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Do Brief Motivational Interventions Reduce Drinking Game Frequency in Mandated Students? An Analysis of Data From Two Randomized Controlled Trials

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College students frequently engage in drinking games (DGs) and experience a variety of consequences as a result. It is currently unknown whether brief motivational interventions (BMIs) that provide feedback on DG participation can reduce this high risk behavior. This study examined outcome data from 2 randomized clinical trials to examine whether BMIs facilitate change in DG frequency and how these changes may occur. Mandated college students (Trial 1, $N = 198$, 46% female; Trial 2, $N = 412$; 32% female) were randomized to BMI or comparison control conditions. Hierarchical linear modeling (HLM) was used to compare the BMI and comparison groups to determine whether the BMI reduced DG participation over time. Percent change talk (PCT) during the discussion of DG during the session was examined as a predictor of change in DG frequency, and gender was examined as a moderator of treatment effects. Controlling for regular drinking frequency, participants who received a BMI did not significantly reduce their DG frequency relative to the comparison group in either sample, and the BMI was equally ineffective at reducing DG behavior for men and women. DG-related PCT during the BMI was associated with lower DG frequency at the second follow-up in both trials. In Trial 1, PCT during the BMI was associated with less steep increases in DG frequency across the course of all follow-ups. Effects of PCT on DG behavior were not moderated by gender. Findings did not support hypothesized reductions in DG participation following a BMI. Future research should explore whether targeted DG-specific interventions could reduce DG participation and the role of in-session client language in facilitating such change.

Keywords: drinking games, brief intervention, motivational interviewing, college, alcohol

College students participate in a variety of drinking activities (e.g., pregaming, 21st birthday celebration), some of which may place them at risk for experiencing negative drinking-related consequences (Mallett et al., 2013). Participation in DGs constitutes one of these activities. DGs are social drinking activities that promote heavy alcohol consumption and require players to per-

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form a cognitive and/or motor task (Zamboanga et al., 2013). They consist of rules that dictate when players drink and how much they should consume. This is what makes DGs unique from other types of high-risk drinking activities: the rules of the game can create a situation in which a player might feel pressured to drink more alcohol than she or he would like (Murugiah & Scott, 2014). Depending on the type of game, some players may even use the rules to target other participants to become particularly intoxicated (Borsari, 2004; Murugiah & Scott, 2014). Because DGs consist of rules that promote heavy alcohol consumption, it is hardly surprising that college students report drinking more on occasions (or days) when they play DGs compared with nongaming occasions (Fairlie, Maggs, & Lanza, 2015; Pedersen & LaBrie, 2006; Polizzotto, Saw, Tjhung, Chua, & Stockwell, 2007).

DG participation has been linked to general negative drinking consequences, such as losing consciousness, sustaining an injury, and getting into fights or physical altercations (e.g., Grossbard, Geisner, Neighbors, Kilmer, & Larimer, 2007; Pedersen & LaBrie, 2006; Zamboanga et al., 2010). It has also been linked to gaming-specific negative consequences, such as sustained social pressure to drink and extreme alcohol consumption (Polizzotto et al., 2007). Men and women also report increased sexual assault perpetration and victimization following DG participation (Johnson & Stahl, 2004). Despite these consequences, DG participation is common. Nearly half of the college students in a large, multisite sample reported playing DGs at least once in the past year (Grossbard et al., 2007). For a review on college DGs, see Zamboanga et al., (2014).

In addition to the negative consequences associated with DG participation, it is also one of the strongest predictors of continued problem drinking following an alcohol intervention according to a moderation analysis of three randomized controlled trials (Henson, Pearson, & Carey, 2015). Despite this, intervention approaches designed to reduce DG participation are limited (Croom et al., 2009, 2015; Wood et al., 2010). Meta-analytic reviews have indicated that BMIs are an empirically supported approach for reducing alcohol consumption and alcohol-related problems among mandated (Carey, Scott-Sheldon, Garey, Elliott, & Carey, 2016) and volunteer (Carey, Scott-Sheldon, Carey, & DeMartini, 2007) college students, and may be a promising approach to reduce DG participation. BMIs address alcohol use and related behaviors using motivational interviewing (MI; W. R. Miller & Rollnick, 2013) and often provide personalized feedback on the participants' drinking behavior, "normative" peer alcohol use, and how to avoid high-risk drinking situations.

There is initial evidence that BMIs can reduce DG frequency among college students (Wood et al., 2010). Wood and colleagues evaluated the efficacy of a BMI and a parent-based intervention in reducing alcohol use and related problems in a randomized factorial trial. In a footnote, they report that BMI participants were less likely than non-BMI participants to partake in DGs over the course of their first two years of college. Likewise, an online alcohol intervention has also been shown to modestly reduce DG participation (Croom et al., 2009, 2015). Of note, these interventions did not include a specific DG-focused module or personalized feedback on DG participation or risks. A BMI that provides a more explicit focus on DGs may facilitate even greater reductions in this high-risk behavior. To address this gap, interventions that specifically target DG participation are needed.

