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Drink Less or Drink Slower: The Effects of Instruction on Alcohol Consumption and Drinking Control Strategy Use

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Brief alcohol interventions often involve recommendations to use drinking control strategies. However, little is known about the functional effect of these strategies on alcohol use. This prospective study employed an experimental design to evaluate the relationship between strategy use and alcohol consumption. The differential effects of instructions to increase the use of strategies or to reduce alcohol consumption were compared to self-monitoring (SM) only. Undergraduate drinkers were randomized into 3 conditions: SM plus strategy increase (SI; $n = 61$), SM plus alcohol reduction (AR; $n = 60$), and SM control (SM; $n = 56$). Participants in the AR group reduced their alcohol use over 2 weeks, while those in the SI group did not drink less. Participants in the SI group increased strategy use over time, whereas the AR group increased use of some strategies but not others. These results indicate that increasing use of drinking control strategies does not necessarily result in reduced drinking. Furthermore, all strategies are not equal in their association with alcohol consumption; if the goal is alcohol reduction, type of strategy recommended may be important.

Keywords: drinking control strategies, college students, alcohol use

Heavy drinking by college students is associated with substantial risks (Aertgeerts & Buntinx, 2002; Hingson, Heeren, Winter, & Wechsler, 2005; Perkins, 2002; Wechsler et al., 2002). Effective alcohol intervention programs for college students have combined information, normative feedback, and values clarification within a context of teaching skills to moderate risky drinking behaviors (Larimer & Cronce, 2007). Many of these brief skills-based interventions offer menus of strategies or tips to help students moderate their drinking. Such suggestions are consistent with observations that college students employ strategies in drinking situations to reduce their alcohol use and/or related risk (Benton, Benton, & Downey, 2006; Benton et al., 2004; Martens et al., 2004; Sugarman & Carey, 2007; Werch & Gorman, 1986, 1988).

Relationship of Drinking Control Strategies and Alcohol Consumption

Studies investigating dimensionality of strategy use measurement scales have produced mixed results, with some finding that items loaded on one single factor (Benton et al., 2004; Haines, Barker, & Rice, 2006), and others showing that items loaded on anywhere from three to seven factors (Martens et al., 2005; Sugarman & Carey, 2007; Werch & Gorman, 1986). One reason for these mixed findings may be that the measures used in each of the studies varied in number and type of strategies. In addition, psychometric information from earlier studies is limited (Werch & Gorman, 1986) and a more recent measure with good psychometric properties addressed only a subset of strategies that can be employed while drinking (Martens et al., 2004). The literature also has shown that the nature of the relationship between strategy use and alcohol consumption varies. Two studies found that strategy use was negatively related to alcohol use (Benton et al., 2004; Martens et al., 2005). However, other studies have found nonlinear relationships between strategy use and alcohol consumption (Werch, 1990; Werch & Gorman, 1988). Specifically, when college students were categorized by the amount of alcohol consumed, moderate drinkers used strategies most frequently, whereas abstainers and heavy drinkers used strategies with lower frequencies (Werch & Gorman, 1988). When categorized by frequency of strategy use, students who used drinking control strategies at moderate levels reported the greatest amount of alcohol use, compared to students who rarely used strategies and students who often used strategies (Werch, 1990).

Sugarman and Carey (2007) examined the relationship of three factors on the Strategy Questionnaire (Sugarman & Carey, 2007) and found that two out of the three factors (Selective Avoidance and Alternatives) were negatively related to alcohol consumption, whereas the factor labeled Strategies While Drinking was positively correlated with alcohol consumption. In addition to a linear relationship, quadratic relationships with drinking emerged for both Strategies While Drinking and Alternatives. This research provides evidence that use of drinking control strategies is not always associated with lower alcohol consumption.

Effects of Alcohol Brief Interventions on Strategy Use

Evidence supports the use of skills-based brief interventions with college students (Baer, Kivlahan, Blume, McKnight, & Marlatt, 2001; Dimeff, Baer, Kivlahan, & Marlatt, 1999; Murphy et al.,

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2004, 2001). A recent meta-analysis evaluating alcohol abuse prevention interventions for college drinkers indicated that 43% of the interventions included drinking control strategies as a component (Carey, Scott-Sheldon, Carey, & DeMartini, 2007). However, this review did not find evidence that the presence of drinking control strategies was associated with outcomes. Furthermore, the hypothesized role of strategies for achieving drinking reductions rarely has been tested.

Indirect evidence supporting a functional relationship between strategy use and alcohol consumption comes from cross-sectional studies demonstrating correlational relationships (Benton et al., 2004; Glassman, Werch, & Jobli, 2007; Martens et al., 2005; Sugarman & Carey, 2007; Werch, 1990; Werch & Gorman, 1988). Direct evidence of change in strategy use as a function of alcohol intervention is limited. Barnett and colleagues (2007) evaluated the efficacy of a brief motivational intervention (BMI) versus a computer-delivered intervention for 225 mandated college students. The BMI included a list of several drinking control strategies, and BMI participants significantly increased strategy use from baseline to 3 and 12 months. No change in strategy use was observed after the computer-delivered intervention at either follow-up time point. In another study, Larimer and colleagues (2007) found that college students' use of protective strategies increased as a result of a personalized mailed feedback intervention. In addition, strategies were strongly related to drinking at follow-up, and the effect of feedback on drinking was no longer significant when controlling for strategy use. This limited evidence indicates that strategy use may be an important factor in determining the effect of brief alcohol interventions for college students.

