HHS Public Access

Author manuscript

Health Psychol. Author manuscript; available in PMC 2017 June 01.

Published in final edited form as:

Health Psychol. 2016 June ; 35(6): 604–613. doi:10.1037/hea0000327.

A Road Paved with Safe Intentions: Increasing Intentions to Use Alcohol Protective Behavioral Strategies via Deviance Regulation Theory

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Abstract

OBJECTIVE—Drinking remains a problem across college campuses. Changing this behavior requires interventions that can be easily and widely dispersed. Several theories place intentions as a proximal predictor of behavior change. The current study examines the effects of a web-based Deviance Regulation Theory (DRT) intervention on (1) intentions to use alcohol protective behavior strategies (PBS) and (2) associations between these intentions and actual behavior.

METHODS—Participants (n = 76) completed a six-week, web-based, study examining drinking behaviors. Participants were randomly assigned to receive a positive frame about individuals who use PBS or a negative frame about individuals who do not. They also reported normative perceptions of PBS use among college students. They subsequently logged onto a secure server each week to report on alcohol involvement, use of three types of PBS (Manner of Drinking, Stopping/Limiting, and Serious Harm Reduction), and intentions to use these PBS the following week.

RESULTS—Consistent with DRT, negative frames resulted in higher PBS use intentions if individuals held high normative beliefs about PBS use. Positive frames resulted in higher Manner of Drinking PBS use intentions if individuals held low normative beliefs about PBS use, but only if individuals endorsed a high belief in the frame. In addition, there was a DRT consistent increase in intention-action associations, but only for Stopping/Limiting PBS.

DISCUSSION—A brief web-based DRT intervention was effective at increasing PBS intentions and increasing PBS intention-action associations. DRT may provide a mechanism to additively or synergistically improve other web-based interventions for college drinking.

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Keywords

Protective behavioral strategies; deviance regulation theory; alcohol use; behavioral intentions

Introduction

Heavy alcohol use is common among college students and has been associated with a number of problematic outcomes (Hingson, Zha, & Weitzman, 2009). Recent findings from the Monitoring the Future study (Johnston, O'Malley, Bachman, Schulenberg, & Miech, 2014) indicated that in 2013, 58% of college students reported having been drunk in the past year and 40% reported having been drunk in the past 30 days. Moreover, 35% of students reported having consumed five or more drinks at least once in the previous two weeks. Identifying factors that can reduce heavy use and alcohol-related consequences remains an important area of study. Research indicates using protective behavioral strategies while drinking can curtail alcohol-related consequences (Pearson, 2013).

Protective Behavioral Strategies

Alcohol protective behavioral strategies (PBS) have been defined as “behaviors that individuals can engage in while drinking alcohol in order to limit negative alcohol-related consequences” (Martens et al., 2004, p. 390). Numerous cross-sectional studies have shown that greater use of PBS is associated with less alcohol use and fewer alcohol-related problems (for a review, see Pearson, 2013). Other studies have shown increases in PBS use mediate the effects of brief multi-component interventions on alcohol use (Murphy et al., 2012), although tests of stand-alone PBS-based interventions have been mixed (Martens, Smith, & Murphy, 2013). To date, studies have not examined intention to use PBS in the context of alcohol.

Intention, Action, and the Intention-Action Gap

Behavioral intentions have formed a key component in several models of health behavior change. Two of the most prominent theories of behavior change, the Theory of Reasoned Action (TRA; Fishbein & Ajzen, 1975) and its extension the Theory of Planned Behavior (TPB; Ajzen, 1991), assume that intentions are the most proximal predictor of reasoned action. However, intentions are not a perfect predictor of health behavior engagement (Armitage & Conner, 2001). In fact, Webb and Sheeran (2006) found that medium-to-large changes in intentions are followed by small-to-medium changes in behavior. Additionally, a number of studies have failed to show that increases in intentions reliably predict increases in behavior (for a review see Sheeran, 2002). Gollwitzer (1999) suggested that this may be due to a lack of goal directed behaviors that support the implementation of intentions. Consequently, interventions meant to affect behavior change require a two-stage process. First, the intervention must reliably increase intentions to engage in the behavior - the *motivational* stage. Second, the intervention must allow for planned behaviors, often in the form of *if-then* statements, meant to facilitate the intention-action link - the *volitional* stage. Theories meant to change behavior must influence intentions in order to progress through the motivational stage. To address this issue we developed an intervention based on

Deviance Regulation Theory, a theory that has been reliably shown to increase behavioral intentions (Blanton, Stuart, & Van den Eijnden, 2001).

Deviance Regulation Theory

Deviance Regulation Theory (DRT) offers a predictive model for behavioral intention and action grounded within the realms of social norms and message framing (Blanton et al., 2001). The basic precept is that individuals are influenced by different messages depending on their perceived normative levels of a given behavior in the population and the framing of messages. DRT predicts that intentions and behavior shift in order to allow individuals to stand out in a positive way, or distance themselves from standing out in a negative. Thus, messages intended to shift intentions for positive behaviors (e.g., protective behavior strategies) that are viewed as more common (i.e., high perceived norm), should be negatively framed by emphasizing the negatives of *not engaging* in the behavior. Conversely, messages designed to shift intentions for positive behaviors that are viewed as less common should be positively framed by emphasizing the positives of *engaging* in the behavior. Several studies have supported the basic DRT predictions for health related behavioral intentions (Blanton et al., 2001); however, research on actual behavior change is more limited. Two recent studies have found evidence linking DRT to college student alcohol use (Ferrer, Dillard, & Klein, 2012; Lewis et al., 2010), though neither of these studies specifically tested the postulates of DRT. Recently, using this dataset, we found that this DRT-based intervention successfully modified PBS use among college student drinkers, which in turn decreased alcohol use and alcohol-related consequences (Dvorak, Pearson, Neighbors, & Martens, 2015). However, we have not previously examined the effects of the intervention on intentions or the association between intentions and behavior.

Linking DRT to the Intention-Action Gap

DRT makes no specific predictions regarding how DRT-based interventions may affect the intention-action gap. However, motivational interviewing, a prominent intervention for behavior change, has suggested that increasing self-referent discrepancies decreases the intention-action gap (W. R. Miller & Rollnick, 2013). This has been borne out in the literature, at least with regard to alcohol use (McNally, Palfai, & Kahler, 2005). DRT is based on a model of self-referent discrepancy such that individuals evaluate themselves in the context of larger normative beliefs. Thus, we hypothesized DRT may affect behavior by (a) increasing health behavior intentions and (b) diminishing the intention-action gap.