In developing and refining BMIs for college students, it is important to note that research has not yet uncovered "key ingredients" of intervention efficacy. Moving forward, research is needed that identifies which aspects of BMIs influence therapeutic success. One way to test how aspects of BMIs may exert their influence on particular behaviors over time is by examining in-session client language. In the context of MI, patient responses to therapeutic communication are referred to as client "change talk" or "sustain talk." Change talk is defined as "any self-expressed language that is an argument for change" (W. R. Miller & Rollnick, 2013, p. 159) and sustain talk is defined as "the person's own arguments for *not* changing, for sustaining the status quo" (W. R. Miller & Rollnick, 2013, p. 7). Recent research has indicated that both change talk and sustain talk are linked to subsequent changes in alcohol use following MI sessions (Magill et al., 2014; Romano & Peters, 2016). However, this research examined discussions of alcohol use in general, and not client language addressing a specific high risk drinking behaviors such as DG participation. Such fine-grained examination of in-session client language is important because it enables researchers to evaluate not only *whether* BMIs facilitate changes in alcohol-related behavior (e.g., DG participation), but also which in-session processes may predict these effects.

Current Study

This study examined data from two randomized controlled trials implementing BMIs with mandated college students (Borsari et al., 2012; Carey, Henson, Carey, & Maisto, 2009). These two trials were chosen because they evaluated the efficacy of an alcohol-focused BMI that included modules specifically targeting DGs, DG-related risks, and DG-related personalized feedback. Additionally, both trials evaluated DG behaviors at baseline and follow-up assessments, providing the opportunity to examine the potential impact of BMI participation and discussion of DGs on outcomes over time. We hypothesized that BMI participants would show greater reductions in the frequency of DG participation at the first and second follow-up compared with the respective comparison control groups and less steep inclines back toward baseline levels of DG frequency across the long term follow-ups. These hypotheses are based on past research linking BMI participation with lower likelihood of DG participation (Wood et al., 2010). The hypothesized pattern of change reflects previously reported outcomes from the original trials (Borsari et al., 2012; Carey et al., 2009) and a meta-analysis indicating that alcohol use typically decreases following a single session brief intervention and then gradually increases toward baseline levels (Samson & Tanner-Smith, 2015).

Second, to further examine the nuances and impact of DG-related discussion on outcomes, we evaluated transcripts from a subset of data from these larger trials that had been coded using the Motivational Interviewing Skills Code (MISC, 2.0; W. R. Miller, Moyers, Ernst, & Amrhein, 2003). For the current study, we evaluated whether participants' DG-specific language that reflected movement toward change (change talk, e.g., *I drink too much during drinking games and I want to change that*) or toward the status quo (sustain talk, e.g., *all my friends play drinking games so it would be hard for me to stop*) predicted DG outcomes. We hypothesized that students who engaged in more DG-related change talk would have greater reductions in DG at first and second-follow-up, and a more gradual (less steep) return toward baseline levels following initial declines. Further, as gender differences have been found in both DG participation (Borsari, 2004; Zamboanga et al., 2014) as well as intervention response (Carey et al., 2009), the current study conducted an exploratory examination of whether gender served as a moderator of the hypothesized relationships.

Method

Participants and Procedures

Data for the current study were derived from two randomized controlled trials with students who were mandated to treatment following violation of campus alcohol policy (Borsari et al., 2012; Carey et al., 2009). The BMIs utilized in both trials elicited within- and between-groups decreases in drinking behaviors over time. In-session client language regarding DG was obtained from a secondary data analysis which coded the BMI sessions from these two trials (Borsari et al., 2015).

Trial 1. Carey and colleagues (2009)[1] assigned participants randomly by gender to receive either (a) an in-person BMI (n = 99), or (b) a single-session, computerized, educational comparison condition (Alcohol 101 Plus; n = 99). Assessments were completed at baseline and 1-, 6-, and 12-month follow-ups. Participants in the BMI condition reported fewer drinks per week, fewer heavy drinking episodes, lower peak blood alcohol concentrations, and fewer alcohol-related consequences than those in the educational condition (Carey et al., 2009).