Purpose of the Present Study

The pattern of findings in cross-sectional studies of drinking control strategies is somewhat mixed with regard to the strength of the relationship and the type of strategies associated with drinking reductions. Although several studies developed strategy measures, these same measures were sometimes not used in follow-up studies, and most often, strategy use was examined as a single construct. The present study used a prospective, experimental design to assess the functional relationship between strategy use and alcohol consumption. Two instructional sets were employed: (a) to reduce drinking and (b) to increase use of strategies. With this design, we hoped to determine if students employ similar or different types of strategies when they are actively trying to reduce drinking than when the instructions are just to increase strategy use. Moreover, this study examined differences between the two experimental groups in alcohol consumption. Specifically, does increased strategy use lead to decreased alcohol consumption? It may be that students who are asked to increase strategy use will employ strategies that are easy to implement while drinking, but these strategies may not necessarily result in reducing alcohol consumption. The design of this study allowed for exploration of the possibility that increasing strategy use in general may not lead to decreased alcohol consumption.

Missing from the current literature is exploration of the effect of strategy use on blood alcohol content (BAC). A number of the strategies focus on maintaining low BACs (i.e., space out drinks, drink slowly, eat before drinking). Therefore, strategy use may be more effective in obtaining safer BACs than in reducing number of drinks consumed. This study examined the effect of strategy use on both average and peak BACs.

We expected that both students who are instructed to increase strategy use and students who are instructed to decrease alcohol consumption will show greater decreases in alcohol consumption and average and peak BACs from baseline to follow-up when compared to the control group. We also expected that the two experimental groups will report greater increases in strategy use frequency from baseline to follow-up than controls.

Method

Overview of Design

This study utilized a randomized prospective design with two experimental conditions (self-monitoring plus alcohol reduction instructions and self-monitoring plus strategy increase instructions) and one control condition (self-monitoring only). Participants completed retrospective assessments at baseline and 2 weeks following the baseline appointment. For the 2 weeks between baseline and follow-up, all participants self-monitored their alcohol consumption and strategy use.

Participants

Undergraduate students 18 years of age or older were recruited for this study and 282 attended a screening session to determine eligibility. Excluded were 32 students who did not report any alcohol use in the past 2 weeks, and 24 students who reported current participation in fraternity/sorority rush (as this event requires students to maintain abstinence from alcohol use). Thus, 80% (n = 226) of the students met inclusion criteria. Of these 226 students, 49 declined participation leaving 177 students (63% of the screened sample) to be randomized to conditions. Participants were assigned to conditions using a random number table that yielded the following: 60 in the alcohol reduction group, 61 in the strategy increase group, and 56 in the self-monitoring group. See Table 1 for descriptive information about the sample.

Measures

Alcohol use. Participants reconstructed the previous 2 weeks of drinking using the Timeline Follow-Back (TLFB; Sobell & Sobell, 1992) interview method in group format. The TLFB is a calendar-based assessment, in which participants indicate for each day of the week: (a) the amount of alcohol that was consumed in standard drink format and (b) the time spent drinking. One standard drink was defined as 12 ounces of beer, 5 ounces of wine, or 1.5 ounces of liquor (Dufour, 2001). These data yielded average drinks per week and average BAC.

Participants also completed a set of open-ended questions on the amount consumed on the heaviest drinking day in the past 2 weeks, and the estimated time spent drinking during the heaviest drinking day. These data were used to estimate peak BAC for the past 2 weeks.

Strategy use. Participants completed the Strategy Questionnaire (Sugarman & Carey, 2007). This 21-item measure assesses the frequency of strategy use in the past 2 weeks (using a Likert-type scale) and yields three internally consistent subscales: Selective Avoidance (e.g., refusing drinks, choosing not to do shots

Table 1
Demographic Information for Randomized Sample

Demographic characteristic	Total	AR	SI	SM
Age: *M* (*SD*)	18.8 (1.0)	18.8 (0.9)	18.9 (1.2)	18.8 (0.9)
Female: *n* (%)	115 (65)	44 (73)	37 (61)	34 (61)
Year in school: *n* (%)				
Freshman	90 (51)	31 (52)	29 (48)	30 (54)
Sophomore	62 (35)	23 (38)	17 (28)	22 (39)
Junior	15 (9)	4 (7)	9 (15)	2 (4)
Senior	10 (6)	2 (3)	6 (10)	2 (4)
Race/Ethnicity: *n* (%)				
Hispanic/Latino	9 (5)	4 (7)	2 (3)	3 (5)
White	143 (81)	48 (80)	49 (80)	46 (82)
African American	13 (7)	3 (5)	5 (8)	5 (9)
Asian	8 (5)	3 (5)	3 (5)	2 (4)
Other	13 (7)	6 (11)	4 (7)	3 (5)
Residence: *n* (%)				
On campus	141 (80)	49 (82)	44 (72)	48 (86)
Off campus	24 (13)	7 (12)	11 (18)	6 (11)
Fraternity/sorority	12 (7)	4 (7)	6 (10)	2 (4)
Greek membership: *n* (%)	25 (14)	10 (17)	8 (13)	7 (13)

