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Test of a Deviance Regulation Theory Intervention Among First-Year College Student Drinkers:

Differential Effects via Frequency and Quantity Norms

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Abstract

OBJECTIVE: First-time-in-college (FTIC) students, or college freshmen, are at a heightened risk of experiencing alcohol-related consequences, as these individuals are relatively inexperienced with alcohol and have tremendous pressure to assimilate to new norms. The current study investigates the use of a Deviance Regulation Theory (DRT) intervention, presented in a web-based format, to increase the use of Protective Behavioral Strategies (PBS) among FTIC students.

METHOD: FTIC students ($n = 157$) completed weekly surveys for six weeks, which examined alcohol use and consequences, PBS use, and perceived PBS norms. Participants were randomly assigned one of three conditions: 1) a positive-framed message about individuals who do use PBS, 2) a negative-framed message about individuals who do not use PBS, or 3) a control group that received no messaging. **RESULTS:** Results suggest the negative-framed message increases PBS use across time for individuals high PBS norms, consistent with DRT. The positive-frame message did not change PBS use across time. However, the positive message was associated with more PBS use at the weekly-level when an individual had low PBS norms, consistent with DRT. Results also suggest PBS norms grew across time. **CONCLUSIONS:** These results provide initial support for the use of a DRT prevention program for FTIC students.

Public Health Relevance: These results can help inform future campaigns aimed at decreasing alcohol-related consequences among Freshmen college students. Furthermore, results suggest that changes in norms across drinking occasions may support the use of adaptive messaging programs.

Keywords: Deviance Regulation Theory; Protective Behavioral Strategies; Alcohol; College Students; First-Time-In-College or FTIC or College Freshmen

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Introduction

The first year of college is an incomparable life transition where social identities become established (Borsari et al., 2007). This distinct developmental period (emerging adulthood; ages 18-25) is accompanied by identity exploration and rapid behavior changes (Arnett, 2000; Arnett, 2005). As a result, alcohol consumption peaks during this developmental period, particularly in the first few weeks of college when risky drinking increases and the utilization of protective behavioral strategies (e.g. safe drinking strategies such as limiting the number of drinks consumed) decreases (Fromme et al., 2008). Additionally, ‘first-time-in-college’ (FTIC) students have several social experiences during the first few weeks of college, many of which involve alcohol. These experiences lead to the development of perceived alcohol norms (Pedersen et al., 2010) and predict alcohol consumption during the first year of college (Stappenbeck et al., 2010).

Neighbors, Lee, Lewis, Fossos, and Larimer (2007) found that perceived social norms may be a strong predictor of alcohol consumption among FTIC students. Notably, college students tend to overestimate alcohol consumption among their peers, which may increase heavy alcohol involvement (Borsari & Carey, 2003). A recent study by Cox and colleagues (Cox et al., 2019) found that FTIC students who overestimated peers’ heavy drinking, tended to also be frequent heavy drinkers. Similarly, a study by Ferrer and colleagues (2012) found that the experience of descriptive and injunctive norms as well as positive attitudes towards drinking among FTIC students was associated with alcohol consequences. Though, these researchers also found a unique aspect of drinking linked specifically to the norms of FTIC students.

Conformity is not the only driver of college student drinking, as this same behavior at times reflects a desire to stand out. Interestingly, Ferrer and colleagues (2012) also found that transitions in drinking behaviors from year 1 to year 2 among FTIC students may hinge on the desire to stand out in meaningful ways from their peers (Ferrer et al., 2012). Thus, while the “gold standard”

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for college student interventions may involve correcting normative misperceptions (Dvorak et al., 2020), alternative approaches that allow individuals to identify themselves as unique from the broader social context may provide new ways to target maladaptive behaviors. This is especially important in light of recent large-scale meta-analyses that have indicated normative feedback approaches may not be as successful as once believed (Huh et al., 2015; Mun et al., 2015). Furthermore, it may be important to target outcomes that are not strictly limited to consumption level, but that have a direct impact on alcohol consequences. One of these targets could be the engagement in safe drinking behaviors using Protective Behavioral Strategies.