Trial 2. Borsari and colleagues (2012)[2] evaluated the efficacy of a stepped care approach to alcohol intervention. All participants (N = 598) received brief advice to reduce drinking. Those who continued to report heavy drinking at a 6-week follow-up assessment were then, in turn, randomized by gender and race/ethnicity to (a) an in-person BMI (n = 213), or (b) assessment-only comparison control (n = 199). Follow-up assessments were completed at 3, 6, and 9 months. Participants in the BMI condition reported significantly greater decreases in alcohol-related consequences than those in the comparison condition; however, neither group reported significant reductions in alcohol use over time.

Synthesizing Trials 1 and 2

In both trials, participants were undergraduate students at one of two private, 4-year universities in the Northeast. All participants were over age 18 years, had violated campus alcohol policy, were referred for mandatory counseling by campus staff, and chose to participate in the study as an alternative to treatment as usual. They completed a baseline assessment as part of the in-person intervention, and follow-up assessments were completed online from remote locations. Participants in both studies were offered incentives for study participation and completion of the three follow-up assessments. All procedures were approved by the universities' institutional review boards.

While the two samples examined here were demographically similar, the drinking behavior and frequency of DGs varied between the two trials. As such, testing the same research question across both trials (compared with just one) is valuable, in that it provides a better range of our outcome variable and essentially represents a replication test. There are a few methods for integrating findings across multiple randomized trials and, from these, we chose the parallel analysis approach. In this approach, a standardized analysis protocol is followed across trials, and findings are synthesized. This approach is ideal because the two trials were similar in key ways (e.g., number of follow-ups, intervention condition, target population). We chose this analysis over the integrative data analysis approach (Brown et al., 2013) because the two trials were also different in key ways (e.g., different timing of follow-ups, different measures).

Study Measures

Demographics. Participants in both studies provided information regarding age, gender, race/ethnicity, weight, and year in school.

Alcohol use. Both studies included measures of drinking frequency and quantity. Frequency items assessed how often participants consumed alcohol either (a) in a typical week using the Daily Drinking Questionnaire (Trial 1; Collins, Parks, & Marlatt, 1985), or (b) in the past 30 days (Trial 2). For assessments of drinking quantity, an identical item was used across studies; participants indicated the average number of drinks they consumed on a typical drinking day in the past month.

DG participation. In both studies, two items were used to assess participants' DG behavior (Borsari et al., 2007; Borsari & Carey, 2005). Participants reported (yes/no) if they had played "any kind of drinking game" in the past 30 days. Those who endorsed DG participation were then asked to indicate how many times they had played DG in the past 30 days.

Interventions and Drinking Game Modules

The BMI manual used in Trials 1 and 2 were developed and refined through previous randomized trials with volunteer (Borsari & Carey, 2000; Carey, Carey, Maisto, & Henson, 2006) and mandated (Borsari & Carey, 2005; Borsari, O'Leary Tevyaw, Barnett, Kahler, & Monti, 2007) college students. The format of the BMI sessions was similar in both trials: both were in person; took place in private offices on campus; and included didactic information on blood alcohol content (BAC), DG, and alcohol tolerance along with personalized feedback on those topics. The studies differed in that the Trial 1 BMI only addressed consequences reported at the baseline assessment, whereas the Trial 2 BMI compared specific alcohol-related consequences reported both at baseline and the 6-week assessment (i.e., the assessment that determined whether participants were included in the stepped-care arm). Both interventions concluded with goal setting and discussion of harm reduction strategies and lasted approximately 45–60 min.

Both BMIs in Trial 1 and Trial 2 explicitly adhered to previous intervention recommendations to educate students about the risks of DG participation (Borsari, 2004; Cameron et al., 2010), include specific modules or segments focusing on DG in broader alcohol-focused interventions (Borsari et al., 2007; Kilmer, Cronce, &

[1] Clinical trial registration number for Trial 1: NCT00289965.
[2] Clinical trial registration number for Trial 2: NCT00247182.

Logan, 2014), and address DG in personalized feedback. Both studies provided feedback on DG frequency and instructed interventionists to elicit and discuss the types of games the student plays, types of alcohol consumed, and the manner by which DG participation can lead to higher BAC.

Training and Supervision

Interventionists were graduate students (Trial 1) and master's- and doctoral-level clinicians (Trial 2) who were trained in MI (W. R. Miller & Rollnick, 2013). Training specifically addressed both MI style (e.g., empathy) and technique (e.g., reflective listening). Both studies used similar methods to ensure the consistent delivery of the in-person BMI, which included 20 hr of training involving reading, didactic information, and role-play exercises. Interventionists completed supervised, full-session role-plays until they met the study threshold of competency, a subjective judgment by the project principal investigators who had developed the interventionist manual. Interventionists in both studies then received weekly group supervision using videotape (Trial 1) or audiotape (Trial 2) to maintain fidelity to manual content and MI style. Fidelity in Trial 1 was evaluated by randomly selecting videotapes of the session (20%), rating them using a content checklist of 54 items, and evaluating 10-min segments using the MISC 2.0 (W. R. Miller et al., 2003). Fidelity in Trial 2 was monitored by listening to randomly selected BMI sessions in their entirety and providing the interventionists with written feedback regarding provision of feedback content and adherence to MI.