Note. $N = 177$, AR: $n = 60$, SI: $n = 61$, SM: $n = 56$. Demographic data were missing for two participants. AR = alcohol reduction; SI = strategy increase; SM = self-monitoring.

when available; $\alpha = .80$), Strategies While Drinking (e.g., drinking slowly, eating before and during drinking; $\alpha = .82$), and Alternatives (e.g., choosing to participate in enjoyable activities that do not include alcohol; $\alpha = .76$). Response options were: *none*, *once, 2–3 times, 4–5 times, 6–10 times, and more than 10*. Because previous cross-sectional research has shown that the Selective Avoidance and Alternatives scales were negatively related to alcohol consumption, whereas Strategies While Drinking were positively related to alcohol consumption (Sugarman & Carey, 2007), the three scales were analyzed separately.

Daily diary. The daily diary (DD) contained 14 pages, 1 for each day of the 2-week monitoring period. For each day, the participant recorded the number of standard drinks consumed. In addition, each page contained a list of the 21 strategies from the Strategy Questionnaire. Participants were asked to indicate which, if any, strategies were used on each day, regardless of whether alcohol was consumed.

Procedure

Baseline. Participants convened in small group sessions of up to 10 people, and provided written informed consent. The primary investigator administered the TLFB, after which participants completed a demographic form, questions about peak alcohol use in the past 2 weeks, and the Strategy Questionnaire.

Eligible participants were randomized into one of three conditions: alcohol reduction (AR), strategy increase (SI), or self-monitoring (SM) control group. Participants were grouped according to their assigned condition, and then were oriented to that condition. Participants heard a common set of instructions for the SM component and received the DD forms. The two experimental conditions received additional instructions determined by their randomization status. Specific instructions for the AR condition read,

> Over the next 2 weeks, we ask that you try to reduce the amount of alcohol that you drink by 50%. By 50% reduction, we mean you cut the number of drinks you typically drink per occasion by half in the next 2 weeks.

Specific instructions for the SI condition read,

> Over the next 2 weeks, we ask that you try to increase your use of the strategies listed below by 50%. By 50% increase, we mean you increase the typical number of strategies used by half. You can use some more frequently and/or use additional strategies that you haven't yet tried.

The instructions were adapted from previous studies that successfully used similar behavioral prescriptions of alcohol reduction with college student samples (Burish, Maisto, Cooper, & Sobell, 1981; Correia, Benson, & Carey, 2005). There was no precedent in the literature to estimate how much of an increase in strategy use would be needed to be directly equivalent to a 50% reduction in alcohol use. Therefore, a goal of 50% increase in strategy use was instructed based on the need to give participants a clear goal that would be meaningful and could be directly measured from baseline. Participants in the SM condition did not receive any instructions to increase or decrease either behavior.

Follow-up. All participants returned 2 weeks after their baseline appointment and completed the TLFB, questions about peak alcohol use in the past 2 weeks, and the Strategy Questionnaire. Thirty participants (17%) were unable to return at the 14-day mark, thus the follow-up length ranged from 14- to 20-days postbaseline.

Analysis Plan

Descriptive analyses will assess relationships between strategy use and alcohol consumption at baseline. In addition, group differences will be examined for demographic variables (gender, age, year in school, race, residence, and Greek membership) and drinking variables at baseline. Next we will conduct repeated measures analyses of variances (ANOVAs) to assess for group by time interactions for the three alcohol use and three strategy use variables. Follow-up analyses will be conducted on change scores for ease of interpretation and to efficiently examine comparisons.

Results

Data Preparation

Data from the TLFB were aggregated to compute the average number of drinks per week and average BAC variables. BAC was calculated using the formula outlined by Matthews and Miller (1979), which adjusts for gender and body weight. Average BAC was calculated by applying this formula to the data for each of the 14 TLFB days for baseline and follow-up, and then averaging across BACs for drinking days to obtain mean BAC scores for baseline and follow-up time points. Heaviest BAC was calculated by using this formula with data from the two open-ended questions about the heaviest drinking day, at baseline and follow-up. Estimated BAC is an approximation of BAC and therefore subject to some error due to lack of control over conditions affecting individual rates of absorption and metabolism (Davies & Bowen, 2000). However, estimated BAC and BAC have been found to be significantly correlated (Carey & Hustad, 2002; Hustad & Carey, 2005).

Summary statistics were generated to evaluate the distributions of variables. To correct for nonnormality due to positive skew, the following variables were square-root transformed: average drinks per week (baseline and follow-up), average BAC (baseline and follow-up) and heaviest BAC (baseline and follow-up).