Study Overview

The present study examines the efficacy of a brief, web-based intervention, grounded in DRT, among college student drinkers. Based on previous theory, the current analyses examined two specific research questions. First, does a DRT web-based intervention modify intentions to engage in PBS? We expected that when participants received a positive frame, there would be increases in PBS use intentions for those with low PBS use norms. For those who received a negative frame, we expected an increase in PBS use intentions for those with high PBS norms (see Figure 1, panel a). Second, does a DRT web-based intervention operate to change behavior by decreasing intention-action discrepancy? We expected that PBS use intentions would be positively associated with actual PBS use if individuals (a) held low

PBS norms and received a positive frame or (b) held high PBS norms and received a negative frame (see Figure 1, panel b). In addition, we examined the moderating effects of frame believability.

Method

Participants

Participants (n = 76; 53.95% female) were college student drinkers recruited during spring 2014 from the university psychology research subject pool for course credit. The sample ranged in age from 18–24 (M = 19.29, SD = 1.42). Ninety-three percent of the sample was White, 3% Asian, and 3% were other or did not wish to respond.

Procedure

This study had two phases: a screening (Phase I) and intervention (Phase II) phase. In both phases participants completed an online informed consent. All surveys were administered anonymously via a secure online survey system. Participants completed surveys from their preferred personal computing locations (e.g., dorm rooms). In Phase I, screened participants (n = 207) completed an online questionnaire assessing demographics, alcohol involvement, and use of PBS. Individuals endorsing alcohol use in the last six months (n = 149) were invited to participate in Phase II. Among those invited, 45 opted out and 104 enrolled and completed at least the initial week of the intervention. Individuals who did not drink during the intervention (n = 28) were removed from the analysis since PBS use is only relevant among those using alcohol (final analysis sample of n = 76). Once enrolled, participants logged onto a secure server and completed a weekly survey assessing alcohol and PBS use over the previous week and intentions to use PBS over the coming week. The NDSU IRB approved this study. Greater details of the intervention and the CONSORT diagram are reported elsewhere (Dvorak et al., 2015).

Measures

Use of Protective Behavioral Strategies—PBS use was measured using the 15-item Protective Behavioral Strategies Survey (PBSS; Martens et al., 2005), which assesses three domains of PBS: Manner of Drinking (5 items; sample item: “Avoid trying to ‘keep up’ or out-drink others”), Serious Harm Reduction (3 items; sample item: “Make sure that you go home with a friend”), and Limiting/Stopping Drinking (7 items; sample item: “Alternate non-alcoholic beverages and alcoholic beverages”). Participants rated the frequency of each strategy used during the previous week on a five-point response scale (0 = *never*, 4 = *always*). Previous research supports the reliability and validity of the PBSS among college students (Martens et al., 2005). Internal consistencies across study weeks were acceptable (SLD: α = .63–.87; MD: α = .65–.79; SHR: α = .83–.90; Total PBS: α = .80–.90).

Intentions to use Protective Behavioral Strategies—Each week, following the rating of past week PBS use and the intervention reminder, participants were asked “How frequently do you **PLAN** to engage in the following strategies over the **NEXT WEEK**?” They then rated each of the 15 PBSS items on a five-point response scale (0 = *never*, 4 = *always*). This served as the measure of intentions to use PBS over the next week. This was

assessed in week 0 (immediately after the initial intervention) as well as in weeks 1–6 of the study. Thus, there was a total of 7 weeks of intentions data. Internal consistencies of weekly intentions to use PBS were adequate in the current study (SLD: α = .93–.94; MD: α = .78–.86; SHR: α = .89–.96; Total PBS: α = .94–.96).

Normative Use of Protective Behavioral Strategies—In the initial intervention week (i.e., week 0) participants were asked, "*What percent of NDSU students do you believe regularly engage in these strategies?*" Participants responded in a free text box. Participants were also asked this each week to examine possible changes in normative PBS use beliefs as a function of the intervention. To maintain consistency with previous DRT studies, and to increase ease of interpretation, this variable was dichotomized into high and low normative PBS beliefs (see data preparation section below).

Modified Daily Drinking Questionnaire (DDQ-M)—The DDQ-M (Dimeff, Baer, Kivlahan, & Marlatt, 1999) was used to assess alcohol consumption. The DDQ-M consists of a grid, with the days of the week and free-text boxes under each day. Participants entered the number of drinks consumed on each day over the previous week.

Frame Believability—Following the intervention statements (see below), participants were told: "*Sometimes, we tell people this research and they don't believe it. How much do you believe the above findings?*" They responded on a 5-point response scale (1 = *not at all*, 5= *absolutely believe*). Previous analyses have indicated framing belief affects the intervention effect, thus we included this variable as a covariate in the current analysis.

Intervention

Participants were randomly assigned to receive a positively or negatively framed message about individuals who do, or do not, use PBS. Participants were told: "*Here are some things we have found in our research at NDSU over the last few years. Please indicate if you knew this or not.*" In the positive frame, participants were told: "*People who report that THEY DO USE these strategies…*" In the negative frame, participants were told: "*People who report that THEY DO NOT USE these strategies…*" This frame was followed by a list of 12 statements (sample positive frame: "*…are viewed as more competent by their peers*"; sample negative frame: *"…tend to be less conscientious*"). Participants responded by selecting: *no I didn't know, yes I knew*, or *do not wish to respond*.

Analysis Overview

The primary analyses evaluated two outcomes as a function of the intervention: (1) PBS use intentions and (2) associations between PBS intentions and PBS use during drinking weeks. Analysis 2 used a reduced sample, as intentions to use PBS cannot predict PBS use if individuals do not drink. We dichotomized the PBS norms variable using a median split[1], resulting in four groups: High PBS Norms/Negative Frame (HN/NF; $n = 19$), High PBS

[1]We also examined PBS norms as a continuous moderator. In analysis 1, the three-way interactions differed slightly for MD PBS (Interaction using median split $p = .02$ vs. Interactions using continuous moderator $p = .03$) and SLD PBS (Interaction using median split $p = .05$ vs. Interactions using continuous moderator $p = .06$). However, for the HR PBS there was a marked difference with the three-way interaction being non-significant using the median split ($p = .339$), but much more robust using a continuous moderator (p

Norms/Positive Frame (HN/PF; $n = 18$), Low PBS Norms/Negative Frame (LN/NF; $n = 19$), and Low PBS Norms/Positive Frame (LN/PF; $n = 20$). Primary hypotheses were tested in M*plus* 7.3 using maximum likelihood estimation with robust standard errors. One Level-1 intercept had no random variance, and was constrained to zero (see Table 3). All other intercepts were allowed to vary randomly. Variance components of Level 1 slopes were not significant and thus fixed to zero. For both analyses, between-subjects variables were grand-mean centered while within-subjects variables (including time in analysis 1) were subject-mean centered.