Transcript Coding

In a secondary data analysis (Borsari et al., 2015), the BMI sessions from Trial 1 and Trial 2 were transcribed and coded by five trained bachelor's- and master's-level raters using the MISC 2.0 (W. R. Miller et al., 2003). Based on criteria established by Cicchetti (1994), reliabilities of these ratings ranged from the "good" to "excellent" range (Borsari et al., 2015). The MISC has guidelines for coding client utterances related to the target behavior change, which, in this investigation, was DG participation. Seven MISC client language codes (reason, desire, need, ability, commitment, taking steps, other) were given a valence (+/−) that reflected movement toward change (+; change talk) or away from change (−; sustain talk). Client utterances that occurred during the discussion of DG that were not related to the target behavior were coded as follow/neutral; these included asking a question, reporting what had happened to them, or following along with the conversation (e.g., "Uh huh," "yeah").

To evaluate whether DG participation was discussed during the transcribed sessions, we examined transcripts of the BMI sessions in Trial 1 and Trial 2. Specifically, transcripts were searched for the terms "drinking game" and specific types of games, such as "beer pong," "Beirut," and "cards." The context of these terms was then examined. The session had to include at least two utterances about DGs (one by participant and one by interventionist); an utterance is defined as a complete thought or thought unit (W. R. Miller et al., 2003). These DG-related utterances were identified by two independent coders. Agreement was 95%, and discrepancies were resolved through discussion. Following our review and coding, we determined 99% of Trial 1 transcripts and 93% of Trial 2 transcripts included discussion of DGs. For these transcripts, the corresponding change talk and sustain talk codes were extracted for each DG-related utterance. To determine how much of each session was focused on discussing DG we divided the number of change talk utterances related to DGs by the total number of change talk utterances for the whole session. Likewise, we divided DG-related sustain talk by sustain talk for the whole session. In Trial 1 approximately 16.9% of all change talk and 24.7% of all sustain talk was related to DGs. In Trial 2, approximately 14.6% of all change talk and 25.4% of all sustain talk was related to DGs.

Consistent with previous work (Apodaca, Magill, Longabaugh, Jackson, & Monti, 2013; Davis, Houck, Rowell, Benson, & Smith, 2016), we computed proportion scores for change talk and sustain talk rather than using raw frequency counts of client language. This was accomplished by dividing the number of occurrences of change talk by the sum of all change talk and sustain talk utterances: [change talk/(change talk + sustain talk)]. This resulted in a range of possible scores from 0.0 to 1.0 for each variable, yielding the Percent change talk (henceforth, PCT) related to DG in each session. Computing a proportion also helps to account for variability in verbosity and session length.

Data Analytic Plan

The stepped care approach utilized in Trial 2 required some unique decisions regarding data selection. Specifically, as all participants received a brief advice session in the interim between the baseline and 6-week assessment, data collected at the 6-week assessment was used as the baseline time point in Trial 2 analyses. Then, a parallel set of analyses was run in each data set. First, we examined outcome variable descriptives at each time point separately within condition (BMI, comparison). Next, HLMs were run in the HLM 7.01 program (Raudenbush, Bryk, & Congdon, 2013), using full maximum likelihood estimation. HLM is ideal for data nested within participants across time and allowed us to examine both between-person (Level 2) effects (i.e., condition, change talk) and within-person (Level 1) effects (i.e., time, drinking frequency) on our DG outcomes. An additional advantage of HLM is its flexibility in handling missing data at the within-person level, allowing us to retain for analysis any participant that completed at least one assessment.

Distributions of outcome variables were examined, and six outliers in Trial 2 (falling 3 standard deviations above the mean) were recoded to the highest nonoutlying value plus one (Tabachnick & Fidell, 2007), in order to resolve nonnormality. In models in which the homogeneity of variance assumption was violated, we relied on robust standard errors. Fully unconditional HLM models (i.e., no predictors) were run first in order to determine intraclass correlations (ICCs) for each outcome. ICCs provided information on the percentage of variation in each outcome at both the between- and within-person level. A piecewise growth model was then used to examine the impact of receiving a BMI on DG behavior, with two time components included at Level 1. The first time trend was coded (−1, 0, 0, 0) and the second time trend was coded (−1, −1, 0, 1). These particular time trend specifications allowed us, within the same model, to examine the impact of condition on initial change in DG frequency from the baseline assessment to the first follow-up (first time trend), the impact of intervention condition on the slope of DG behavior across the course of the three follow-ups (change across follow-ups, second time trend) and the impact of condition on DG frequency at the second follow-up (as effects regressed on the intercept represent effects when both time components equal 0). We also included a time-varying covariate for regular drinking frequency, in order to test whether DG behavior was reduced above and beyond any effect of the intervention on general drinking behavior. In addition to testing main effects of condition, we conducted an exploratory test of gender as a moderator of the effects of BMI versus comparison condition. The Gender × Condition interaction was regressed on the intercept and both time effects, and interaction testing followed recommendations of Aiken and West (1991).

