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Gender and Depression Moderate Response to Brief Motivational Intervention for Alcohol Misuse Among College Students

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Objective: Brief motivational interventions (BMIs) effectively reduce problematic drinking in college students. However, not all students benefit, and little is known about the subgroups of students for whom BMIs are most effective. In the present study, we examined 2 factors that may influence BMI efficacy: gender and depression. ***Method:*** We reanalyzed data from a clinical trial in which heavy drinking students ($N = 330$; 65% female) were randomized to a BMI ($n = 165$) or an assessment only control ($n = 165$). Depression was assessed at baseline; past-month typical drinks per week, heavy drinking frequency, and consequences were assessed at baseline and 1 month. Three- and 2-way interactions among intervention condition (BMI vs. control), gender (male vs. female), and depression (low vs. high) were tested. ***Results:*** We observed 3-way interaction effects on 2 outcomes: (a) typical drinks per week and (b) frequency of heavy drinking at 1 month. Relative to controls and adjusting for baseline drinking, low-depression women reduced their drinking more after a BMI whereas high-depression women did not show differential improvement. In contrast, high-depression men showed significant reductions in weekly drinks following the BMI whereas low-depression men did not show differential improvement. In addition, higher levels of depression were associated with higher levels of consequences at follow-up across conditions. ***Conclusions:*** BMIs are indicated for heavy drinking, depressed men, consistent with recommendations for implementing screening and brief intervention in mental health settings. However, BMIs may need to be refined to enhance their efficacy for depressed women.

Keywords: brief motivational intervention, alcohol, depression, gender, college students

Alcohol misuse during the college years continues to be an important public health problem. Alcohol is the most widely used substance among college students (Substance Abuse and Mental Health Services Administration, 2012). More than 30% of college women and 40% of college men report engaging in heavy episodic drinking (≥4 or 5 drinks in a single sitting for female or male students, respectively) at least once in the past 2 weeks (Johnston, O'Malley, Bachman, & Schulenberg, 2010). Heavy episodic drinking can result in myriad adverse consequences, such as accidents, sexual abuse, fighting, and even death (Hingson, Zha, & Weitzman, 2009).

Fortunately, ample evidence documents the efficacy of interventions designed to reduce problematic drinking in college students (e.g., Carey, Scott-Sheldon, Elliott, Garey, & Carey, 2012; Cronce & Larimer, 2011). Among the most efficacious treatments are brief motivational interventions (BMIs) that involve specific strategies tailored to the individual, including personalized feedback on alcohol use and consequences (Carey, 2012; Dimeff, Baer, Kivlahan, & Marlatt, 1999). Despite the evidence for the efficacy of BMIs with college student drinkers, effect sizes for BMIs range from small to moderate (Carey, Scott-Sheldon, Carey, & DeMartini, 2007; Carey et al., 2012) and not all students benefit (Carey, Scott-Sheldon, et al., 2007; Moreira, Smith, & Foxcroft, 2009). One potential explanation for modest effect sizes is that BMIs are less effective for certain subgroups of students.

Depression Among College Students

National surveys show that a substantial minority of college students report depression (Eisenberg, Gollust, Golberstein, & Hefner, 2007; National Alliance on Mental Illness, 2012). The 2012 report from the Association for University and College

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Counseling Center Directors indicated that 95% of counseling center directors believe that psychological problems are a growing concern and that depression is one of the most prevalent concerns with 36% of college students affected (Mistler, Reetz, Krylowicz, & Barr, 2012). A recent national survey of 123,078 college students indicated that 11% reported they had been diagnosed with or treated for depression within the past year. Further, 22% had experienced depression in the past 12 months; among those endorsing depression, 39% said that it has affected their academic performance (American College Health Association, 2013). Other research further supports that depression is a significant predictor of both lower grade point average and higher probability of dropping out (Eisenberg, Golberstein, & Hunt, 2009).