Protective Behavioral Strategies

Protective behavioral strategies (PBS) are a set of harm-reduction strategies that have been shown to effectively reduce both the rate of consumption and severity of negative alcohol-related outcomes (Martens et al., 2005; Pearson et al., 2013). Motivating people to increase their use of PBS is a basic harm-reduction approach to decrease the negative effects experienced from alcohol consumption (Marlatt et al., 1995). Three subtypes of protective behavioral strategies exist: (1) Manner of Drinking (MD; e.g., avoiding mixing different types of alcohol), (2) Stopping/Limiting Drinking (SLD; e.g., stopping drinking at a predetermined time), and (3) Serious Harm Reduction (SHR; e.g., knowing where your drink is at all times) (Martens et al., 2005). Previous research has found that students who implement PBS are able to avoid or reduce negative alcohol-related outcomes (Lewis et al., 2010; Pearson et al., 2013; Prince et al., 2013; Treloar et al., 2015).

PBS Based Interventions. Incorporating PBS into alcohol prevention and intervention programs on college campuses may mitigate the experience of alcohol consequences (Dvorak et al., 2017; Lewis et al., 2010; Martens et al., 2005). Despite a consistent negative relationship between PBS use and alcohol consumption/problems in both cross-sectional and longitudinal research (Barnett et al., 2007; Dvorak et al., 2017; Dvorak et al., 2016; Dvorak et al., 2015;

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Larimer et al., 2007; Martens et al., 2007), the evidence for stand-alone PBS interventions has shown mixed support. For example, Martens, Smith, and Murphy (2013) implemented an intervention comparing alcohol personalized normative feedback (PNF) and PBS Feedback, meant to increase use of PBS by highlighting normative discrepancies in PBS use. Across three consumption measures PNF (Cohen's $ds = -0.77$ to -1.16) was more effective at reducing alcohol consumption than PBS Feedback (Cohen's $ds = -0.22$ to -0.68). However, PBS Feedback showed the only significant increase in PBS use at 6-month follow-up (PNF: Cohen's $d = 0.18$; PBSF: Cohen's $d = 0.54$), as well the most robust, and only statistically significant, decrease in alcohol consequences at 6-months (PNF: Cohen's $d = -0.32$; PBSF: Cohen's $d = -0.64$).

LaBrie and colleagues (2015) found evidence that a stand-alone PBS intervention, which utilized PBS skills training and personal PBS feedback, increased PBS use. Sugarman and Carey (Sugarman & Carey, 2009) found that a simple intervention, instructing students to use more PBS, resulted in greater PBS use, but no change in alcohol consumption, suggesting that improvement in strategies to limit the effects of alcohol consumption might not limit the amount of alcohol consumed. In contrast, Kenney and colleagues found that a standalone PBS intervention, delivered in a *group* format to first-year college women, produced increased PBS use and subsequent decreases in both heavy alcohol consumption and alcohol consequences (Kenney et al., 2014). In summary, although standalone PBS-based interventions appear to increase PBS consistently, the effects on alcohol consumption are less consistent. However, they may be more effective at reducing the most relevant outcome: alcohol consequences.

Norm-Based Interventions. An alternative to information-based campaigns designed to educate drinkers about PSB strategies and to promote positive PBS expectations is a broad class of interventions focused on use of social norms. A wide range of alcohol interventions seek to harness social norms to affect alcohol use and consequences. The majority of these introduce

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normative information designed to reduce heavy alcohol consumption. The most common such approach to reducing alcohol consumption is a strategy focused on correcting norm misperceptions. A wide array of studies suggests that young people in general, and perhaps college students in particular, tend to misperceive norms regarding the frequency of drinking, amount of drinking, and support for heavy drinking in their peer groups, and these misperceptions can promote more frequent and heavier drinking (Lewis & Neighbors, 2006). Interventions focused on correcting norm misperceptions have been found to reduce drinking, both in terms of frequency and amount (Lewis & Neighbors, 2006). However, as noted above, normative feedback approaches may not be as successful as once believed (Huh et al., 2015; Mun et al., 2015).

Combined Interventions. One potentially promising approach to promoting public health on college campuses is to combine a PBS focus with a normative approach. Social norms can be utilized to encourage greater PBS use, to determine their effect on both PBS use and on alcohol use and consequences. There are two issues such an intervention would need to address, however. One is that it is not clear that there are any misperceptions of PBS norms to correct in an intervention. It is quite possible that college students do *not* underestimate the number of PBS strategies employed by their peers, and so it is not clear how one could use normative levers to promote PBS on a campus. Another issue is that any approach of this sort might rely on an overly restrictive understanding of the role that norms play in the alcohol-related decisions of college students.