Comparisons Across Assessment Mode

Drinking data collected from the TLFB assessment at follow-up were compared with drinking data collected from the DD because these data reflect the same time period. TLFB and DD data were found to be highly correlated (average drinks per week: $r = .96$, $p < .001$; average BAC: $r = .88$, $p < .001$). Although heaviest BAC was calculated from open-ended questions, this variable could also be derived from the TLFB and DD data. To assess consistency of report, heaviest BAC variables were created from the TLFB at follow-up and the DDs. These data revealed that the heavy BAC variable derived from open-ended questions was highly and significantly correlated with the TLFB and DD heaviest BAC variables ($r = .89$, $p < .001$; $r = .89$, $p < .001$). This same relationship emerged when the TLFB and DD BAC variables were correlated with each other ($r = .83$, $p < .001$). Because the three derived heaviest BAC variables were all highly correlated, it was decided to use the heaviest BAC variable derived from the open-ended questions, as this is most often reported in the literature (Collins et al., 2002; Larimer et al., 2001; Murphy et al., 2004). These analyses indicated that the variables derived from the TLFB were highly correlated with the variables derived from the DD. Because the TLFB was administered in a controlled setting and was assessed at both baseline and follow-up, the TLFB variables will be used in the primary analyses. However, analyses also were examined with the DD variables and no differences were found for any of the outcomes. All results in this manuscript will refer to TLFB variables.

Descriptive Analyses

Chi-square and one-way ANOVA tests were performed to compare the three groups on demographic variables assessed at baseline (see Table 1). The three groups did not differ on any demographic variables (gender, age, year in school, race, residence, and Greek membership), or on baseline drinking characteristics (see Table 2). However, a group difference was present at baseline on one of the strategy use variables. One-way ANOVA revealed a significant group difference for Strategies While Drinking, $F(2, 174) = 3.22$, $p = .04$; with the SM group having a higher score at baseline compared to the AR and SI groups.

Correlations of the three subscales of the Strategy Questionnaire were as follows: Selective Avoidance and Strategies While Drinking ($r = .48$, $p < .001$); Selective Avoidance and Alternatives ($r = .45$, $p < .001$); Strategies While Drinking and Alternatives ($r = .33$, $p < .001$). Because the subscales shared only 11 to 23% of variance, separate analyses were run on each.

The relationship between strategy use and alcohol use at baseline was examined by correlating the three strategy use variables (Selective Avoidance, Strategies While Drinking, Alternatives) with the three drinking variables (average number of drinks per week, average BAC, and heaviest BAC). Average drinks per week was inversely correlated with Selective Avoidance and Alternatives scores ($r = -.18$, $p < .05$; $r = -.18$, $p < .05$, respectively),

Table 2
Drinking Characteristics and Drinking Control Strategy Use

	Total	AR	SI	SM
Variable	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)
Average drinks per week				
Baseline	13.64 (12.88)	12.75 (10.99)	15.01 (14.97)	13.09 (12.88)
Follow-up[a]	11.88 (11.41)	9.06 (8.52)	15.11 (14.36)	11.39 (9.65)
Average BAC				
Baseline	0.04 (0.03)	0.03 (0.03)	0.04 (0.04)	0.04 (0.04)
Follow-up	0.03 (0.03)	0.03 (0.02)	0.04 (0.03)	0.03 (0.03)
Heaviest BAC				
Baseline	0.16 (0.11)	0.17 (0.10)	0.17 (0.12)	0.15 (0.11)
Follow-up	0.16 (0.11)	0.14 (0.09)	0.17 (0.11)	0.18 (0.13)
Selective Avoidance				
Baseline	7.97 (6.26)	7.60 (5.86)	7.61 (6.06)	8.77 (6.89)
Follow-up	10.59 (6.59)	10.73 (6.01)	11.69 (6.62)	9.23 (7.01)
Strategies While Drinking				
Baseline[b]	17.91 (8.63)	17.22 (7.91)	16.44 (8.75)	20.25 (8.89)
Follow-up	18.29 (8.85)	17.20 (9.14)	19.46 (8.32)	18.18 (9.10)
Alternatives				
Baseline	8.25 (4.55)	8.15 (4.31)	8.34 (4.70)	8.27 (4.71)
Follow-up	9.18 (4.37)	8.60 (4.20)	9.89 (4.31)	9.04 (4.59)

Note. $N = 177$, AR: $n = 60$, SI: $n = 61$, SM: $n = 56$. Data in table are raw values; F-test statistics are reported for transformed values. AR = alcohol reduction; SI = strategy increase; SM = self-monitoring; BAC = blood alcohol content.
[a] Significant between-groups, $F(2, 174) = 4.08$, $p = .02$. [b] Significant between-groups, $F(2, 174) = 3.22$, $p = .04$.

but positively correlated with Strategies While Drinking score (r = .18, $p < .05$). Correlation analyses examining the relationship of average BAC and strategy use revealed significant negative correlations for Selective Avoidance scores (r = –.17, $p < .05$) and a significantly positive correlation for Strategies While Drinking scores (r = .19, $p < .05$). Alternatives scores were not significantly correlated with average BAC. Heaviest BAC displayed fewer relationships with strategy use compared to the other drinking variables, with only Selective Avoidance scores inversely correlated with heaviest BAC (r = –.15, $p < .05$).