Depression and Alcohol Misuse

Research also shows a link between depression and alcohol misuse among college students; even subclinical levels of depression are linked to alcohol or other substance misuse (Pedrelli et al., 2011; Weitzman, 2004). More than 80% of college students who experience depression or poor mental health consume alcohol, and many report heavy episodic drinking (Weitzman, 2004). Of importance, depression has been associated with alcohol-related consequences including other health, academic, social, and judicial problems (Dennhardt & Murphy, 2011; Geisner, Larimer, & Neighbors, 2004; Grant & Harford, 1995; LaBrie, Kenney, & Lac, 2010; Martens et al., 2008; Weitzman, 2004). Despite the prevalence of depression among college students and the co-occurrence of depression with alcohol misuse, little is known about whether depression affects students' responses to a BMI.

Depression Effects on Intervention: Theoretical Underpinnings and Research

In theory, depression symptoms may interfere with a student's response to a BMI in several ways. First, depression-related cognitive deficits (e.g., reduced attention or concentration; American Psychiatric Association, 2000) may interfere with the encoding of information that might otherwise be helpful. Second, depressive symptoms may thwart adaptive goal-directed behavior or self-regulation processes (Ferster, 1973; Street, 2002) essential to BMIs. Third, use of alcohol to cope with negative affect is associated with alcohol problems (Kuntsche, Knibbe, Gmel, & Engels, 2005); yet, coping motives are typically not addressed in BMIs, and so alcohol use may continue following intervention. Fourth, depression may disrupt social interaction, reducing social support and perhaps socialization opportunities that might facilitate response to a BMI (Joiner, 2000; Joiner & Timmons, 2009).

A handful of studies have examined symptoms of depression as a moderator of the effects of brief alcohol interventions in adult (non-college-student) populations. Among 248 problem drinkers from a trauma center, baseline depression did not influence patient response to two brief interventions (i.e., personalized motivational interventions or information and advice; Ryb et al., 2010). However, in a sample of risky drinking women, those with higher levels of depression at baseline reported greater improvements in a motivational intervention plus feedback condition (compared to those in the control conditions; Penberthy, Hook, Hettema, Farrell-Carnahan, & Ingersoll, 2013). Other research suggests that depressive disorders in individuals with problematic drinking predicts help seeking for drinking problems in general, but that depression reduces the likelihood that an individual will seek additional help following brief alcohol intervention (Grothues et al., 2008).

Studies investigating depression as a moderator of intervention efficacy in college students are rare. One study examined the effect of BMI among college students with high levels of depression. In this study, a mailed intervention with personalized alcohol use feedback was used as an adjunct to a depression treatment (Geisner, Neighbors, Lee, & Larimer, 2007). Overall, the mailed intervention was not efficacious in reducing alcohol use or consequences, suggesting that depressive symptoms may have interfered with improvement. Limitations of this study include its emphasis on treatment for depression, use of a suboptimal BMI to address alcohol misuse, and lack of a control group, preventing a true test of moderation. A second study compared individuals who received a BMI plus a component based in behavioral activation techniques (which may also benefit depression) to a control group that augmented the BMI only with relaxation training (Murphy et al., 2012). In the control group, students with high depression reduced their heavy drinking less following a BMI than did individuals with low depression. Thus, in the absence of an intervention component that may more directly target negative mood, depression resulted in worse outcomes. More research clearly is needed to understand in what way depression may influence response to BMI among college students, including an investigation of the impact of depression when comparing a standard BMI to no treatment at all.

Gender Effects on Intervention: Theoretical Underpinnings and Research

In addition to depressive symptoms, gender may also moderate BMI efficacy. One reason for this may be that, when prompted to use protective behavioral strategies to reduce alcohol-related harm, women are more likely to do so (Benton et al., 2004; Walters, Roudsari, Vader, & Harris, 2007). Another reason comes from the gender role/masculinity literature. It has been suggested that attempting to fulfill a masculine sex role and/or to reject a feminine sex role may result in heavy drinking (Chomak & Collins, 1987). Relative to women, men also may be less likely to ruminate and more likely to distract themselves in response to depressed mood, perhaps by engaging in externalizing behaviors such as alcohol use (Nolen-Hoeksema, 2002). These processes may prevent men from reducing their drinking following an intervention.