A second piecewise growth model, including only BMI participants for whom we had both outcome data and coded transcripts ($n = 80$ in Trial 1, $n = 136$ in Trial 2), was then estimated in order to examine the impact of DG-specific change talk on DG behavior. The PCT variable was grand-mean centered. Time was specified as described above, and we again added tests of gender as a moderator (of the effect of change talk on DG frequency).

In all models, we applied an unrestricted variance/covariance matrix structure; all intercepts and slopes were initially specified as random in order to account for individual variation in both mean levels of DG frequency and time-varying associations. However, nonsignificant variance components were fixed for more parsimonious final models.[3] Condition effect sizes from HLM models were calculated using the formula $r = t2/(t2 + df)$ (Rosenthal & Rosnow, 1991). Effects of $r = .1–0.23$ are considered small, $r = .24–0.36$ are medium, and $r \geq .37$ are large (Cohen, 1988).

Results

Preliminary Analyses

Descriptive statistics for the two studies are presented in Table 1, along with sample descriptives for change and sustain talk among participants for whom we had session transcripts. Frequency of DG participation at each time point is depicted in Figure 1 by condition (BMI and comparison conditions). For Trial 1, the person-period data set for full sample analyses was represented by 792 observations ($N = 198$ participants × 4 assessments). Across participants, data were missing due to failure to complete surveys on a total of 121 out of 792 assessments (15%). ICCs represent the proportion of the variance in each outcome due to the way in which individuals differ from one another (vs. the proportion due to within-person changes over time). The ICC of DG frequency in Trial 1 was .53, meaning that 53% of the variance in DG frequency is due to between-person differences, while 47% is due to within-person differences across the follow-ups. This suggested that a two-level model was appropriate. In Trial 2, the person-period data set for full sample analyses was represented by 1,648 observations ($N = 412$ participants × 4 assessments). Across participants, data were missing due to failure to complete surveys on a total of 137 out of 1648 assessments (8%). The ICC of DG frequency in Trial 2 was .47, again suggesting that that a two-level model was appropriate.

Effects of Condition on DG Frequency

Results of the model predicting DG frequency in the full Trial 1 sample, by condition, are displayed in the top left portion of Table 2. The covariate representing the time-varying effect of regular drinking frequency on DG frequency was significant. Beyond this effect, there was a significant decline in DG frequency from baseline to first follow-up (initial response), but not differentially by condition. Effects on the intercept indicated that DG frequency at the second follow-up also did not differ by condition. There was also a significant linear increase in DG frequency across all three follow-ups; yet, again, this did not differ by intervention condition (i.e., a return toward baseline DG frequency levels did not occur faster in the comparison vs. the intervention). Moreover, the interactions between gender and intervention condition on DG frequency were nonsignificant for all of the time trends. Effect sizes for the effect of condition were small at first follow-up ($r = .05$), second follow-up ($r = .04$), and over the course of follow-ups ($r = .02$).

Results of the model predicting DG frequency in the Trial 2 sample, by condition, are displayed in the top right portion of Table 2. The covariate representing the time-varying effect of regular drinking frequency on DG frequency was significant. Similar to Trial 1, on average, across both BMI and comparison group participants, there was a significant decline in DG frequency from baseline to first follow-up (initial response), but not differentially by condition. The two conditions also did not differ on DG frequency at the second follow-up (effect of condition on intercept), and there was no significant linear effect of DG frequency across all three follow-ups, and this did not differ by condition. Further, the interactions between gender and intervention condition on DG frequency were again nonsignificant. Effect sizes for the effect of condition were small for change between baseline and first follow-up ($r = .02$), at second follow-up ($r = .03$), and over the course of follow-ups ($r = .06$).