Results

Descriptive, univariate, bivariate, and compliance statistics

Descriptive and bivariate statistics of between-subjects data are listed in Table 1. Across all PBS scales, intentions and use of PBS were positively correlated. Alcohol use was inversely correlated with all intentions and use of PBS scales, though not all reached statistical significance. Number of weeks in the study was positively correlated with intentions and use of all PBS subscales. Women endorsed greater intentions to use all three types of PBS as well as higher actual use of MD PBS. Women also reported less average alcohol consumption than men. PBS norms were associated with higher PBS intentions and higher PBS use across all subscales.

There were a total of 386 post-intervention person-weeks out of total possible 456 person weeks (i.e., 76 participants × 6 weeks) resulting in an overall participation rate of 84.65%. Individuals participated for an average of 5.18 weeks ($SD = 1.13$; Range: 2–6) including baseline data collection (i.e., week 0). Participants provided up to seven weeks of intentions data ($M = 6.18$, $SD = 1.12$), as intentions to use PBS during week 7 were assessed in the final week (week 6) of the study. On drinking weeks ($n = 244$) in the analysis (i.e., weeks with data for PBS use, PBS use intentions, and alcohol use), participants consumed an average of 7.13 drinks per week ($SD = 4.81$; Range: 1–21). An ANOVA of mean total PBS use the week prior to the intervention indicated a significant effect of perceived PBS use norm group, $F(1, 72) = 4.66$, $p = .034$, $d = 0.49$, but no differences by DRT frame ($F[1, 72] = 1.11$, $p = .296$) or the interaction of DRT frame × PBS norm group ($F[1, 72] = 0.78$, $p = .380$).

Protective Behavioral Strategies: Intentions

Using a multilevel framework, we examined mean intentions (i.e., intercept) as well as changes in intentions across seven weeks (i.e., slope) among all three PBS subtypes as a function of time (level 1), DRT frame (level 2), PBS norms (level 2), and belief in the DRT frame (level 2). The following multilevel equation was specified:

$$\text{Level 1: PBS Use Intentions}_{ti} = \pi_{0i} + \pi_{1i}(\text{Week of Study}_{ti}) + e_{ti}$$

= .003). In analysis 2, the two-way interactions on the slope for MD PBS and SLD PBS both became less robust, and in fact were not statistically signifcant, when using a continuous moderator. The two-way interaction on the slope for HR PBS was again more robust using the continuous moderator relative to the median split (though only slightly). None of the tested three-way interactions were significant using the continuous moderator in analysis 2. In all cases the direction of effects was consistent. Complete data and analysis code are available from the first author upon request.

Level 2: $\pi_{0i} = B_{00} + B_{01}(\text{Gender}) + B_{02}(\text{Age}) + B_{03}(\text{Frame}) + B_{04}(\text{PBS Norm Group}) + B_{05}(\text{Frame Belief}) + B_{06}(\text{Frame} \times \text{PBS Norm Group}) + B_{07}(\text{Frame Belief} \times \text{PBS Norm Group}) + B_{08}(\text{Frame} \times \text{Frame Belief}) + B_{09}(\text{Frame} \times \text{Frame Belief} \times \text{PBS Norm Group}) + u_{0i}$

$\pi_{1i} = B_{10} + B_{11}(\text{Frame}) + B_{12}(\text{PBS Norm Group}) + B_{13}(\text{Frame Belief}) + B_{14}(\text{Frame} \times \text{PBS Norm Group}) + B_{15}(\text{Frame Belief} \times \text{PBS Norm Group}) + B_{16}(\text{Frame} \times \text{Frame Belief}) + B_{17}(\text{Frame} \times \text{Frame Belief} \times \text{PBS Norm Group})$

We examined the same model for each of the three PBS subtypes. At Level 1, Week of Study, *t*, was the week of the study for person *i*. At level 2, we examined the effects of DRT frame, PBS use norms, belief in the frame, and interactions among the latter three variables on the intercept and slope for each PBS. Table 2 depicts the results of these models.

Stopping/Limiting Drinking (SLD)—There was a significant effect of DRT (frame × PBS norm) on the SLD PBS use intentions across time ($B = 0.150$, $p = .036$). Examination of the simple time slopes for each DRT condition revealed that the slopes were consistent with DRT, but did not reach conventional levels of statistical significance (HN/NF: $B = 0.047$, $p = .123$, HN/PF: $B = -0.014$, $p = .753$, LN/NF: $B = -0.037$, $p = .293$, LN/PF: $B = 0.051$, $p = .082$). There was also a significant interaction of DRT frame × frame belief on the time slope that did not vary by PBS norms ($B = 0.144$, $p = .003$). At +1*SD* frame belief, neither the positive ($B = -0.054$, $p = .118$) nor negative ($B = 0.031$, $p = .333$) frames were associated with change in SLD PBS use intentions across time. Paradoxically, at -1*SD* frame belief there was an increase in intentions to use SLD PBS among those who received a positive frame ($B = 0.093$, $p = .025$) but not among those who received a negative frame ($B = -0.023$, $p = .427$). PBS use norms were strongly associated with mean SLD PBS use intentions. There was a marginal effect of frame × PBS norms on the SLD PBS intercept ($B = 0.754$, $p = .051$) that did not vary by belief in the DRT frame, see panel a of Figure 2. Examination of this interaction indicated no difference in SLD PBS among those with low PBS norms ($B = 0.223$, $p = .468$). However, at high PBS norms, individuals who received a negative frame had significantly higher SLD PBS use intentions ($B = 0.531$, $p = .031$).

Serious Harm Reduction (SHR)—There were no effects of DRT on the SHR PBS use intentions across time. PBS norms were positively associated with mean SHR PBS use intentions. There was a significant interaction of PBS norms × DRT frame on the SHR PBS use intentions intercept ($B = 0.743$, $p = .043$) that did not vary by frame belief, see panel b of Figure 2. Among those with low PBS norms, there was no effect of DRT frame ($B = -0.326$, $p = .289$). However, among those with high PBS norms a negative frame resulted in higher SHR PBS use intentions ($B = 0.417$, $p = .043$).