Potential Interactions Among Gender, Depression, and Intervention

Gender differences have been observed in levels of depression, alcohol use, and response to BMIs. Female students are more likely to screen positive for depression and to report depressive symptoms (Eisenberg et al., 2007; Geisner et al., 2004). Male students typically consume more alcohol than female students do (Johnston, O'Malley, Bachman, & Schulenberg, 2012; O'Malley & Johnston, 2002). Findings regarding gender differences in alcohol consequences (Nolen-Hoeksema, 2004; Perkins, 1992; Sugarman, DeMartini, & Carey, 2009; Wechsler, Dowdall, Davenport, & Rimm, 1995; A. White, Jamieson-Drake, & Swartzwelder,

2002) and response to BMI have been mixed (Borsari & Carey, 2000; Carey, Henson, Carey, & Maisto, 2007; Murphy et al., 2004). Given that gender differences in depression, drinking, and response to a BMI have been observed, it is important to determine how gender and depression may interact to affect drinking outcomes following an empirically validated BMI. Indeed, gender has been found to moderate the relationship between depression and alcohol use, though in the absence of intervention. However, findings are equivocal, with some research demonstrating the link between depression and alcohol use for men (e.g., Cooper, Russell, Skinner, Frone, & Mudar, 1992; Geisner et al., 2004) and others for women (Noel & Lisman, 1980).

The Present Study

In sum, depression not only is common but also is linked to problematic drinking among college students. Many students do not respond to BMIs for alcohol misuse, making the identification of students at risk for poor response important. Researchers studying the comorbidity of mental disorders and substance misuse have commented on the need for (a) increased focus on college populations and (b) further exploration of subgroup (e.g., gender) differences, in order to more effectively inform targeted harm reduction efforts (Cranford, Eisenberg, & Serras, 2009; Kenney & LaBrie, 2013; O'Brien et al., 2004).

In light of this background, the present study extends the literature by examining whether and for whom symptoms of depression impact the efficacy of BMIs for college students. First, we hypothesized a main effect such that students with higher levels of depressive symptoms would report more alcohol use and consequences relative to students with lower levels of depressive symptoms. Second, because BMIs focus on changing cognitive and motivational determinants of drinking (Carey, 2012), we predicted that symptoms of depression would interfere with BMI-induced change. Thus, we also hypothesized a two-way interaction between intervention condition (BMI vs. control) and depressive symptoms, with higher levels of depressive symptomatology expected to interfere with BMI efficacy. Third, given research demonstrating that gender and depression may interact to predict alcohol misuse, we also explored whether the impact of depression on BMI outcomes differed by gender, without an a priori hypothesis. An explicit test of how depression may explain the variability in response to brief alcohol interventions can advance the literature, representing an initial step toward informing whether it might be necessary to design interventions that specifically target students with poor mental health.

Method

Data for this study come from a randomized clinical trial (Carey, Carey, Maisto, & Henson, 2006). All procedures were approved by the institutional review board. Student volunteers provided written consent prior to completing a screening survey and were eligible if they were age 18–25; freshmen, sophomore, or junior in status; and reported ≥1 episode of heavy drinking in an average week or ≥4 heavy drinking episodes in the last month. Heavy drinking was defined as ≥4 standard drinks for women and ≥5 for men. Five hundred and nine consenting students were randomized (stratified by gender) to one of six conditions formed by crossing: (a) timeline followback interview (TLFB; administered at baseline or not) and (b) intervention (none, basic BMI, or a BMI enhanced with a decisional balance exercise). As a part of the larger randomized controlled trial, all participants completed additional assessments at baseline and three follow-ups (1, 6, and 12 months).

We compared students in the two control conditions (no intervention, with and without a TLFB at baseline; $n = 165$) to students in the two conditions receiving the basic BMI (with and without a TLFB at baseline; $n = 165$). The enhanced BMI condition was excluded because this condition did not produce significant reductions in drinking in comparison with the control condition (Carey et al., 2006) and because we sought to examine the potential for depression to interfere with behavior change in the context of an efficacious intervention. Additional details on the procedure are available in (Carey et al., 2006). For the present study, baseline and 1 month follow-up data were used, as the BMI had its greatest impact at 1 month.