Effects of Change Talk During BMI on DG Frequency

Results of the models predicting DG frequency among Trial 1 BMI participants by change talk are displayed in the bottom left portion of Table 2. Controlling for regular drinking frequency, PCT was not associated with change in DG frequency between baseline and first follow-up. However, higher PCT was associated with lower levels of DG frequency at the second follow-up (effect of PCT on intercept). Further, there was an effect of PCT on change in DG frequency over the course of follow-ups. Specifically, DG frequency increased over time across all participants, but this increase was less steep for those with higher PCT. Gender did not moderate the effects of PCT in any case. Effect sizes for the effect of PCT were small for change between baseline and first follow-up ($r = .18$) and over the course of follow-ups ($r = .22$), and medium at second follow-up ($r = .26$).

For Trial 2, results of the model predicting DG frequency among BMI participants by PCT are displayed in the bottom right portion of Table 2. Again, a significant time-varying effect of regular

[3] In the Trial 1 data for the full sample (models examining effect of intervention condition), and in both trials for the subsample (models examining effect of PCT), the random effects for the change between baseline and first follow-up and for the change in DG across follow-ups both were nonsignificant. In the Trial 2 data for the full sample (models examining effect of intervention condition), the random component for the slope of change in DG across follow-ups was nonsignificant. In all cases, these nonsignificant slopes were fixed.

Table 1
Descriptive Statistics for Trial 1 and Trial 2

Variable/Construct	Trial 1 (n = 198) M (SD) or N (%)	Trial 2 (n = 412) M (SD) or N (%)
Demographics		
Age in years	19.2 (.7)	18.7 (.8)
Sex		
Male	107 (54.0)	280 (68.0)
Female	91 (46.0)	132 (32.0)
Race		
White	181 (91.4)	394 (95.6)
Non-White	13 (6.6)	17 (4.1)
Year in school		
First year	111 (56.1)	282 (68.4)
Second year	78 (39.4)	95 (23.1)
Upperclassmen	9 (4.5)	32 (7.8)
Baseline alcohol use		
"Regular" drinking frequency	2.96 (1.57)[a]	11.32 (12.25)[b]
Average no. drinks per drinking day	5.57 (3.28)	7.95 (4.18)
Client in-session language about drinking games		
Change talk total	5.40 (4.85)	3.43 (4.08)
Sustain talk total	3.26 (3.96)	3.01 (3.01)
Percent change talk (PCT) CT/(CT + ST)	.64 (.31)	.53 (.34)

Note. Three participants had missing data for "Race." Four participants had missing data for "Year in school." CT = change talk; ST = sustain talk.
[a] Number of drinking episodes in a typical week. [b] Number of drinking episodes in the past month.

drinking frequency was covaried. A higher PCT was associated with a lower frequency of DG at second follow-up; however, PCT did not influence change in DG frequency between baseline and the first follow-up or across follow-ups.[4] Effect sizes for the effect of PCT were small for change between baseline and first follow-up (r = .04), at second follow-up (r = .22), and over the course of follow-ups (r = .03).

Discussion

To our knowledge, this is the first study to evaluate DG outcomes as a function of BMIs that included discussion and personalized feedback related to DG participation. It is also the first study to examine whether in-session client language regarding DG predicts subsequent change in DG participation within the treatment group. Many BMIs incorporate modules on risky drinking practices, but few have examined whether these specific modules are efficacious. This study aimed to fill that gap by examining specific in-session client language to help elucidate potential mechanisms of MI efficacy. BMIs in both Trial 1 and Trial 2 explicitly adhered to previous intervention recommendations to educate students about the risks of DG participation (Borsari, 2004; Cameron et al., 2010), include specific modules or segments focusing on DG in broader alcohol-focused interventions (Borsari et al., 2007; Kilmer, Cronce, & Logan, 2014), and address DG in personalized feedback. Despite these efforts, after controlling for regular drinking frequency, we failed to reject the null hypothesis. Neither BMI resulted in statistically significant reductions in DG participation relative to comparison conditions at first or second follow-up, or in a less steep increase back to baseline levels of DGs across the course of all follow-ups. Likewise, specific tests of interaction effects for gender did not reach the threshold for statistical significance. These findings stand in contrast to previous research reporting a reduction in DG participation following an in-person BMI (Wood et al., 2010) and computerized interventions (Croom et al., 2009, 2015).

There are several interpretations of these null findings. First and foremost, DG participation may be an especially difficult behavior to change. As noted, DG participation was the strongest predictor of continued drinking following alcohol interventions in a moderation analysis of three randomized controlled trials among college students (Henson et al., 2015). Students take part in DGs for many reasons, including disinhibition, entertainment, competition, and sexual manipulation (Johnson, Hamilton, & Sheets, 1999; Johnson & Sheets, 2004). Higher participation in DGs is also linked to stable personality factors such as sensation-seeking (Diulio, Silvestri, & Correia, 2014; Johnson & Cropsey, 2000). Likewise, those who report playing DGs for "competition and thrills" report consuming more alcohol during DGs and experience more negative consequences during and after play (Johnson & Sheets, 2004). Perhaps future BMIs could address these DG motives and help students identify alternative ways to celebrate, compete, and find thrills that do not involve DG participation. Another possible interpretation of our null findings is that the BMIs did not provide a sufficient emphasis on DG reduction given that each BMI covered many alcohol-related topics. Specifically, approximately 15% of all change talk and 25% of all sustain talk in the BMIs took place in the context of a DG-related discussion, respectively. Given that the current study is the first and only published test of DG outcomes following an intervention that explicitly addressed DG-related behavior, determining the ideal type and intensity of DG intervention is an important direction for future research.