Manner of Drinking (MD)—There was a significant effect of DRT (PBS norms × frame) on the MD PBS use intentions across time ($B = 0.136$, $p = .019$). Examination of the simple time slopes for each DRT condition revealed that the slopes were again consistent with DRT, but did not reach conventional levels of statistical significance (HN/NF: $B = 0.040$, $p = .072$, HN/PF: $B = -0.021$, $p = .481$, LN/NF: $B = -0.050$, $p = .137$, LN/PF: $B = 0.025$, $p = .387$). There was also a significant frame × belief in the frame interaction on the MD PBS time

slope that did not vary by PBS norms. At -1*SD* frame belief, neither the positive ($B = 0.049$, $p = .149$) nor negative ($B = -0.027$, $p = .417$) frames were associated with change in MD PBS use intentions across time. Similar to above, there was a paradoxical effect, though this time at +1*SD* Frame belief. At high frame belief there was a marginal decrease in intentions to use MD PBS among those who received a positive frame ($B = -0.043$, $p = .068$) but not among those who received a negative frame ($B = 0.014$, $p = .631$). PBS use norms were also associated with mean MD PBS use intentions. Finally, there was a significant effect of the DRT intervention on mean MD PBS use intentions that varied by frame belief ($B = 1.109$, $p = .018$). At low levels of frame belief there were no differences in MD PBS use intentions among those with high ($B = 0.210$, $p = .553$) or low ($B = 0.463$, $p = .228$) norms. However, at high levels of frame belief there were DRT consistent differences in mean MD PBS use intentions, see Figure 3. In the low norms group, a positive frame resulted in higher MD PBS use intentions ($B = 0.797$, $p = .011$). In contrast, at high norms a negative frame resulted in higher MD PBS use intentions ($B = 0.502$, $p = .025$).

Protective Behavioral Strategies: Intention-Action Associations

Next we examined the effects of the DRT intervention on associations between intentions to use PBS and actual PBS use during drinking weeks ($n = 244$ weeks). We initially estimated a model that examined variation in the DRT effect as a function of frame belief. However, none of the intention slopes were predicted by the PBS norms × DRT frame × frame belief interaction. Thus, we removed this interaction. The following multilevel equation was specified:

Level 1: $\text{PBS Use}_{ti} = \pi_{0i} + \pi_{1i}(\text{PBS use intentions}_{(t-1)i}) + \pi_{2i}(\text{Weekly Alcohol Use}ti) + e_{ti}$

Level 2: $\pi_{0i} = B_{00} + B_{01}(\text{Gender}) + B_{02}(\text{Age}) + B_{03}(\text{Mean Alcohol Use}) + B_{04}(\text{Mean PBS Intentions}) + B_{05}(\text{Frame}) + B_{06}(\text{PBS Norm Group}) + B_{07}(\text{Frame Belief}) + B_{08}(\text{Frame} \times \text{PBS Norm Group}) + u_{0i}$

$\pi_{1i} = B_{10} + B_{11}(\text{Gender}) + B_{12}(\text{Age}) + B_{13}(\text{Frame}) + B_{14}(\text{PBS Norm Group}) + B_{15}(\text{Frame Belief}) + B_{16}(\text{Frame} \times \text{PBS Norm Group})$

$\pi_{2i} = B_{20}$

We examined the same model for each of the three PBS subtypes. At Level 1, PBS use was actual use of PBS during week *t* for person *i*. Weekly alcohol use was drinks consumed during week *t* for person *i*. PBS use intentions were intentions to use PBS next week (reported during week *t*-1, the week prior to the actual PBS use) for person *i*. We controlled for the association between PBS use and alcohol use during week *t* for person *i*. At level 2, we examined the effects of frame, PBS norms, and the PBS norms × frame interaction on the intercepts and slopes for all PBS subtypes. We controlled for between-subjects alcohol use and PBS intentions (using variance parsed across levels). Results of the analysis, for each PBS subtype, is presented in Table 3. Table 4 lists the specific PBS intention-action associations across conditions.

Stopping/limiting Drinking—SLD PBS intentions were associated with PBS use at both the within- and between-subjects level. Mean SLD PBS use was higher in the high PBS

norms group, among men, and among older participants. There was a significant interaction of PBS norms × frame on the SLD PBS intention slope. Table 4 shows there were no associations between intentions and behavior in the LN/NF or the HN/PF groups. However, in the LN/PF and the HN/NF groups, intentions predicted use of PBS the following week. Thus, intentions predicted SLD PBS use in a DRT consistent manner.

Manner of Drinking—MD PBS intentions were associated with PBS use at the between- but not within-subjects level. There was a significant PBS norms × frame interaction on the MD PBS intention slope. The observed slopes across conditions were directionally consistent with DRT, though none reached conventional levels of statistical significance.

Serious Harm Reduction—SHR PBS intentions were associated with PBS use at both the within- and between-subjects level. PBS norms were positively associated with SHR PBS use. There was a significant interaction of PBS norms × frame on the SHR PBS intention slope, that took a different form than the previous two PBS interactions. In the LN/NF there was a positive association between intentions and actual use of SHR PBS. Intentions did not predict behavior in the other three groups; though, directionally the associations appeared opposite to DRT prediction. The intention-action association was also moderated by gender, with SHR intentions predicting SHR use for women ($B = 0.359$, $p = .011$) but not for men ($B = -0.044$, $p = .493$).

Discussion

The purpose of the present study was to examine a DRT web-based intervention targeting use of alcohol PBS. Specifically, we examined whether this intervention was able to increase intentions to use PBS and strengthen intention-action associations. Although most DRT studies have used intentions as the focal outcome, the original formulations of DRT do not specifically mention how intentions or the intention-action gap may be related to how social influence can result in behavior change. Based on other literature (e.g., W. R. Miller & Rollnick, 2013), we hypothesized DRT would both increase PBS intentions and decrease the intention-action gap.

Although the specific main and interaction effects that were statistically significant varied across the models, the direction of effects on PBS use intentions was consistent with DRT. Specifically, the negative frame resulted in higher intentions to use all types of PBS among individuals with high PBS norms. In contrast, the positive frame resulted in higher intentions to use all types of PBS among individuals with low PBS norms. These effects do not appear to increase or decay over at least six weeks.