Participants

Participants were 330 heavy drinking college student volunteers at a northeastern university who were assigned to the basic BMI or control conditions and who provided complete data at baseline and at the 1 month follow-up (96% of the 342 students originally assigned to those groups). In all, 65% were female and the average age was 19.26 years ($SD = 0.81$). Most self-identified as White (86%), while 2% self-identified as Black, 3% as Asian, and 9% as other/unknown.

Measures

Descriptive information. Participants reported demographic information including gender, age, race/ethnicity, residence, and Greek affiliation.

Depression. Symptoms of depression were assessed with the 20-item Center for Epidemiologic Studies Depression Scale (CES-D; Santor & Coyne, 1997) at baseline. Response options range from 0 (*rarely or none of the time*) to 3 (*most or all of the time*) and assess symptoms over the past four weeks. A continuous summary score was obtained by summing across the 20 items. Alpha in this sample was .89.

Alcohol use. A modified version of the Daily Drinking Questionnaire (DDQ; Collins, Parks, & Marlatt, 1985) assessed alcohol use over the past month at both baseline and the 1 month follow-up. A standard drink was defined (10–12 oz beer/wine cooler, 4 oz wine, 1.25 oz liquor). The DDQ was used to calculate the typical number of drinks consumed per week (weekly drinks). Participants also reported the frequency of heavy drinking (heavy frequency) in the last month, defined as ≥5 or ≥4 drinks for men or women, respectively (Wechsler et al., 1995).

Alcohol consequences. Past month consequences were assessed with the Rutgers Alcohol Problems Index (RAPI; H. White & Labouvie, 1989) at baseline and at the 1 month follow-up. A 5-point scale (0 = *never*, 4 = *>10 times*) indicates how often each of 24 consequences occurred in the previous 30 days. Alpha in this sample was .83.

Data Analysis Plan

Weekly drinks and consequences were positively skewed. To address nonnormality, we examined residuals from the final mod-

els, and outliers were recoded to the next highest value plus one (Tabachnick & Fidell, 2007). Multiple regression models were used to test three-way interactions among intervention (BMI vs. control), gender (male vs. female), and level of depression (continuous). All analyses controlled for baseline values on the outcome, allowing for characterization of reductions in alcohol use from baseline. We hypothesized a main effect of depression, qualified by a two-way interaction between condition and level of depression; we also explored a three-way interaction, assessing whether the condition by depression interaction varied as a function of gender. All variables were centered at their mean prior to forming the interactions, reflecting a weighted effects code for the dichotomous variables (Aiken & West, 1991). For significant interactions, simple slopes were probed within gender and at high and low values of depression, 1 standard deviation above and below the mean, respectively. We report the unstandardized coefficients for the effect of condition within gender and level of depression.

Results

Descriptives

Demographic and drinking variables did not differ by intervention condition. Sample descriptives at baseline are displayed in Table 1. Women reported more symptoms of depression than men, and men consumed more drinks in a typical week and had more heavy drinking occasions than women. Men and women did not differ in level of consequences.

Substantive Models

Results of substantive models are displayed in Table 2 and described below.

Weekly drinks. Condition, depression, and gender interacted in the prediction of weekly drinks ($B = 0.51$, $t = 1.96$, $p = .05$; $f^2 = .01$). We note that, in testing the interactions, 1 standard deviation above the overall mean of depression, at a score of 22.5, is well above the standard cut point of 16 for significant depressive symptomatology (Radloff, 1977). Relative to the control condition, the BMI significantly reduced weekly drinks among men who were high in depression ($B = -5.61$, $t = -2.05$, $p = .04$) but was no better than control among men who were low in depression ($B = 0.46$, $t = 0.23$, $p = .82$). The opposite pattern emerged among women. The BMI had only a marginal effect among women who were high in depression ($B = -2.39$, $t = -1.70$, $p = .09$) but significantly reduced weekly drinks among women who were low in depression ($B = -4.89$, $t = -3.08$, $p = .01$), relative to control.

