

Tests of main effect tests of drinking motives on consequences indicated no

significant associations between evening or retrospective coping or enhancement motives

and consequences, either at the between- or within-person levels. However, these results

were qualified by significant interactions, including between-person retrospective coping

motives x gender (p<.01), between-person retrospective enhancement motives x gender

(p =.045, and within-person evening coping motives x gender (p<.001; Table 3).

In order to interpret these significant interactions, we ran separate models by

gender. Results of the between-person models indicated that for women, retrospective

coping motives were positively associated with consequences (b = 1.29, SE = 0.36, CI =

[0.58, 2.00], p <.001). For men, there was a negative association between retrospective

coping motives and consequences (b = -5.05, SE = 1.91, CI = [-8.78, -1.31], p <.01).

Additionally, for women, there was a positive association between retrospective

enhancement motives and consequences that approached significance (b = 0.74, SE =

0.44, CI = [-0.13, 1.61], p=.10). There was not a significant association between

retrospective enhancement motives and consequences for men.

We then probed within-person motives x gender interactions. For women, there

was a negative association between evening coping motives and consequences (b = -0.73,

SE = 0.33, CI = [-1.37, -0.09], p = .03). For men, there was a positive association

between evening coping motives and consequences (b = 1.40, SE = 0.31, CI = [0.80,

2.00], p < .001).

Testing drinking motives x gender norm interactions indicated significant coping motives x masculine norm domain interactions such that the association between coping motives and consequences different at varying levels of self-reliance and risk-taking (Table 3). Probing these interactions indicated a positive association between between-person evening coping motives and consequences for participants with self-reliance domain scores one standard deviation below the sample mean ($b = 2.41$, $SE = 0.89$, CI = [0.67, 4.15], $p < .01$). There was not a significant association between between-person evening coping motives and consequences for participants with self-reliance domain scores one standard deviation above the sample mean ($b = -0.80$, $SE = 0.90$, CI = [-2.57, 0.96], $p=0.37$). Further, there was a negative association between within-person evening coping motives and consequences for participants with risk-taking scores one standard deviation below the sample mean ($b = -0.87$, $SE = 0.25$, CI = [-1.36, -0.37], $p < .001$). Conversely, there was a positive association between within-person evening coping motives and consequences for participants with endorsement of the risk-taking domain one standard deviation above the sample mean ($b = 0.5271$, $SE = 0.23$, CI = [0.075, 0.98], $p=.02$).

Mood Change During the Drinking Event

In order to test whether participants experienced changes in affect from daytime random prompt reports to evening reports of mood, and whether drinking day and/or gender moderated this association, we ran parallel models with daytime mood (negative and positive) as repeated measures nested within participants. The final models included main effects of between-person and within-person mood, biological sex, and drinking day (yes or no).

Results of the moderation models were not significant, indicating that the associations between daytime mood and evening mood did not differ by gender or whether participants drank that day. As expected, tests of main effects of daytime mood on evening mood indicated that within-person negative daytime mood was positively associated with negative evening mood ($b = 0.37$, $SE = 0.06$, CI = [0.25, 0.49], $t(30.7) = 6.18$, $p < .001$). Further, within-person positive daytime mood was positively associated with positive evening mood ($b = 0.48$, $SE = 0.05$, CI = [0.39, 0.57], $t(47.1) = 10.45$, $p < .001$).

Discussion

The goal of this project was to test possible mechanisms for observed gender differences in drinking behavior and consequences. Specifically, we sought to test whether a) gender norm adherence, drinking motives, and mood separately predict alcohol outcomes and b) individual differences in gender norm adherence moderate the influence of motives and/or mood on outcomes. Based on previous studies, we hypothesized that men high in adherence to certain traditional gender norm domains would report more drinking to cope. We also hypothesized that this effect would differ across days, such that on days when men reported more drinking to cope, they would consume more alcohol and experience more consequences. Finally, we hypothesized that the trajectory of mood across the day would change, such that men high in traditional gender norm adherence would report less post-drink negative evening mood on days when they experienced higher negative daytime mood. We tested our hypotheses using both a biological representation of gender (sex assigned at birth) as well as a social construct representation of gender (traditional masculine/feminine gender norms) in an

attempt to tease apart the distinct influence of each on the alcohol outcomes of consumption and consequences.