[4] We reran these analyses using an alternative proportion score for change talk, that also controlled for "follow/neutral" language (CT/CT + ST + FN). In Trial 2, findings were the same. In Trial 1, change talk was no longer associated with change across follow-ups.

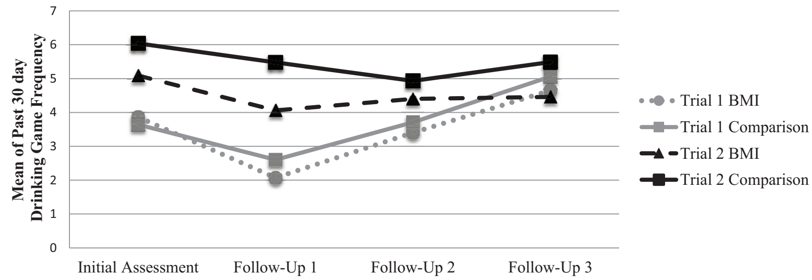

Figure 1. Drinking game frequency across time for Trial 1 and 2. For Trial 1 follow-up time points took place at 1, 6, and 12 months. For Trial 2 follow-up time points took place at 3, 6, and 9 months.

This research also examined technical aspects (specific behaviors) of MI that are hypothesized to represent mechanisms of change. We calculated DG-related client language to test our hypothesis that PCT would predict reductions in DG frequency. Our hypothesis was partially supported. In both trials, higher PCT was associated with lower DG frequency at the second follow-up (6 months) in Trial 1, while DG frequency significantly increased across the course of follow-ups, at higher levels of change talk, this increase occurred more slowly. The effect sizes were in the small-to-medium range. These findings suggest there may be a delayed effect of PCT in terms of predicting subsequent behavioral change. The slower return to baseline suggests that PCT may predict delayed but lasting behavior change. Future research should examine the impact of change talk over long-term follow-ups to determine if this is a replicable finding. However, recent research indicates change talk alone may not be a robust predictor of client outcomes in studies of addictive behavior (Apodaca et al., 2014; Magill et al., 2014). Research suggests it may be important to evaluate dynamic in-session processes, rather than just change talk proportions. Houck and Moyers (2015) found that conditional

Table 2
Hierarchical Linear Models Predicting Drinking Game Frequency by Condition and Percent Change Talk

	Trial 1 (n = 198)				Trial 2 (n = 412)			
By condition	*B*	*SE*	*t*	*p*	*B*	*SE*	*t*	*P*
Drinking frequency	1.11	.10	10.98	<.001	.38	.02	17.80	<.001
Change across follow-ups	.96	.15	6.38	<.001	−.04	.10	−.37	.72
Condition	.10	.31	.33	.74	.20	.20	1.02	.31
Gender	−.54	.30	−1.77	.08	−.07	.18	−.38	.70
Condition × Gender	.38	.61	.63	.53	.16	.37	.42	.67
Initial intervention response	−1.05	.18	−5.85	<.001	−.50	.20	−2.50	.01
Condition	−.32	.36	−.89	.38	.22	.40	.55	.58
Gender	.80	.36	2.24	.03	.22	.38	.58	.56
Condition × Gender	−.26	.71	−.37	.72	−.60	.77	−.79	.43
DG at second follow up	.25	.23	1.09	.28	1.05	.17	6.02	<.001
Condition	−.18	.32	−.58	.57	−.16	.24	−.68	.50
Gender	−.40	.32	−1.26	.21	−.33	.23	−1.44	.15
Condition × Gender	.22	.63	.35	.73	−.34	.46	−.74	.46
	Trial 1 (n = 80 with transcripts)				Trial 2 (n = 136 with transcripts)			
By change talk	*B*	*SE*	*t*	*p*	*B*	*SE*	*t*	*P*
Drinking frequency	1.05	.16	6.37	<.001	.32	.04	8.99	<.001
Change across follow-ups	1.20	.25	4.85	<.001	.23	.16	1.48	.14
PCT	−2.21	.94	−2.35	.02	.19	.48	.39	.70
Gender	−.44	.50	−.88	.38	.06	.34	.18	.86
PCT × Gender	3.46	1.87	1.85	.07	.37	1.02	.37	.72
Initial intervention response	−1.44	.30	−4.78	<.001	−.51	.30	−1.74	.08
PCT	1.90	.98	1.93	.06	.60	.92	.66	.51
Gender	.25	.59	.43	.67	−.30	.60	−.50	.62
PCT × Gender	−2.52	1.93	−1.31	.19	.44	1.81	.24	.81
DG at second follow up	.60	.39	1.55	.12	1.30	.28	4.61	<.001
PCT	−2.22	.95	−2.32	.02	−1.49	.57	−2.61	.01
Gender	−.43	.54	−.80	.43	−.69	.39	−1.76	.08
PCT × Gender	−.17	1.87	−.09	.93	1.49	1.08	1.38	.17