Table 2
Regression Model Results for Tests of Two- and Three-Way Interactions

Predictor	Weekly drinks *B*	Heavy frequency *B*	Consequences *B*
Condition	−3.27***	−0.48***	−1.69**
Gender	−2.94***	−0.03	0.29
Depression	0.03	−0.00	0.09**
Baseline level of outcome	0.43***	0.55***	0.51***
Condition × Gender	−1.05	−0.21	−0.79
Condition × Depression	−0.03	0.01	−0.07
Gender × Depression	0.05	0.02	0.05
Condition × Gender × Depression	0.51*	0.08*	−0.07

* $p < .05$. ** $p < .01$. *** $p < .01$.

Heavy frequency. The three-way interaction among condition, depression, and gender also significantly predicted heavy frequency ($B = 0.08$, $t = 2.11$, $p = .04$; $f^2 = .01$). The pattern of effects was similar to that found for weekly drinks. Relative to control, the BMI was associated with a marginal reduction in heavy frequency among men who were high in depression ($B = -0.78$, $t = -1.69$, $p = .09$) but was not superior to control among men who were low in depression ($B = 0.08$, $t = 0.25$, $p = .81$). The BMI also had no effect on heavy frequency among women who were high in depression ($B = -0.24$, $t = -1.04$, $p = .30$). However, the BMI reduced heavy frequency among women who were low in depression ($B = -0.87$, $t = -3.29$, $p = .001$).

Consequences. The three-way interaction among condition, depression, and gender was not significant for consequences ($B = -0.07$, $t = -0.49$, $p = .63$). The two-way interaction between depression and condition was also nonsignificant ($B = -0.07$, $t = -1.12$, $p = .27$). Consistent with hypotheses, however, there was a main effect of depression on consequences ($B = 0.09$, $t = 2.61$, $p = .01$), indicating that, across condition and gender, higher levels of depression were associated with increased experiences with alcohol-related consequences at follow-up.

Examination of Change Scores

To further explore the relationships in our data, we created groups representing the interactions between condition, gender, and high (CES-D ≥ 16) versus low (<16) depression. Subsequently, *t* tests were used to examine differences from baseline to

Table 1
Sample Descriptives for Predictors and Outcomes at Baseline

Measure	Total sample $N = 330$ *M* (*SD*)	Men $n = 116$ *M* (*SD*)	Women $n = 214$ *M* (*SD*)	*t* test for gender difference
Depression	13.61 (8.9)	11.47 (7.6)	14.76 (9.4)	$t = -3.45$, $p = .001$
Weekly drinks	19.19 (11.5)	24.30 (13.2)	16.42 (9.4)	$t = 5.68$, $p = .001$
Heavy frequency	3.86 (1.5)	4.18 (1.6)	3.69 (1.5)	$t = 2.80$, $p = .01$
Consequences	7.58 (6.2)	7.58 (6.3)	7.57 (6.1)	$t = 0.00$, $p = .99$

Time 1 in both drinking outcomes, and change scores in from pre- to posttest were plotted for both weekly drinks (see Figure 1) and heavy drinking frequency (see Figure 2).

As displayed in Figure 1, for women, the best outcomes in weekly drinks were observed in the BMI condition in the context of low symptoms of depression. For men, the BMI was similarly effective regardless of depression status. The worst outcomes were observed in the control condition in the context of high symptoms of depression, for both men and women. Figure 1 reveals that the relative differences between BMI and control for men versus women are partially explained by the fact that the nondepressed participants (male and female) in the control conditions tended to improve from baseline to 1 month, whereas depressed male students in the control conditions showed no evidence of improvement.

When one looks at changes in frequency of heavy drinking (see Figure 2), findings are similar. For women, the best outcomes were again observed in the BMI condition in the context of low symptoms of depression. For men, those who were depressed and received the BMI reported the greatest reductions in heavy drinking frequency. The interpretation of findings differs slightly, however, because of outcomes in the control conditions. In contrast to drinks per week, heavy drinking frequency was reduced among all depressed women but not among nondepressed women in the control condition. Taken together, these follow-up analyses suggest that for those who received BMI, depression had a similar impact for men and women (i.e., significant reductions in drinks per week and heavy drinking frequency); however, for those who did not receive intervention, depression had inconsistent effects across genders.