In terms of the intention-action gap, the predicted interaction between PBS norms and frame was consistent with DRT for two types of PBS: Stopping/Limiting Drinking PBS and Manner of Drinking PBS. Specifically, the associations between PBS use intentions and actual PBS use was strongest for individuals who reported low PBS norms and received the positive frame or who reported high PBS norms and received the negative frame. Thus, individuals showed increased week-to-week intentions to use PBS as well as stronger associations between their PBS use intentions and actual PBS use. However, we also found

an interaction that was opposite of prediction for Serious Harm Reduction PBS. Individuals with low perceived norms, who received a negative frame, showed a significant positive association between PBS use intentions and actual PBS use. These individuals showed the lowest intentions to use Serious Harm Reduction PBS and subsequently had the lowest actual PBS use. The three distinct PBS that form the Serious Harm Reduction PBS subscale are each tightly constrained based on the drinking milieu. For example, one can only "use a designated driver" if transportation by car is necessary, and one can only "go home with a friend" if drinking socially with a friend. Thus, the observed increase in intentions to use Serious Harm Reduction PBS may not have resulted in a decrease in the intention-action gap as use of these strategies may not have been an option during the drinking week. Alternatively, given the relatively modest effects throughout, and our small sample, this association may be spurious. This remains an important question for future research.

Theoretical Implications

Several health behavior models have behavioral intentions as a proximal antecedent to actual behavior. Intentions are considered *the* most proximal antecedent to behavior according to the Theory of Planned Behavior (TPB; Ajzen, 1991) and the most proximal antecedent of "reasoned" behaviors in the Prototype Willingness Model (PWM; Gerrard et al., 2008). Interestingly, despite the fact that most DRT studies have assessed behavioral intentions rather than actual behavior as the primary outcome, DRT is quite silent with regards to how behavioral intentions play a prominent role in mediating behavior change as a result of the social influence processes described by this theory. Other prominent theories have focused more explicitly on understanding when intentions are more or less likely to predict behavior. For example, Gollwitzer's (1999) work on implementation intentions demonstrates that having a goal intention (i.e., having the goal to use PBS) is often insufficient to produce follow-through with this goal. With their meta-analysis, Gollwitzer and Sheeran (2006) show that the use of implementation intentions (or action planning) can strengthen the association between intentions and behavior. Implementation intentions are subordinate to an overall behavioral intention and clearly specify the when, where, and how of a behavioral intention in the form of an *if-then* statement. Our results demonstrated that a DRT-based intervention increased intentions to use three distinct types of PBS and at least for two of these PBS, produced an increased likelihood of following through with intentions. This latter finding is new and potentially very important. It means that this approach not only increases motivation to change, but crucially, makes this change *more* likely. We can only speculate how this simple intervention worked to close the intention-action gap. However, it is possible that increasing PBS use intentions led participants to engage in improved action planning. Overall, our results suggest the associations between intentions and behavior warrant further attention in testing the predictions of DRT.

Clinical Implications

Not only were the results from the present study generally consistent with DRT predictions, but we also demonstrated the efficacy of a simple DRT grounded web-based intervention. Despite the prevalence of norms-based interventions for college student drinking (M. B. Miller et al., 2013), these interventions are nearly entirely focused on providing personalized normative feedback in order to decrease perceived drinking norms. These interventions seem

to be based on the assumption that individuals universally wish to conform to the norm. DRT posits that individuals at times want to conform to the norm, but at other times want to deviate from the norm. Rather than manipulating normative beliefs themselves, this DRT-based intervention demonstrates the promise of giving targeted messages that capitalize on pre-existing normative beliefs. Importantly, such messaging is not typically found in college student alcohol interventions but could be easily given and tailored based on normative beliefs.

Though there is considerable research supporting the efficacy of web-based normative interventions (M. B. Miller et al., 2013), there is also research indicating that web-based normative interventions do not always work as predicted (Bewick et al., 2010). The use of message framing may assist in these instances. The present findings suggest that appropriately framed messages could be delivered following normative feedback designed to change normative beliefs. This is a fairly novel approach, especially for drinkers who may not hold extremely high beliefs about alcohol use norms. Thus, personalized normative feedback designed to decrease perceived drinking norms could be combined with a positively framed message about individuals who drink normatively, and personalized normative feedback designed to increase the perceived use of PBS could be combined with a negatively framed message about individuals who do not use PBS. There are many unexplored opportunities to integrate and tailor messages to college students receiving traditional norm-based interventions. The ability to provide this intervention content via the web circumvents several implementation barriers associated with face-to-face interventions, further highlighting the promise of DRT-informed interventions.

Limitations

Despite the strengths of the present study, there are several limitations that should be noted. First, our sample size was rather small considering that we were examining two- and three-way interactions between DRT frame, PBS norms, and belief in the DRT frame. For example, we only had 18–20 subjects per DRT frame × PBS norms condition. Thus, we only had sufficient sample size to detect medium-to-large effects. Consequently, many of the effects we observed did not reach conventional levels of statistical significance; though, they often showed theoretically consistent patterns. Second, we assessed PBS norms using a one-item measure of the percentage of college students at the participating university who use PBS. Although we used this single measure to capture overall PBS norms, we examined three distinct types of PBS in our analyses. Thus, our overall PBS norms measure lacked precision, and future studies should use more comprehensive assessments of PBS norms. In addition, we did not explicitly examine effects on alcohol use or problems. Future research could explore the effects of intention-action associations on more clinically relevant outcomes.[2] Finally, individuals in this study were relatively well-adapted adults, drinking at relatively nonhazardous levels. Thus, it remains to be seen if this intervention would be effective among more problematic drinkers.

[2]In the present manuscript, we limit the analyses to intentions and intention-behavior associations for PBS so as not to overlap with previously reported results. However, it is possible that the strength of the intention-action gap may influence alcohol use (and subsequently problems). Therefore, we examined this possibility using the weekly intention-action slopes as predictors of alcohol use and problems. The effects were theoretically consistent, though did not reach conventional levels of statistical significance.

Conclusion

Although the old adage “the road to hell is paved with good intentions” may be coopted to rather keenly to describe the intention-action gap, the path to safe drinking may very well be paved with safe intentions. We found that a brief web-based intervention based on DRT was effective at both increasing PBS use intentions and increasing the predictive utility of PBS use intentions in determining actual PBS use (for two of three types of PBS). Further investigation of whether DRT and other norms-based intervention approaches close the intention-action gap is warranted to not only explain a potential mechanism through which such interventions achieve behavior change, but also to consider how to best integrate other interventions that may additively or synergistically improve intervention efficacy (e.g., normative feedback, action planning). In the context of the present study’s limitations, we consider our results as both preliminary and promising. Future studies aiming to directly and conceptually replicate these findings are needed to determine the robustness of the observed effects.

Acknowledgments

Preparation of this manuscript was supported in part by grant AA014576 from the National Institute on Alcohol Abuse and Alcoholism (NIAAA) to Clayton Neighbors. Matthew R. Pearson is supported by a career development grant (K01- AA023233) from NIAAA.