Compliance With Behavioral Instructions

All participants randomized into the study completed follow-up assessments. A percentage change score in average drinks per week from baseline to follow-up was derived from the TLFB data. In total, 68% of the AR group participants decreased their alcohol use by some amount over the follow-up period. A percentage change in strategy use from baseline to follow-up score was derived from the Strategy Use Questionnaire data. Overall, 84% of the SI participants increased their strategy use by frequency or number over the follow-up period. In comparison, 50% of the SM group reduced their alcohol use by some amount, and 55% of the SM group increased their strategy use by frequency or number.

Alcohol Use Outcomes

A 3 (group: AR, SI, SM) × 2 (time: baseline, follow-up) ANOVA using the square-root transformed average drinks per week variables was conducted. There was no main effect for group, $F(2, 174) = 1.64$, $p = .20$; but there was a main effect for time, $F(1, 174) = 8.60$, $p = .004$. Results indicated a significant Group × Time interaction, $F(1, 174) = 4.87$, $p = .008$; as shown in Figure 1a. To explore the interaction, change scores were created to investigate differences in average number of drinks per week by subtracting baseline from follow-up raw values. The three change score variables showed nonnormality in their distributions that could not be corrected by transformation. One-way ANOVA comparing the three groups on change in average drinks per week was nonsignificant, $F(2, 174) = 2.53$, $p = .08$. The mean change scores (and standard deviations) for average drinks per week for the three groups were as follows: AR = –3.69 (1.05), SI = 0.09 (1.31), SM = –1.71 (1.24). Only the AR change score differed significantly from zero, $t = –3.50$, $df = 60$, $p < .001$. Post hoc pairwise comparisons revealed that the AR group reduced average drinks per week more than the SI group ($p < .05$), but not significantly more than the SM group.

The effect of group on intoxication level was assessed by examining average and peak BAC scores. A 3 (group: AR, SI, SM) × 2 (time: baseline, follow-up) ANOVA using the square-root transformed average BAC variables showed nonsignificant main effects of group, $F(2, 172) = 0.52$, $p = .59$; and time, $F(1, 157) = 0.31$, $p = .58$; and a nonsignificant Group × Time interaction, $F(2, 171) = 2.60$, $p = .08$. A one-way ANOVA comparing the three groups on change in average BAC indicated no significant differences in change scores, $F(2, 171) = 1.24$, $p = .29$; see Figure 1b. The mean change scores (and standard deviations) for average BAC for the three groups were as follows: AR = –0.01 (0.02), SI = –0.001 (0.03), SM = –0.01 (0.03); again only the AR group's change score differed significantly from zero, $t = –3.21$, $df = 58$, $p = .002$.