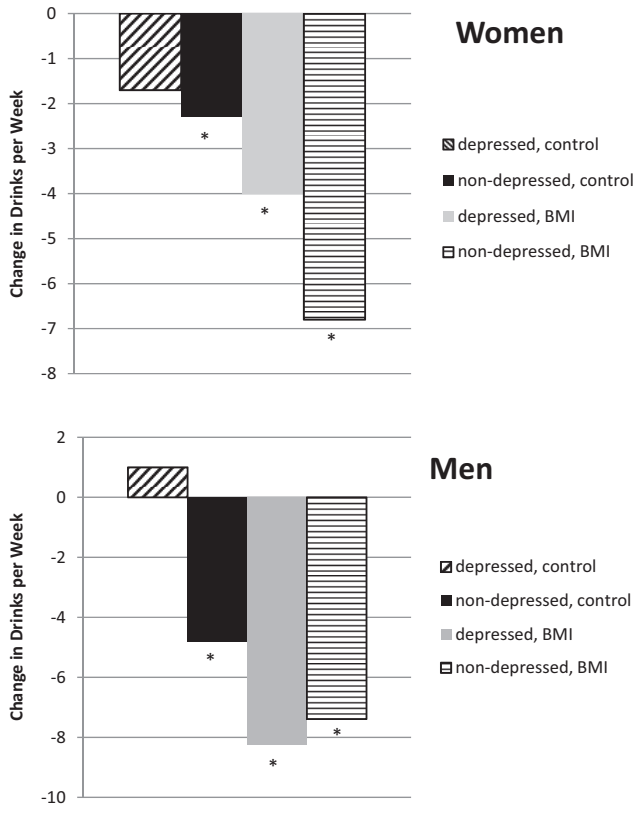

Figure 1. Change scores from baseline to Time 1 in drinks per week. BMI = brief motivational intervention. * $p < .05$.

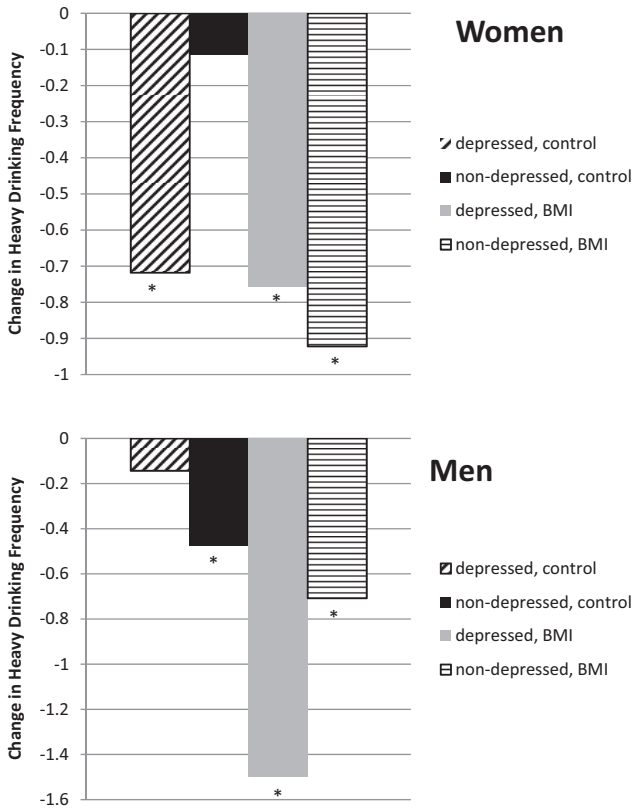

Figure 2. Change scores from baseline to Time 1 in heavy drinking frequency. BMI = brief motivational intervention. * $p < .05$.

Discussion

We found differential effects of a BMI relative to control for men and women with and without depressive symptoms. Women who were depressed did not benefit from a BMI more than they did from an assessment-only control; however, women with low depression reported greater reductions in two drinking outcomes (weekly drinks, heavy frequency) if they received the BMI compared to a control condition. In contrast, depressed men reported greater reductions in weekly drinks only (and marginally greater reductions in heavy frequency) if they participated in the BMI instead of a control. However, among men low in depression, there was no difference between the BMI versus control condition. We also found that higher depression makes individuals more vulnerable to alcohol consequences, but this effect did not differ by gender or exposure to intervention.

