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Alcohol consumption as a function of dietary restraint and the menstrual cycle in moderate/heavy ("at-risk") female drinkers

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ABSTRACT

Previous research suggests that women who report dietary restraint tend to consume alcohol in greater quantities, however most studies use retrospective data collection, which is often unreliable, and no studies have accounted for this relationship with respect to potential changes in alcohol consumption across the menstrual cycle. Therefore, the present study investigated the relationship between prospectively monitored drinking patterns and dietary restraint across the menstrual cycle among females from the general population whose drinking level (7–20 drinks/week) places them at-risk for developing alcohol use disorders. Restrained eaters (RES; N = 51) and unrestrained eaters (UN-RES; N = 55), per the cognitive restraint scale scores from the Three-Factor Eating Questionnaire, provided prospective ratings measuring mood, alcohol consumption, and consequences of alcohol use across one full menstrual cycle. Dysphoric mood increased during the late luteal and menstrual phases in both groups. Although overall the RES group did not drink more than the UN-RES group, the RES group drank less than the UN-RES group during the follicular phase, suggesting that among RES women alcohol consumption may be modulated by hormonal fluctuations across the menstrual cycle. The differences between the present findings and previous research may be due to the cohorts sampled; the majority of previous studies sampled college students, where binge drinking and dietary restraint are more common, whereas this study sampled the general population. Future research should replicate prior studies in a college-aged population using the current design of prospective data collection for greater accuracy of self-reported alcohol consumption.

1. Introduction

Previous research in non-psychiatric populations has consistently found that women who show patterns of restrictive eating and/or tendencies towards dieting also show greater alcohol consumption (Bradstock et al., 1988; Bryant et al., 2010; Higgs & Eskenazi, 2007; Khaylis et al., 2009; Krahn et al., 2005; Lavik et al., 1991; Stewart et al., 2000; Xinaris & Boland, 1989). However, previous findings have been restricted by sampling only a subset of the female population (i.e., college women), retrospective data collection, which has been associated with underreporting of drinking behavior (Whitty & Jones, 1992), and not assessing the role of the menstrual cycle. In the general population, both an absence of menstrual cycle-related changes in alcohol consumption (Charette et al., 1990; Freitag & Adesso, 1993; Holdstock & de Wit, 2000; Nyberg et al., 2004; Terner & de Wit, 2006) and increased alcohol consumption in the menstrual and luteal phases (Mello et al., 1990; Pastor & Evans, 2003) have been found, suggesting that further research on the impact of the menstrual cycle on alcohol use is warranted.

The current study sought to investigate whether menstrual cycle-related changes in alcohol consumption are moderated by dietary restraint among women using a study design addressing previous methodological limitations. Therefore, changes in mood and alcohol consumption were assessed across the menstrual cycle between female restrained (RES) and unrestrained (UN-RES) eaters, who were also all "at-risk" drinkers, from the general population using prospective data collection. Based on previous research, we hypothesized that all women would increase alcohol consumption in the luteal and menstrual phases but there would be a greater increase in RES eaters than the UN-RES eaters.

2. Material and methods

2.1. Participants

Women recruited from advertisements around the New York City area were told that the purpose of the study was to determine changes in mood, patterns of alcohol use and eating behavior across the menstrual

Abbreviations: UN-RES, unrestrained eaters; RES, restrained eaters.

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cycle. Based on the National Institute of Alcohol Abuse and Alcoholism (2010) guidelines, for women, "at-risk" drinking is defined as ≥7 drinks per week and binge drinking is defined as ≥4 drinks per day. Women who typically drank more than 20 drinks per week were excluded, similar to our previous studies (Evans & Levin, 2004, 2011; Pastor & Evans, 2003). No participant had an Axis I disorder within the last year. All women were normally cycling, not using hormonal contraceptives, and not pregnant (confirmed using a urine pregnancy test at screening). No one endorsed significant medical or psychiatric histories, moderate to severe premenstrual symptoms, or daily medication use. The Institutional Review Board at the New York State Psychiatric Institute approved this study. Participants signed informed consent and were financially compensated for their participation.

2.2. Procedures

Based on an initial telephone interview, women who endorsed "at-risk" drinking were brought in for screening; participants were recruited to obtain both restrained and unrestrained eaters. During screening, all participants completed a number of questionnaires (see Measures section). "At-risk" drinking was confirmed through a structured interview with the participant. Participants were assessed for current Axis I disorders, using the MINI International Neuropsychiatric Interview (Sheehan et al., 1994) and substance abuse module of the Structured Clinical Interview for DSM-IV-TR (First et al., 1994).

Eligible individuals were provided with modified Daily Ratings Form (DRFs; Pastor & Evans, 2003) to prospectively monitor their mood, alcohol consumption, and consequences of alcohol use across one full menstrual cycle. Participants were instructed to fill these forms out each morning for the previous day and to return them to the laboratory by mail each day using the addressed, stamped envelopes provided. Once all forms were received, participants came in for an exit interview to discuss their drinking behavior. Each participant was paid for her participation, received informational brochures on the effects of alcohol use, and offered treatment referrals if necessary.