Our results indicated that gender and gender norms separately influenced alcohol outcomes, both directly and by moderating other risk factors. Overall, increased negative mood predicted drinking more and experiencing more consequences. Individuals who reported more coping motives also reported lower drinking quantity. Reporting increased enhancement on a given day was associated with increased drinking quantity, consistent with other recent studies (e.g., Cook et al., 2020). However, most results were qualified by significant interactions, suggesting that effects differed by gender identity and masculine gender norm domains.

Moderation by Gender Identity

We found that the impact of positive mood differed by gender identity. For women, experiencing positive mood predicted greater drinking, but for men, experiencing positive mood during the day predicted both lower drinking quantity and fewer consequences. Negative mood predicted increased consequences for both men and women, but for women, it was evening negative mood while for men it was daytime negative mood.

Our findings supplement existing theory as well as other results in the literature that position negative mood as a motivator for consumption and suggest that moderators may explain associations between negative mood and quantity (Bresin & Fairbairn, 2019). The mixed findings regarding positive daytime mood support theory regarding differential use by gender (Lara-Cantú et al., 1990) and suggest that women may use

alcohol both to enhance positive mood and alleviate negative mood, while men may use alcohol more to alleviate negative mood.

Additionally, we found interactions between coping motives and gender identity that differed by evening and retrospective reports. Prior between-person studies have found that on average, men drink to cope with stress and drinking to cope is related to more alcohol-related problems in men moreso than women (Nolen-Hoeksema & Harrell, 2002; Timko et al., 2005). We assessed day-level behavior and found that at the within-person level, men's evening coping motives predicted experiencing more consequences, whereas women's evening coping motives predicted experiencing fewer consequences, supporting study hypothesis that the drinking to cope-consequences association would be stronger for men. For retrospective reports, we found that women's coping motives predicted more consequences but fewer consequences for men.

This is the first comparison of the predictive ability of concurrent vs. retrospective motives by gender. The contrasting pattern of findings raises questions regarding which type of report is most accurate and what influences might produce these differences. One possibility is that retrospective reports result from post-hoc adjustments in the self-attribution of motives. For example, women may make the post-hoc attribution that they had been drinking to cope the previous evening after episodes where they experience more consequences, while men may make the opposite post-hoc attribution.

Interestingly, we did not find support for our hypothesis that reporting more drinking to cope would predict higher drinking quantity. This finding, considered within the context of the previously discussed finding that negative mood predicts quantity

across gender, suggests that coping motives may have a more distal impact on consequences experienced as the result of alcohol consumption.

Moderation by Gender Norms

Next, of the five masculine norm domains hypothesized to predict outcomes (total score, playboy, risk-taking, winning, and self-reliance), we only found support for the playboy domain as being strongly associated with alcohol quantity and consequences. Additionally, we found that playboy and risk-taking each altered the relationship between mood and outcomes. The results indicated that positive evening mood was more strongly associated with quantity as playboy scores increased; conversely, positive evening mood was associated with more consequences as risk-taking scores decreased.

Thus, our results indicate that for our sample, low risk-taking scores (reflecting a low value of participation in risk-taking behaviors) exerted an influence similar to high playboy scores (reflecting a high value or importance of sexual prowess) when experiencing positive mood. Our findings add to the existing literature on the association between the playboy norm and drinking outcomes. Previous work demonstrates that the playboy domain is positively associated with positive alcohol expectancies, which is in turn related to increased use (Iwamoto et al., 2014). Our study is the first to test interaction effects involving motives and masculine gender norms and suggests that individuals who value having multiple sexual partners (reflected in high playboy scores) may be more likely to engage in heavy drinking when experiencing positive mood, perhaps because they view consumption as instrumental to achieving success at securing a partner.

We found a different pattern of interactions between gender norms and drinking motives. For example, coping motives in general were not associated with consequences; however, coping motives were more predictive of consequences when participants were either high in risk-taking or low in self-reliance. Coping motives predicted consequences in a way not typically found in the literature (i.e., predicted experiencing fewer consequences) when participants were low in risk-taking and high in self-reliance; this interaction with self-reliance is less clear, but potentially suggests that individuals who are less independent (reflected in low self-reliance scores) use alcohol or other external sources for coping with negative internal states instead of internal sources of emotion regulation. These results carry implications for how coping motives are associated with consequences after accounting for adherence to masculine gender norms and are somewhat in contrast to effects found in prior research examining masculine norms and alcohol use (e.g., Iwamoto et al., 2011, which found that endorsing self-reliance predicted greater likelihood of alcohol-related problems).