Supplementary examination of change scores in weekly drinks across groups highlights the magnitude of change rather than relative change. In general, the BMI was more effective than control for both men and women, as reported in the parent study (Carey et al., 2006). However, the greatest reductions in weekly drinks and heavy drinking frequency occurred among nondepressed women who received the BMI. In the control conditions,

we observed no change in weekly drinks among the depressed students of both genders and no change in heavy drinking frequency among depressed men. The lack of change evidenced by most depressed students in the control group contrasts with significant, though small, reductions in weekly drinks by nondepressed students of both genders and reductions in heavy drinking frequency among nondepressed men in the control group. These findings suggest that, whereas assessment is sufficient for motivating reductions in drinking among nondepressed students, depressed students will not initiate changes in the absence of an intervention.

As noted, the small body of prior literature examining effects of depression on alcohol intervention has been mixed. Although one study found that depressed women (when compared to nondepressed women) improved more in a motivational intervention plus feedback relative to control (Penberthy et al., 2013), we found that only women who were low in depression improved after the BMI relative to control. These divergent findings may reflect methodological differences between the studies, including sampling (i.e., differences between college student and general population heavy drinkers) and choice of control conditions (video or written information vs. assessment only). Of note, our findings for the role of depression among women are more in line with those of Murphy et al. (2012), who found that individuals who received BMI plus relaxation (the control condition) with high depression reduced their heavy drinking less than individuals with low depression. However, gender was not examined by Murphy et al. as an additional moderator of outcomes; thus, whether their results would hold up for both men and women remains unknown.

We hypothesized that depression would interfere with intervention outcomes. Contrary to this prediction, the data showed that, among the men in our sample, receiving an intervention was superior to control when depression was high. When depression was low, BMI and control outcomes were equivalent. No studies have examined an interaction between depression and BMI outcomes for men specifically. However, these findings converge with those of a study examining the interaction between BMI outcomes and posttraumatic stress disorder (PTSD) symptoms (Monahan et al., 2013). PTSD-positive students who received a counselor-delivered MI (vs. a computer delivered intervention or assessment only) reduced their alcohol consequences, while there was no significant change in consequences for PTSD-negative students who received MI. However, the role of gender was not evaluated by Monahan et al. (2013). They suggested that elevated distress may make students more open to the possibility of making changes to their drinking, an interpretation that may also apply to the depressed men in our sample.

This suggestion is consistent with research on gender roles/masculinity, which may help to explain the observed three-way interaction among gender, depression, and intervention. First, Taylor and Hall (1982) suggest that higher levels of depressive symptoms will tend to be associated with lower levels of masculinity. Further, men are also less likely to seek out mental health treatment (Addis & Mahalik, 2003). Even when they do seek treatment, men hold expectations that prevent their full utilization of services (Schaub & Williams, 2007). Combined with the fact that men drink more than women, all of this suggests that depression may result in lower levels of masculinity, which in turn should be associated with both more responsiveness/positive attitudes toward seeking psychological health and less drinking. In other words, depression among men may prompt more "feminine" behavior, making them more responsive to the intervention. In the present study we demonstrated that at least in the short term, depressed men appear to be responding to the messages conveyed by the intervention and enacting change, relative to nondepressed men.

We did not observe any three- or two-way interactions in the prediction of alcohol consequences. Still, a main effect of depression on consequences further highlights depression as a risk factor. However, unlike what we observed for alcohol use, this relationship was not moderated by gender. Although women who were depressed were less likely to reduce their alcohol use than depressed men, they were not less likely to reduce their consequences. Such findings make sense in that, even though men tend to drink more, (a) men do not necessarily experience more consequences (Nolen-Hoeksema, 2004; Perkins, 1992; Wechsler et al., 1995; A. White et al., 2002) and (b) interventions do not always result in reductions in consequences despite reductions in drinking (Cronce & Larimer, 2011). In addition, although alcohol use may change in the short term, it may take longer to observe reductions in consequences. Regardless, we believe that the main effect of depression on consequences (in the absence of an interaction) further supports the need to target depression in the context of brief alcohol interventions for those who suffer from it.