2.3. Measures

The Beck-Depression Inventory-II (BDI-II; Beck et al., 1996) and the State-Trait Anxiety Inventory (STAI; Spielberger et al., 1970) assessed depression and anxiety, respectively. The Short Michigan Alcoholism Screening Test (SMAST; Selzer et al., 1975) assessed the presence of alcohol-related problems, and the Quantity–Frequency–Variability Index (QFV; Cahalan et al., 1985) assessed the frequency, type and quantity of alcohol use over the last month. The Alcohol Outcome Expectancy Questionnaire (AOEQ; Leigh & Stacy, 1993) assessed the positive and negative effects of alcohol consumption. The Premenstrual Assessment Form (Halbreich et al., 1982) assessed premenstrual symptoms over the last three menstrual cycles. The Three-Factor Eating Questionnaire (TFEQ; Stunkard & Messick, 1985) was used to classify each participant as either a restrained eater (RES group) or an unrestrained eater (UN-RES group) based on the median split of the cognitive restraint scale scores, a strategy successfully used in other studies (Kanarek et al., 1995; Yeomans & Coughlan, 2009). The modified DRFs (see Endicott et al., 1986; Pastor & Evans, 2003) were used to prospectively measure mood, alcohol consumption, consequences of drinking alcohol, and the onset and duration of menses.

2.4. Data analysis

Analyses were based on the 106 women (55 UN-RES and 51 RES eaters) who completed the study. Chi-Square and t-tests compared demographic characteristics, depression, anxiety, SMAST scores, pattern of substance use, and menstrual cycle characteristics (e.g., onset of menses, cycle length) between the UN-RES and RES women.

The menstrual cycle was divided into three clearly defined phases: menstrual (days one to five of menses), follicular (days six to 10 after the onset of menses), and late luteal (five days prior to the onset of menses). Dependent measures of prospective alcohol consumption, based on information from the DRFs, included: 1) alcohol consumption during each of these three menstrual cycle phases (calculated as the number of drinks consumed): 2) number of drinking days; 3) number of days intoxicated, and 4) number of binge drinking episodes. Mood scores were calculated for these menstrual cycle phases by averaging the scores within each defined phase. Similarly, positive and negative consequences of drinking scores were calculated, but only on days alcohol was consumed. SPSS® software was used to conduct separate two-factor analyses of variance (ANOVA) with group (UN-RES and RES) as the between-subject factor and phase (menstrual, luteal, and follicular) as the within-subject factor for each dependent measure. Post hoc analysis using Tukey's HSD tests were used when warranted.

For all analyses, results were considered statistically significant at $p<0.05$.

3. Results

Table 1 shows demographic characteristics for the UN-RES and RES groups. Overall, there were few differences between the two groups; the RES group reported significantly longer menstrual cycles ($p=0.05$), fewer marijuana users ($p=0.02$) and higher cognitive restraint ($p<0.0001$) and disinhibition ($p=0.01$) scores on the TFEQ than the UN-RES group. However, there were no differences between groups on retrospective self-reported weekly alcohol consumption; both groups drank an average of 13 drinks per week.

Based on the DRFs, dysphoric mood scores significantly increased in the late luteal and menstrual phases compared to the follicular phase [$F\ (2/205)=15.95$, $p<0.0001$] to the same extent in both groups. Fig. 1 shows drinking patterns as a function of menstrual cycle phase and group. Based on the DRFs, there was a significant group effect with the RES group reporting significantly fewer drinks consumed [$F\ (1/105)=4.04$; $p=0.05$], drinking days [$F\ (1/105)=4.65$; $p=0.03$], number of binge drinking episodes [$F\ (1/105=6.19$; $p=0.01$] and days intoxicated [$F\ (1/105=3.85$; $p=0.05$], and greater negative consequences of drinking [$F\ (1/105)=4.31$; $p=0.04$] compared to the UN-RES group. Specifically, post-hoc analyses showed

Table 1
Demographics.

	UN-RES (N=56)	RES (N=51)	p
Demographics[a]			
Age (years)	26.62 (5.20)	26.98 (5.87)	N.S.
Racial/ethnic composition (% White)	52.73%	56.86%	N.S.
Education (years)	15.53 (3.72)	15.49 (2.64)	N.S.
Body mass index (BMI)	22.39 (3.65)	22.83 (2.62)	N.S.
State Anxiety Inventory	32.29 (8.45)	33.55 (8.22)	N.S.
Trait Anxiety Inventory	34.73 (8.13)	35.24 (8.31)	N.S.
Beck Depression Inventory	5.40 (4.28)	5.41 (5.06)	N.S.
Short Michigan Alcohol Screening Test	0.80 (1.08)	0.75 (1.00)	N.S.
Age of onset menses (years)	12.59 (1.46)	12.60 (1.68)	N.S.
Menstrual cycle length	28.65 (2.62)	29.69 (2.91)	0.05
Substance use			
Retrospective mean drinks per week[a]	12.97 (5.16)	13.16 (5.30)	N.S.
Retrospective range of drinks per week	4.00–28.00	3.00–22.00	
% caffeine users	82.14%	92.16%	N.S.
% marijuana users	51.79%	29.41%	0.02
% cocaine users	12.50%	3.92%	N.S.
% cigarette smokers	39.29%	33.33%	N.S.
Three-Factor Eating Questionnaire (TFEQ)[a]			
Cognitive restraint score	4.23 (2.88)	13.31 (2.60)	<0.0001
Disinhibition score	4.69 (2.56)	6.22 (3.20)	0.01
Hunger score	5.85 (2.54)	5.41 (2.34)	N.S.

N.S. not significant.
[a] Shown are means (standard deviations).