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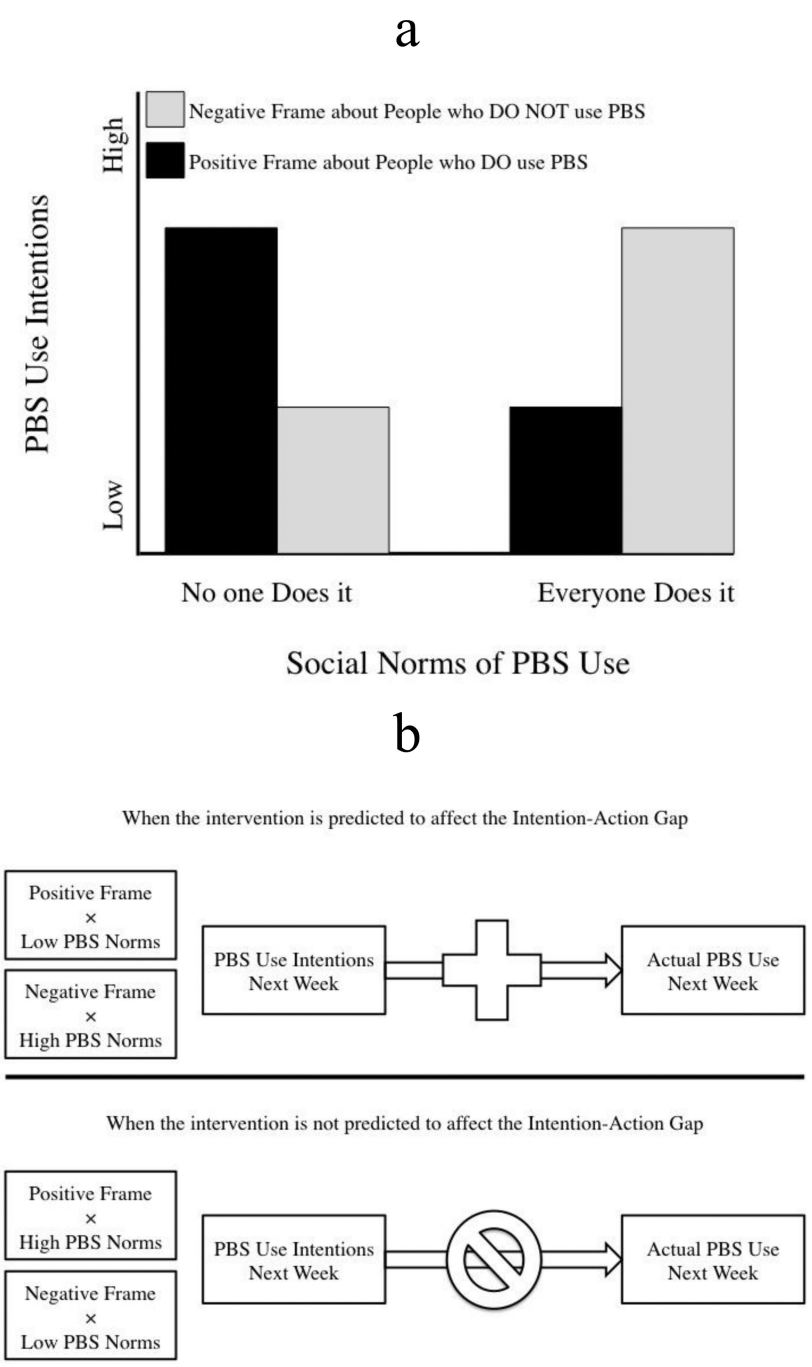

Figure 1.
Hypothesized intervention effects for Research Question 1 (panel a) and Research Question 2 (panel b).

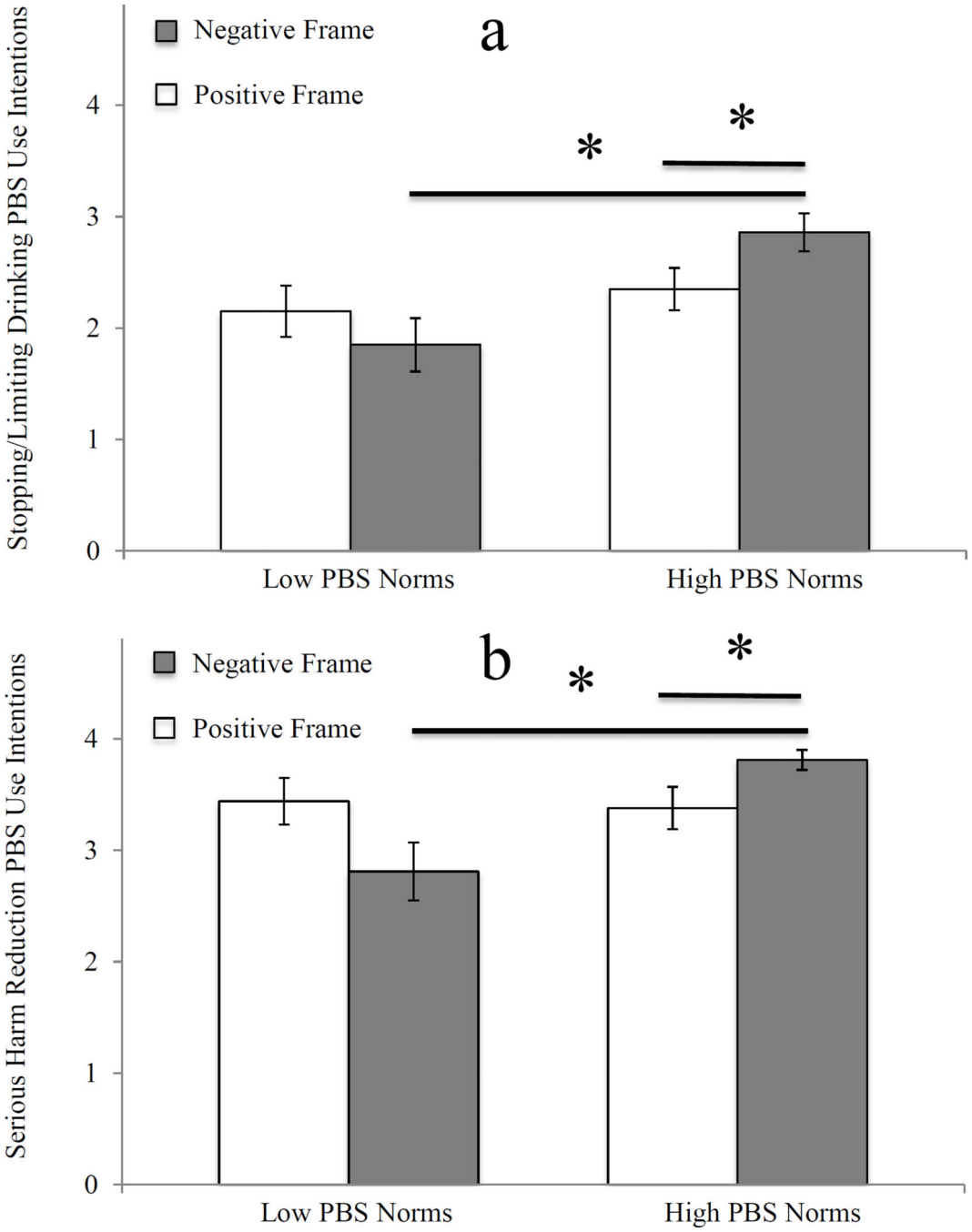

Figure 2.