Implications

Overall, our results indicated notable interactions between gender identity and mood and motives, a main effect of the playboy norm on alcohol outcomes, and mixed interactions between gender norms and mood and motives. We found that gender identity interacted with mood and motives separately; while we did not find support for our hypothesis that coping motives would predict greater consumption, we found that positive mood predicted drinking differentially by gender and negative mood consistently predicted greater consequences across women and men. Taken together, the interactions between gender identity and mood suggest that men may use alcohol to dampen the

effects of negative mood, whereas women may use alcohol both to enhance positive mood and alleviate negative mood. We found the playboy norm domain to be predictive of drinking quantity and consequences on its own as well as via an interaction with positive mood. Though we also found interactions between self-reliance and risk-taking and mood and motives, the results are mixed and do not present clear conclusions; however, this is the first examination of interactions between drinking motives and masculine gender norms.

Limitations and Future Directions

This study produced a number of notable findings and carries several strengths, including the assessment of in-the-moment mood, drinking motives, and consumption, one of the first tests of associations between drinking motives and masculine gender norms, and a novel look at the differential predictive power of evening vs. retrospective reports of drinking motives. There are, however, limitations that should be considered when interpreting our results. Our relatively small sample size ($N = 53$) consisted of moderate to heavy young adult, mostly White (90.4%) drinkers. Further, participants were recruited from a single community, and as such, our results may not be generalizable to all adult drinkers, which calls attention to the need for replication of similar studies among more diverse samples. Our study design did not allow for examination of participants' perceptions of mood change following consumption, which limits our conclusions as to whether participants experienced alleviation of negative mood following drinking to cope.

The crossover pattern of findings for evening and retrospective reports of coping motives by men and women is a novel addition to the literature. Our finding that for men,

evening report coping motives predicted more consequences, but retrospective report coping motives predicted fewer consequences suggests that at some point during the drinking event or afterward, individuals may experience shifts in their attributions or understandings of their reasons for drinking. We did not assess participants' reasons for switching attribution strategies and as such are unable to draw conclusions about whether men switch attribution strategies for the purpose of self-preservation, for instance. Thus, future EMA studies should evaluate the attributional processes by which differential relationships emerge between concurrent motives, retrospective motives, and alcohol outcomes.

Perhaps one of the most striking results of our study, we found that evening and retrospective reports of coping motives predicted alcohol-related consequences in opposite ways for men and women. To our knowledge, only one prior study examined effects of concurrent and retrospective reports of motives, which were linked to planned versus unplanned drinking (Stevens et al., 2021). Ours supplements these, finding that retrospective enhancement motives predicted greater quantity. Together, these results call into question predictive ability of each type of report; future studies should examine the proper interpretation of the results.

Given our finding that daytime and evening negative mood predicted consequences by gender, future research should examine whether there is a meaningful difference in the temporal association between timing of the experience of negative mood and subsequent use. For example, it is possible that for men, the effect of negative daytime mood is more pervasive and prompts planning to drink to cope later that

evening, whereas for women the effect of evening negative mood may be more

immediate (e.g., promoting concurrent drinking).

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Table 1

Characteristics of Sample

Demographics *M* (*SD*), *Mdn*, or %	*N* = 53
Female	50.90%
Age (years)	24.0 (2.55)
Race/Ethnicity	
White	90.40%
Black	5.80%
Asian	1.90%
Latinx/Hispanic	1.90%
Drinking Characteristics	
Past 30 days	
Number of drinking days	5-6 times/week
Drinks per day on drinking days	3-4 drinks
Binge drinking days	1x/week

Note. Table displays sample demographics and alcohol use characteristics.