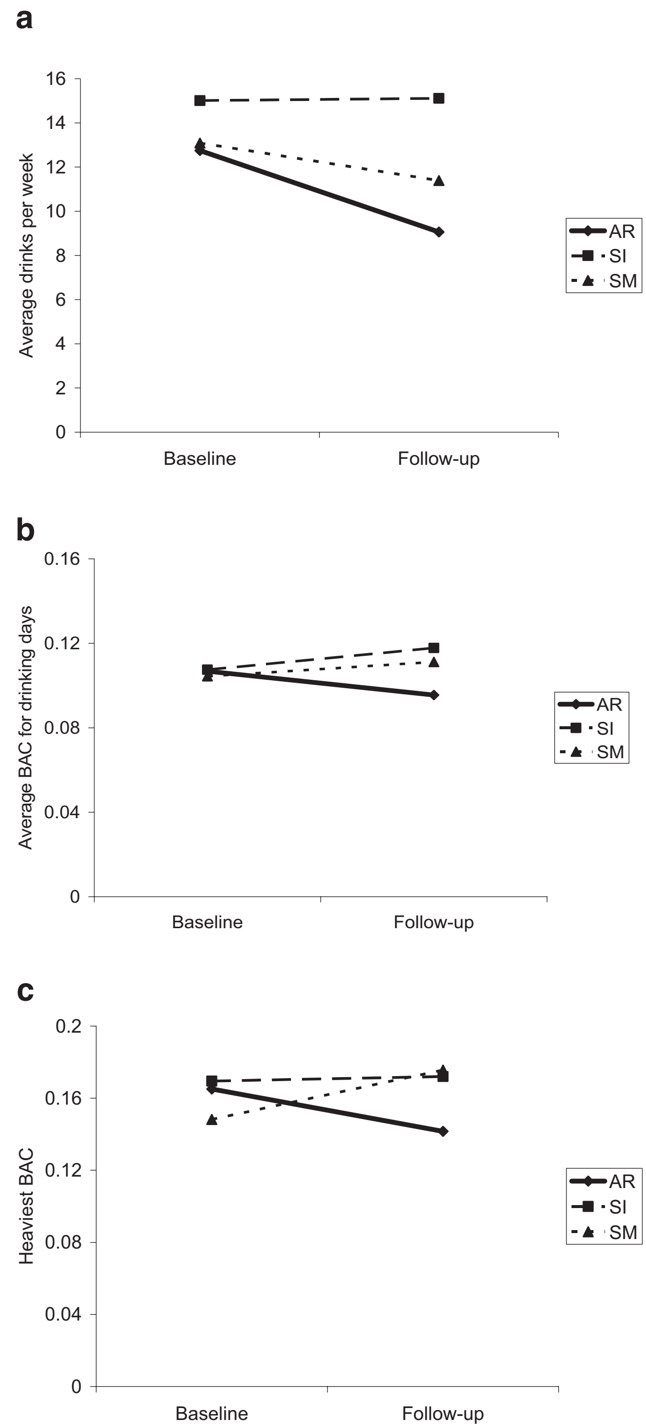

Figure 1. (a through c): Effect of group assignment on alcohol variables (average drinks per week, average BAC, heaviest BAC) at baseline and follow-up. BAC = blood alcohol content; AR = alcohol reduction; SI = strategy increase; SM = self-monitoring.

A 3 (group: AR, SI, SM) × 2 (time: baseline, follow-up) ANOVA using the square-root transformed heaviest BAC variables revealed nonsignificant main effects of group, $F(2, 173) = 0.27$, $p = .77$; and time, $F(1, 172) = 0.02$, $p = .89$; and a significant Group × Time interaction, $F(2, 172) = 5.85$, $p = .004$. A one-way ANOVA comparing the three groups on change in heaviest BAC showed significant differences in change, $F(2, 172) = 5.93$, $p = .003$ (see Figure 1c). The mean change scores (and standard deviations) for heaviest BAC were as follows: AR = –0.02 (0.01), SI = 0.002 (0.01), SM = 0.03 (0.01). Both the AR and SM groups' change scores differed significantly from zero, AR: $t = -2.10$, $df = 60$, $p = .04$; SM: $t = 2.72$, $df = 55$, $p = .008$, however the SM group increased in heaviest BAC from baseline to follow-up, whereas the AR group decreased. Post hoc pairwise comparisons indicated that the AR group decreased in heaviest BAC significantly more than the SM group ($p < .05$). However the AR group did not differ from the SI group, and the SI group did not differ from the SM group.

Strategy Use Outcomes

Three separate 3 (group: AR, SI, SM) × 2 (time: baseline, follow-up) ANOVAs were conducted using the Selective Avoidance, Strategies While Drinking, and Alternatives variables. There was a significant main effect of time for the Selective Avoidance variable, $F(1, 174) = 40.90$, $p < .001$; and a significant main effect of time for the Alternatives variable, $F(1, 174) = 8.48$, $p < .01$. The main effect for Selective Avoidance was qualified by a significant Group × Time interaction, $F(2, 174) = 7.12$, $p < .001$; another significant Group × Time interaction emerged for Strategies While Drinking scores, $F(2, 174) = 6.77$, $p = .002$. The Group × Time interaction for Alternatives scores was not significant, $F(2, 174) = 1.08$, $p = .34$. Figure 2 represents these results graphically.

To further explore these findings, change scores were created for the Selective Avoidance, Strategies While Drinking, and Alternatives variables by subtracting baseline from follow-up values. One-way ANOVAs indicated significant differences in change for Selective Avoidance, $F(2, 174) = 6.85$, $p < .001$; and Strategies While Drinking, $F(2, 174) = 6.77$, $p = .002$ scores, but no significant difference in change for Alternatives scores, $F(2, 174) = 1.08$, $p = .34$.

Selective avoidance. Pairwise comparisons on the Selective Avoidance change scores revealed that both the SI and AR groups significantly increased in strategy use compared to the SM group ($p < .05$), with no differences between the AR and SI groups. The mean change scores (and standard deviations) for Selective Avoidance for the three groups were as follows: AR = 3.13 (0.69), SI = 4.08 (0.80), SM = 0.46 (0.62), with both the AR and SI groups' change significantly different from zero, AR: $t = 4.57$, $df = 60$, $p < .001$; SI: $t = 5.12$, $df = 61$, $p < .001$.

Strategies while drinking. Examination of the means for Strategies While Drinking scores revealed that the SI group increased in strategy use ($M = 3.02$, $SD = 1.09$), the AR group showed relatively no change ($M = -0.02$, $SD = 0.97$), and the SM group decreased in strategy use scores ($M = -2.07$, $SD = 0.85$). The mean change scores (and standard deviations) for Strategies While Drinking for the three groups were as follows: AR = –0.02 (0.97), SI = 3.02 (1.1), SM = –2.07 (0.85), with both the SI and SM groups' change significantly different from zero, SI: $t = 2.77$, $df = 61$, $p = .007$; SM: $t = -2.45$, $df = 56$, $p = .02$. Pairwise comparisons of the means of the change scores indicated a difference between the SI and AR group, and the SI and SM group ($p < .05$), but no difference between the AR and SM groups.