Differences in intentions to use stopping/limiting PBS (panel a) and serious harm reduction PBS (panel b) by DRT frame and PBS use norms.

Note. PBS = Protective Behavioral Strategies

* $p < .05$

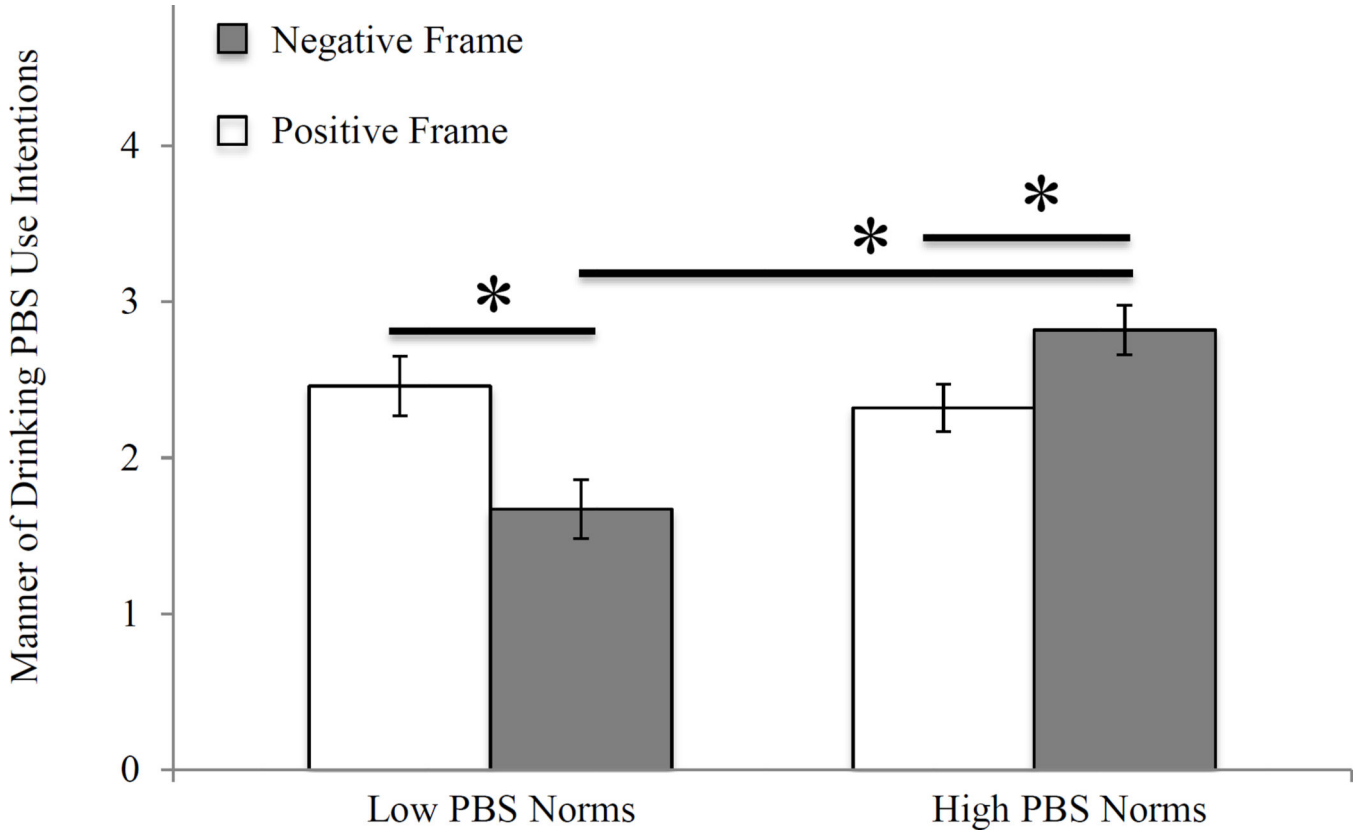

Figure 3.
Differences in intentions to use manner of drinking PBS by DRT frame and PBS use norms at high levels (+1SD) of belief in the DRT frame.
Note. PBS = Protective Behavioral Strategies
* $p < .05$

Table 1

Descriptive statistics and bivariate correlations of between-subjects data ($n = 76$)

Variables	1	2	3	4	5	6	7	8	9	10	11	12
1. Age	----											
2. Gender	.12	----										
3. PBS Use Norms	.16	.11	----									
4. DRT Frame	−.02	−.08	.03	----								
5. SLD PBS Use Intentions	−.07	.28*	.31*	.03	----							
6. MD PBS Use Intentions	−.02	.36*	.27*	−.03	.89*	----						
7. SHR PBS Use Intentions	−.17	.25*	.34*	−.02	.75*	.77*	----					
8. SLD PBS Use	−.18	.08	.39*	.01	.81*	.69*	.59*	----				
9. MD PBS Use	−.11	.29*	.39*	−.10	.64*	.74*	.56*	.74*	----			
10. SHR PBS Use	−.22	.13	.43*	−.08	.56*	.58*	.76*	.61*	.64*	----		
11. Alcohol Use	−.06	−.48*	−.03	.18	−.26*	−.38*	−.18	−.16	−.30*	−.09	----	
12. Time in Study	−.23	.20	.22	−.02	.50*	.41*	.43*	.37*	.25*	.37*	−.05	----
Mean	19.25	0.54	0.49	0.50	2.28	2.21	3.24	1.79	2.09	3.19	7.13	5.18
SD	1.42	0.50	0.50	0.50	1.03	0.87	0.99	0.92	0.80	1.12	4.81	1.13
Skew	1.44	−0.16	0.05	0.00	−0.51	−0.63	−1.63	−0.16	−0.51	−1.79	1.00	−1.32
Range: Lower Limit	18	0	0	0	0.09	0.00	0.10	0.00	0.00	0.00	1	2
Range: Upper Limit	24	1	1	1	3.88	3.83	4.00	3.71	3.67	4.00	21	6

Note. PBS = Protective Behavior Strategies. DRT = Deviance Regulation Theory. SLD = Stopping/Limiting Drinking. MD = Manner of Drinking. SHR = Serious Harm Reduction. DRT Frame coded 0 = positive, 1 = negative. PBS Norms coded 0 = low norms, 1 = high norms. Gender coded: 0=Male, 1=Female. PBS Use and Alcohol Use were only during drinking weeks.