Table 2

Between- and Within-Person Predictors of Alcohol Outcomes

Model DV:	Quantity				YAACQ Consequences			
Effect	*b*	95% CI	*t*	*p*	*b*	95% CI	*z*	*p*
1. Intercept	3.71	[2.82, 4.61]	8.36	<.001	-1.15	[-1.65, -0.66]	-4.56	<.001
2. Sex	.24	[-1.06, 1.53]	.36	.72	-.73	[-1.74, 0.28]	-1.42	.15
3. CMNI Total	.11	[-0.19, 0.41]	.76	.45	.10	[-0.05, 0.24]	1.32	.19
4. CMNI Playboy	1.28	[0.13, 2.43]	2.24	.03	.59	[0.10, 1.07]	2.36	.02
5. CMNI Risk-taking	1.05	[-0.49, 2.59]	1.37	.18	-.14	[-1.32, 1.03]	-.24	.81
6. CMNI Winning	.29	[-1.30, 1.87]	.37	.72	.79	[-0.07, 1.64]	1.81	.07
7. CMNI Self-reliance	.24	[-0.93, 1.42]	.41	.62	-.27	[-1.04, 0.50]	-.68	.50
8. CFNI Total	-.12	[-0.46, 0.22]	-.71	.48	-.09	[-0.25, 0.06]	-1.19	.24
9. Between-person negative daytime mood	-.28	[-0.63, 0.08]	-1.56	.12	.26	[0.07, 0.44]	2.69	.007
10. Within-person negative daytime mood	-.04	[-0.26, 0.18]	-.33	.74	-.10	[-0.31, 0.10]	-.96	.34
11. Between-person positive daytime mood	.03	[-0.17, 0.23]	.30	.77	-.02	[-0.14, 0.10]	-.36	.72
12. Within-person positive daytime mood	.02	[-0.10, 0.14]	.27	.79	.09	[-0.16, 0.34]	.73	.46
13. Between-person negative evening mood	-.27	[-0.68, 0.13]	-1.37	.18	.21	[0.00, 0.42]	2	.045
14. Within-person negative evening mood	.24	[0.03, 0.44]	2.25	.03	.01	[-0.12, 0.14]	.14	.89
15. Between-person positive evening mood	.07	[-0.13, 0.27]	.70	.49	.03	[-0.07, 0.12]	.51	.61
16. Within-person positive evening mood	.06	[-0.07, 0.19]	.90	.37	.04	[-0.18, 0.26]	.36	.72
17. Between-person evening coping motives	-2.22	[-4.39, -0.05]	-2.05	.045	1.19	[-0.08, 2.45]	1.84	.07
18. Within-person evening coping motives	.43	[-0.53, 1.38]	.88	.38	-.36	[-0.82, 0.09]	-1.56	.12
19. Between-person evening enhancement motives	.29	[-1.02, 1.61]	.45	.66	.52	[-0.47, 1.51]	1.03	.31
20. Within-person evening enhancement motives	1.04	[0.31, 1.77]	2.81	.01	-.12	[-0.90, 0.66]	-.31	.76
21. Between-person retrospective coping motives	-1.52	[-3.48, 0.45]	-1.56	.13	.88	[-0.04, 1.80]	1.88	.06
22. Within-person retrospective coping motives	.21	[-0.84, 1.27]	.40	.69	-.40	[-1.24, 0.45]	-.92	.36
23. Between-person retrospective enhancement motives	1.01	[-0.40, 2.41]	1.44	.16	-.12	[-1.24, 0.99]	-.22	.83
24. Within-person retrospective enhancement motives	1.78	[1.14, 2.44]	5.44	<.001	.69	[-0.25, 1.63]	1.44	.15

Note. Table displays two-level multilevel models examining predictors of alcohol outcomes. For all models, sex was coded with female as the reference.
Rows 1-2 reflect predictors from the baseline, covariate-only model; rows 3-24 reflect predictors from separate models and were added iteratively to the table.