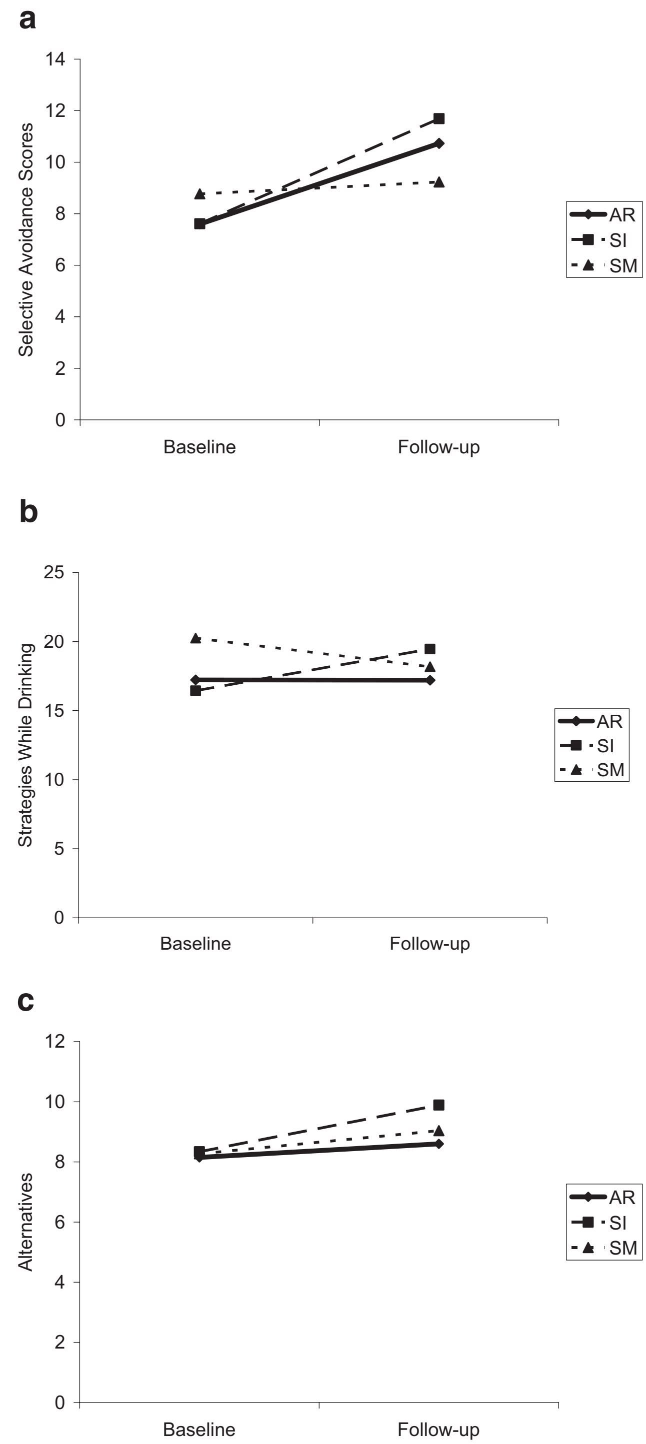

Figure 2. (a through c): Effect of group assignment on strategy use variables (Selective Avoidance, Strategies While Drinking, Alternatives) at baseline and follow-up. AR = alcohol reduction; SI = strategy increase; SM = self-monitoring.

Alternatives. Examination of the means for Alternatives scores revealed that the SI group increased in strategy use ($M = 1.54$,

SD = 0.60), whereas the AR group and the SM group showed relatively no change (AR: M = 0.45, SD = 0.49; SM: M = 0.77, SD = 0.53). The mean change scores (and standard deviations) for Alternatives for the three groups were as follows: AR = 0.45 (0.49), SI = 1.54 (0.60), SM = 0.77 (0.53). Change in Alternatives was only significantly different from zero for the SI group, t = 2.55, df = 61, p = .013. Moreover, pairwise comparisons of the Alternatives change scores indicated no significant differences between any of the groups.

Comparison across strategy type. To address the possibility that SI and AR participants differentially changed across strategy types, additional within-subjects analyses were conducted. All strategy scores were standardized to allow comparison across strategy type, and change scores were compared across strategy type, within each experimental group separately. No significant differences in magnitude of change were found across the three strategy types for either the SI group, $F(2, 177) = 0.75$, $p = .47$; or the AR group, $F(2, 177) = 0.47$, $p = .46$.

Relationship Between Change in Strategy Use and Change in Alcohol Use

The three strategy use change scores were correlated with the three alcohol use change scores and no significant relationships emerged (rs ranged from .02 to –.13). We also looked at these relationships separately for the two instruction groups. The correlations between the three strategy use variables and the three alcohol use variables were nonsignificant for both instruction groups (AR: rs ranged from .01 to –.17; SI: rs ranged from .01 to –.16).

Discussion

This study provides knowledge about which strategies are employed when students are actively trying to reduce their drinking, as well as information on the effect of nonspecific instructions to increase strategy use on alcohol consumption. The prediction that the two experimental groups would display significant decreases in alcohol use over the 2-week follow-up period was only partially supported. The AR group demonstrated significant reductions on two of the three drinking measures (average drinks per week and heaviest BAC). Thus, students did not just reduce one type of consumption (e.g., abstaining 5 days and drinking heavily on the weekend); instead students reduced their drinking across at least two domains when asked to cut back. Although groups did not differ on average BAC, it appears that AR participants were reducing their heavy drinking episodes, but reducing average BACs only slightly across time. Consistent with the findings of Correia et al. (2005), when instructed to, college students can and will voluntarily reduce their alcohol use even in the absence of receiving external rewards for complying with instructions.