* $p < .05$

Table 2

PBS use intentions as a function of DRT frame, PBS norms, and Belief in the Frame

Model Parameters	MC	SLD PBS	HR PBS	MD PBS
π_{0i} Intercept	B_{00}	2.296***	3.276***	2.233***
Gender	B_{01}	0.535***	0.444**	0.592***
Age	B_{02}	−0.071	−0.151**	−0.008
Frame	B_{03}	0.144	0.035	0.088
PBS Norm	B_{04}	0.607***	0.675***	0.413**
Belief in Frame	B_{05}	0.049	0.108	0.112
Belief × PBS Norm	B_{06}	−0.003	0.377	0.130
Frame × PBS Norm	B_{07}	0.754*	0.743**	0.523*
Frame × Belief	B_{08}	−0.136	−0.483	−0.360
Frame × Norm × Belief	B_{09}	0.770	0.544	1.109**
Random Variance	u_{0i}	0.719***	0.567***	0.443***
π_{1i} Time in Study	B_{10}	0.012	−0.045**	−0.002
Frame	B_{11}	−0.015	0.010	−0.009
PBS Norm	B_{12}	0.009	0.020	0.022
Belief in Frame	B_{13}	−0.033	−0.036	−0.018
Belief × PBS Norm	B_{14}	−0.070	0.022	−0.052
Frame × PBS Norm	B_{15}	0.150**	0.121*	0.136**
Frame × Belief	B_{16}	0.144***	0.009	0.095**
Frame × Norm × Belief	B_{17}	0.082	0.136	0.154*
ICC		0.364	0.460	0.427

Note. MC = Model Coefficient from Multilevel Equation. PBS = Protective Behavioral Strategy. SLD = Stopping/Limiting Drinking. MD = Manner of Drinking. SHR = Serious Harm Reduction. DRT = Deviance Regulation Theory. DRT Frame coded 0 = positive, 1 = negative. PBS Norms coded 0 = low norms, 1 = high norms. Separate analyses were done for each PBS. Between-subjects observations (i.e., study participants) n = 76, within-subjects observations (i.e., study weeks) n = 467

* $p < .10$,

** $p < .05$,

*** $p < .01$

Table 3

Weekly intention-action associations as a function of DRT frame and PBS norms

Model Parameters	MC	SLD PBS	HR PBS	MD PBS
π_{0i} PBS Use Intercept	B_{00}	1.801***	3.206***	2.060***
Gender	B_{01}	−0.303***	−0.135	0.022
Age	B_{02}	−0.094***	−0.092	−0.026
Mean Alcohol Use^{L2}	B_{03}	−0.001	0.009	−0.010
Mean Intentions^{L2}	B_{04}	0.779***	0.789***	0.738***
Frame	B_{05}	−0.018	−0.139	−0.066
PBS Norm	B_{06}	0.235**	0.442**	0.175
Belief in Frame	B_{07}	−0.119*	−0.035	−0.076
Frame × PBS Norm	B_{08}	−0.181	0.044	−0.103
Random Variance	u_{0i}	0.076**	0.284**	0.000[a]
π_{1i} Weekly Intentions^{L1}	B_{10}	0.419***	0.172**	0.047
Gender	B_{11}	0.013	0.404***	0.059
Age	B_{12}	0.114	−0.016	0.064
Frame	B_{13}	−0.256	0.126	0.010
PBS Norm	B_{14}	−0.236	−0.019	−0.129
Belief in Frame	B_{15}	−0.062	−0.039	−0.031
Frame × PBS Norm	B_{16}	0.984***	−0.566**	0.487**
π_{2i} Weekly Alcohol Use^{L1}	B_{20}	−0.019	0.172**	−0.004

Note. MC = Model Coefficient from Multilevel Equation. PBS = Protective Behavioral Strategy. SLD = Stopping/Limiting Drinking. MD = Manner of Drinking. SHR = Serious Harm Reduction. DRT = Deviance Regulation Theory. DRT Frame coded 0 = positive, 1 = negative. PBS Norms coded 0 = low norms, 1 = high norms. Separate analyses were done for each PBS. Between-subjects observations (i.e., study participants) n = 76, within-subjects observations (i.e., study weeks) n = 244.

^{L1}Within-subjects effect (i.e., variance parsed at the individual level)

^{L2}Between-subjects effect (i.e., variance parsed at the group level)

[a]This intercept did not have a significant random variance component, and thus the level 2 variance component was constrained to zero.

*p < .10,

**p < .05,

***p < .01

Table 4

Specific intention-action associations within each group

PBS Intention → PBS Use	Intercept		Slope	
	Estimate	SE	Estimate	SE
Stopping/limiting Drinking PBS				
Low PBS Norm – Positive DRT Frame	1.651***	0.116	0.901***	0.282
Low PBS Norm – Negative DRT Frame	1.721***	0.103	0.166	0.124
High PBS Norm – Positive DRT Frame	1.977***	0.109	0.173	0.175
High PBS Norm – Negative DRT Frame	1.866***	0.090	0.422***	0.151
Manner of Drinking PBS				
Low PBS Norm – Positive DRT Frame	1.983***	0.094	0.224	0.166
Low PBS Norm – Negative DRT Frame	1.968***	0.092	−0.003	0.079
High PBS Norm – Positive DRT Frame	2.209***	0.095	−0.149	0.154
High PBS Norm – Negative DRT Frame	2.091***	0.076	0.111	0.176
Serious Harm Reduction PBS				
Low PBS Norm – Positive DRT Frame	3.071***	0.109	−0.019	0.143
Low PBS Norm – Negative DRT Frame	2.910***	0.131	0.382***	0.102
High PBS Norm – Positive DRT Frame	3.491***	0.180	0.245	0.166
High PBS Norm – Negative DRT Frame	3.374***	0.118	0.080	0.192

Note. PBS = Protective Behavioral Strategy. DRT = Deviance Regulation Theory. Separate analyses were done for each PBS. Between-subjects observations (i.e., study participants) $n = 76$, within-subjects observations (i.e., study weeks) $n = 244$.

*** $p < .01$