Table 3

Significant Interactions Predicting Alcohol Outcomes

Model DV:	Quantity				YAACQ Consequences			
Effect	*b*	95% CI	*t*	*p*	*b*	95% CI	*z*	*p*
1. Intercept	3.71	[2.82, 4.61]	8.36	<.001	-1.15	[-1.65, -0.66]	-4.56	<.001
2. Sex	.24	[-1.06, 1.53]	.36	.72	-.73	[-1.74, 0.28]	-1.42	.15
3. Within-person negative daytime mood x gender	.04	[-0.41, 0.49]	.18	.86	.79	[0.50, 1.10]	5.22	<.001
4. Between-person positive daytime mood x gender	-.72	[-1.07, -0.37]	-4.14	<.001	-.10	[-0.29, 0.09]	-1.02	.31
5. Between-person negative evening mood x gender	-.23	[-1.04, 0.57]	-.57	.57	-.60	[-1.20, -0.01]	-2	.045
6. Between-person positive evening mood x gender	-.71	[-1.06, -0.35]	-4.02	<.001	-.15	[-0.31, 0.02]	-1.77	.08
7. Within-person negative evening mood x gender	-.43	[-0.85, -0.01]	-2.03	.044	-.22	[-0.54, 0.11]	-1.28	.20
8. Between-person positive evening mood x CMNI Total	.15	[0.06, 0.25]	3.18	.003	.01	[-0.01, 0.04]	1.01	.31
9. Between-person positive evening mood x CMNI Playboy	.39	[0.08, 0.70]	2.53	.02	-.01	[-0.13, 0.12]	-.11	.91
10. Between-person positive evening mood x CFNI Total	-.12	[-0.21, -0.03]	-2.6	.01	-.02	[-0.06, 0.02]	-.90	.37
11. Within-person positive evening mood x gender	.01	[-0.37, 0.38]	.04	.97	-.45	[-0.78, -0.11]	-2.6	.009
12. Within-person positive evening mood x CMNI Risk-taking	-.39	[-0.82, 0.04]	-1.87	.07	-.39	[-0.66, -0.12]	-2.85	.004
13. Between-person evening coping motives x CMNI Self-reliance	-1.88	[-5.88, 2.11]	-.95	.35	-2.82	[-5.05, -0.59]	-2.48	.01
14. Within-person evening coping motives x gender	.26	[-1.74, 2.26]	.26	.80	1.69	[0.77, 2.61]	3.61	<.001
15. Within-person evening coping motives x CMNI Risk-taking	-.98	[-3.33, 1.37]	-.82	.41	1.76	[0.91, 2.60]	4.08	<.001
16. Within-person evening enhancement motives x CFNI Total	-.60	[-1.05, -0.13]	-2.65	.01	.04	[-0.26, 0.34]	.28	.78
17. Between-person retrospective coping motives x gender	-1.86	[-6.32, 2.60]	-.84	.40	-5.63	[-9.79, -1.48]	-2.66	.01
18. Between-person retrospective enhancement motives x gender	1.3	[-1.53, 4.12]	.92	.36	-1.62	[-3.22, -0.03]	-2	.045

Note. Table displays two-level multilevel models examining predictors of alcohol outcomes. For all models, sex was coded with female as the reference.

Rows 1-2 reflect predictors from the baseline, covariate-only model; rows 3-18 reflect predictors from separate models and were added iteratively to the table.

Gender	Gender Norms	Mood	Drinking Motives	Drinking Behavior	Alcohol-related problems
Men				Drink more, more often	Increased
				Drink at an earlier age	Higher lifetime prevalence of AUDs
				Report more binge drinking	
		Negative		Increased consumption	
		Negative	Coping		
			Coping	Increased consumption	
			Coping		Increased
	Traditional masculinity			Increased consumption	
	Playboy, risk-taking, winning, self-reliance				Increased
	Primacy of work, heterosexual presentation			No change in consumption	
	Masculinity threatened in a social context			Increased consumption	
Women				Heavy drinking	Sexual assault (victimization)
				Increased consumption	Telescoping and comorbidity
		Negative	Coping		
		Negative		Increased consumption	
			Coping	Increased consumption	
			Coping		Increased self-care, social/interpersonal problems, and academic/occupational problems
	Traditional femininity			Decreased consumption	
				Higher rates of abstinence	

Figure 1. Theoretical model from exogenous (left) to endogenous (right) of bivariate associations from between-subjects studies.

Gender	Gender Norms	Mood	Drinking Motives	Drinking Behavior	Alcohol-related problems
Men		Negative		Increased consumption	
			Coping	Increased consumption	
		Negative		Increased work for alcohol (IV settings)	
		Negative	Coping	Increased consumption	Acute AUD symptoms
Women		Negative	Coping	Increased consumption	

Figure 2. Theoretical model from exogenous (left) to endogenous (right) of bivariate associations from within-subjects studies.