Counter to predictions, the SI group showed no change on the three alcohol measures. Unlike instructions to reduce drinking, instructions to increase drinking control strategies did not lower alcohol consumption. Compliance data indicate generally good adherence to experimental instructions. Specifically, the SI group showed increases in all three Strategy subscales. Thus, the lack of significant alcohol reductions cannot be attributed to failure to increase use of strategies. The implication for prevention is that using drinking control strategies alone is unlikely to reduce drinking without explicit intent to reduce drinking.

We note that the SM group evidenced selective reactivity, such that participants instructed to self-monitor their alcohol use and strategy use for 2 weeks increased peak intoxication levels and actually reduced their use of Strategies While Drinking. Previous research on reactivity to self-monitoring of alcohol use is mixed (for review see Leigh, 2000); however, our finding that the combination of self-monitoring of consumption and strategy use revealed an isolated increase on one consumption measure does not support a risk reduction role for self-monitoring. The fact that the same self-monitoring task also had an isolated effect on suppressing some drinking control strategies suggests that the overall effect of self-monitoring did not consistently support either instructional set.

Instructions to reduce drinking revealed an interesting selective effect on strategy use. Participants in the AR group reported using more Selective Avoidance strategies (e.g., "choosing not to do shots when available," "refusing drinks"). Selective avoidance of situations commonly associated with heavier drinking is consistent with observed reductions in heaviest BAC and average drinks, and suggests that employing this subtype of strategies may be most effective for promoting alcohol reduction. One possibility is that participants in the AR group focused their attention on the goal of reducing alcohol use, which altered their choice of strategies. However, change in Selective Avoidance strategies was not significantly associated with change in drinking in the AR group. Therefore, future research is necessary to further understand the effectiveness of Selective Avoidance strategies in reducing alcohol use.

Limitations

The limitations of this study should be noted. One limitation is that the 2-week follow-up period may have been too short to detect changes in strategy use or the impact of instructions and self-monitoring on strategy use and typical drinking patterns. Although students did report a range of strategy use and multiple-drinking events in a 2-week period, our study was an initial experimental effort designed to demonstrate the relationship between strategy use and alcohol consumption over time. Research using longer follow-up periods is warranted to explore these relationships further. Second, although the majority of participants were compliant with the instructions, 32% did not reduce drinking and 17% did not increase strategies. These noncompliant participants could obscure potential differences among groups. These data suggest that it may be easier for student drinkers to employ strategies than to decrease drinking. A third limitation is the use of self-report assessments, which may reduce the validity of the data. High BACs may interfere with memory for number of drinks consumed. Collateral reports of drinking are sometimes used to corroborate participant reports but are also subject to the same problems as self-report (Laforge, Borsari, & Baer, 2005). Similarly, it is important to consider limitations in the use of estimated BACs. Equations to estimate BACs are less accurate for levels over .08 (Carey & Hustad, 2002), and in our sample participants reported estimated heaviest BACs between .14 and .18.

Fourth, this is a small sample of primarily White, female, freshman college drinkers. Therefore, the results of this study may not generalize to a more heterogeneous population of college students. Finally, recruitment in this study was not limited to participants who were interested in cutting down on their alcohol use. It is possible that participants' interest in cutting down may magnify the effects of instructions to reduce alcohol use and/or to increase strategy use.

It is worth noting that the instructions given to participants in this study differed from how these strategies might be presented in the context of a brief intervention. Specifically, in addition to providing students with a list of strategies, brief alcohol interventions generally provide students with personalized normative feedback about their drinking along with some education about the effects of alcohol. Moreover, in brief alcohol interventions the goal of decreasing alcohol use and/or alcohol-related harms is specifically linked to use of strategies. In this study, alcohol reduction and strategy use increase were separate goals. Thus, the external validity of these results needs to be considered because the instructions given to participants are not directly comparable to how the strategies would be presented in an intervention context. However, given that there were mixed findings in the literature, this study was designed to be an experimental examination of the relationship between strategy use and alcohol consumption.

Conclusions

This study supplements the cross-sectional literature assessing strategy use in college students by using experimental methods to establish causal relationships. Overall, the findings indicate that all strategies are not equal in the way they affect alcohol consumption. When students are told to reduce their drinking they comply and they increase their use of avoidance-related strategies. When students are told to increase their strategy use they also comply, but they do not reduce their drinking. These findings imply that the combination of trying to reduce alcohol use and using Selective Avoidance strategies may be more effective than exhortations to increase strategy use in general. These results have implications for the future use of these strategies as an intervention tool. The knowledge gained from outcomes of our AR group suggest that a more selective prescription of drinking control strategies may be warranted. Additional research is needed to refine our ability to match strategy use to drinking outcomes. Also, given the findings of Martens and colleagues (2004) of the relationship of strategies used while drinking with negative consequences, it may be useful for future research to assess alcohol-related consequences with relation to these types of strategies.

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