Note. BMI = Brief Motivational Intervention; AO = assessment only; DG = drinking game; PCT = Percent Change Talk; *SE* = standard error. Intercept = grand mean when all predictors are 0 (i.e., baseline levels of DG frequency). Condition 0 = BMI, 1 = comparison condition.

probabilities of change talk (i.e., change talk following change talk) were a better predictor of behavior change than change talk proportions alone (like those use in this study). Magill and colleagues (2014) also note that it is difficult to model dynamic MI processes using frequency data because client ambivalence, and not just change talk, may precede change. These authors found that evaluating the average of negative and positive client statements was the best predictor of change. Apodaca and colleagues (2014) found that in-session self-exploration predicted reduced alcohol use among mandated college students. Our findings add to this line of research and indicate that future research is needed to examine whether change talk timing, probabilities, or other relational aspects of MI most reliably predict behavior change.

Limitations and Future Directions

This study has several limitations that highlight promising avenues of future research. First, the study sample was predominantly White/non-Hispanic, consistent with mandated samples, which limits our ability to generalize findings to other populations of interest. The fact that all participants were required to participate in some form of intervention might have limited the degree of change in DGs relative to prior samples (Croom et al., 2009, 2015; Wood et al., 2010). Second, given that this study evaluated BMIs with DG modules, future research may develop and examine interventions that focus exclusively on DG participation to determine if a more focused, intensive DG intervention could reduce this high-risk behavior. This would permit the examination of active ingredients of an online intervention for DG or develop more intensive and focused treatment that address expectancies and motives (Kilmer et al., 2014; Zamboanga et al., 2014). Alternatively, campuses could attempt to reduce DGs by targeting alcohol availability or alcohol policies where heavy drinking takes place, such as fraternities and off-campus housing (M. B. Miller, Borsari, Fernandez, Yurasek, & Hustad, 2016). Third, the assessment of DG-related behavior was limited to DG frequency. A more detailed assessment that includes types of DGs, time spent playing DGs, and number of drinks consumed during DGs could strengthen future research (e.g., Borsari et al., 2014). In our analyses, we controlled for non-DG alcohol use. However, our regular drinking frequency covariate included days on which DGs were played. Due to measurement issues, we were unable to separate the variance in DG and non-DG-related alcohol use. Future research should use detailed alcohol use measures that enable separation of DG and non-DG alcohol use in analyses. Fourth, we did not provide a definition of DGs in our measure. In our focus groups and pilot research, we found that students were aware of what DGs were, including the various types played on campus, and rarely (if ever) needed clarification. Future researchers should consider whether a definition of DGs would improve construct validity. Fifth, although the BMIs evaluated in our study did directly provide and discuss DG feedback, there was a limited amount of therapist and client interactions, or "volleys," regarding DG. As a result, we were unable to examine more nuanced patterns of client speech as predictors of change (e.g., Houck & Moyers, 2015). Future research with more volleys about DGs could examine conditional probabilities and model change talk and/or sustain talk trajectories as predictors of outcome. Finally, our models examining the impact of change talk could only be run among those who had coded transcripts in each study. As such, we may have been relatively underpowered to detect significant effects, and findings of in-session processes may be less generalizable to other samples than findings observed within the full samples.

Conclusion

Overall, we were unable to provide evidence that DG-specific feedback and discussion delivered in the context of an alcohol-focused BMI reduced DG participation. However, our findings should be considered in the context of several other studies that did report reductions of DG following a BMI and online alcohol intervention (Croom et al., 2009, 2015; Wood et al., 2010). Given these conflicting results and the small number of trials, we believe DG intervention research remains important and incomplete. This study did provide evidence that within-session change talk predicted reductions in DG participation, but only at longer-term follow-ups. Given that BMI effects are typically short term, this delayed effect of change talk is intriguing, and should be further examined in future research.

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