Given depression's muting effect on BMI outcomes for women, it is important to consider the potential mechanisms of this effect. First, the cognitive deficits that accompany depression (e.g., reduced ability to attend to information) may undermine encoding of risk reduction information discussed in a BMI. Second, depressive symptoms may thwart goal-directed behavior or other processes of self-regulation that underlie motivation to change. Third, depressed students may continue to drink to cope with life stressors or negative emotions, perhaps due to a lack of alternative coping mechanisms (Bradizza, Reifman, & Barnes, 1999), more positive expectancies regarding alcohol's ability to alleviate negative mood or enhance positive mood (Goldman, Brown, & Christiansen, 1987), increased reinforcing value of alcohol (Murphy et al., 2013; Rousseau, Irons, & Correia, 2011), lack of enjoyable alternatives to drinking (Murphy et al., 2012), or higher perceived norms for drinking (Linden & Lau-Barraco, 2013). An important question is whether depression interferes with intervention effects due to processes that occur during the intervention (e.g., reduced attention), following the intervention (e.g., lower goal-directed behavior, coping motives), or both. Future research is needed to clarify the underlying mechanism(s) of this phenomenon.

Clinical Implications

The finding that gender and depression symptoms moderated the effect of the BMI on drinking outcomes has two important clinical implications. First, use of screening and brief intervention in mental health settings is warranted (Denering & Spear, 2012). Although women may reduce harmful drinking without intervention (Carey, Carey, Henson, Maisto, & DeMartini, 2011), our data suggest that depressed men are at risk for exhibiting worse drinking outcomes over time in the absence of intervention. Clinicians treating depressed male college students are encouraged to screen for risky drinking and to provide or refer for BMI when warranted.

Second, brief alcohol interventions tailored especially for depressed students are needed. Depressed women in our sample did benefit from the BMI but not as much as did nondepressed women, corroborating results obtained by others (Geisner et al., 2007). Taken together, refinement and evaluation of a BMI tailored specifically for students with depression and risky drinking is warranted. An example of an intervention that may be well suited for students with depression comes from Murphy et al. (2012), who found that a BMI supplemented with a substance-free activity session enhanced the efficacy of BMIs for depressed students. BMIs may benefit from broadening students' coping skills or directly targeting the hypothesized mechanisms identified earlier.

Limitations and Future Directions

These findings should be interpreted mindful of study limitations. First, participants were largely White, consistent with previous research showing that minority students tend to drink less heavily (O'Malley & Johnston, 2002). Therefore, findings may not generalize to racial and ethnic minority students. Second, we relied on a self-report measure of depressive symptoms, rather than a diagnostic interview. Even though the CES-D is a reliable and valid measure of depression (Shean & Baldwin, 2008) and we used a cutoff score for simple slopes analysis that is predictive of significant depressive symptomatology (Radloff, 1977), whether our findings would generalize to individuals diagnosed with major depressive disorder in unknown. Future studies might use more rigorous methods for identifying students with major depressive disorder. Third, the analyses involving change scores was limited by a small number of men with high levels of depression. Given this, combined with small effect sizes, our results require replication. Finally, this study was not designed to test why depression might interfere with the benefit of brief alcohol interventions. Future work should be designed to involve longitudinal and a priori investigations of these effects, perhaps by reassessing depression and potential mechanisms of its impact at follow-up.

Conclusion

Results from this study corroborate previous findings suggesting that gender influences response to a BMI (Murphy et al., 2004) and extend this literature by clarifying the role of depression on treatment response. Our initial findings suggests the need for more prospective and a priori investigations of such effects, including research designed specifically to understand why depression has a differential impact on BMI outcomes for men versus women. Increased understanding of the influence of gender and depression on outcomes of BMIs can inform efforts to modify such interventions to promote better outcomes among students most at risk.

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