Social norming highlights pressures students might feel to “fit in” at school, and the value of a norm debiasing intervention is that it works off that existing motive so that “fitting in” transforms from a desire to drink heavily and irresponsibly to a desire to drink in moderation and responsibly. But, college students are also motivated by the desire to “stand out” and this motive

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can also influence alcohol-related decisions (Dvorak, Kramer, et al., 2018; Dvorak et al., 2017; Dvorak et al., 2016; Dvorak et al., 2015; Dvorak, Troop-Gordon, et al., 2018). Indeed, Ferrer and colleagues (2012) have shown that transitions in drinking among FTIC students may hinge on their need to differentiate themselves from the social norm. This analysis suggests two potentially viable norm-based strategies for promoting PBS in college. One would be to promote this as a means of fitting in and the other is as a means of standing out. Guidance on how to pursue such approaches can be found in a theory termed, *Deviance Regulation*, which has also been incorporated into interventions to reduce alcohol consumption and alcohol-related problems in college.

Deviance Regulation Theory

Originally proposed by Blanton and Christie (2003), Deviance Regulation theory posits that people form identities based on the ways they deviate from their surrounding norms, for better or worse. Their positive perceptions are perceptions of how they stand out in good ways. People come to think of themselves as happy, charitable, and competent to the extent that they feel counter-normatively (or unusually or exceptionally) happy, charitable, and competent in relation to the norms surrounding these attributions. Their negative perceptions arise from an equivalent system, one in which they see that they are distinguishing themselves in ways that bring disfavor, either in their own eyes or in others.

This theory then posits two ways that people might regulate their identity in relation to the surrounding norms. The desire to “stand out” is an approach regulatory system, oriented towards achieving positive identities that contrast in desirable ways from prevailing norms. Blanton and Hall (2009) posit that many achievement-related pursuits operate under this regulatory system, as the goal in these instances is to attain a distinguishing, positive status. The desire to “fit in” is an avoidance regulatory system, oriented towards avoiding negative identities that contrast in undesirable ways from prevailing norms. Blanton and Hall argue that moral and ethical pursuits

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often operate under this regulatory system, as the goal in these instances is to avoid distinguishing one's self in ways that bring shame or dishonor. A visual description of the theory is depicted in Figure 1.

The original empirical tests of this theory focused on applications in the health domain. Blanton, Stuart, & Van den Eijnden (2001) found that messages designed to encourage or promote healthy behavior were most effective when unhealthy behaviors were perceived to be most common (normative), whereas messages designed to discourage or prevent unhealthy behaviors were most effective when healthy behaviors were perceived to be most common (normative). Since this early work, a series of studies by Dvorak and colleagues have tested the effects of DRT-based interventions on substance use behaviors and found it has utility (Dvorak et al., 2017; Dvorak et al., 2016; Dvorak et al., 2015; Dvorak, Troop-Gordon, et al., 2018; Sargent et al., 2018). DRT has been shown to increase PBS use and subsequently decrease alcohol consumption and alcohol consequences in college student drinkers (Dvorak et al., 2017; Dvorak et al., 2015; Dvorak, Troop-Gordon, et al., 2018; Sargent et al., 2018). This has been observed both in regular drinking environments (Dvorak et al., 2015; Dvorak, Troop-Gordon, et al., 2018), as well as unique environments such as during Spring Break (Dvorak et al., 2017; Sargent et al., 2018). Furthermore, Dvorak and colleagues have shown that DRT may work by decreasing the intention-action gap (Dvorak et al., 2016). Neighbors and colleagues (2019) have shown that DRT can be used to modify alcohol consumption by emphasizing alcohol consumption as uncommon and unhealthy, thereby leveraging the desire to avoid standing-out in negative ways.

In a recent study, Dvorak and colleagues (Dvorak, Troop-Gordon, et al., 2018) showed that DRT messaging may differentially affect the ways in which PBS use changes. Specifically, they found that, among individuals who believed PBS use was uncommon among their peers, a positive message about individuals that use PBS resulted in immediate and sustained changes in PBS use.

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In contrast, among those that believed PBS use was common, a negative message about non-PBS users did not have an immediate effect but did result in significant growth across time. These changes in PBS translated to fewer alcohol consequences supporting a mediational model whereby the intervention produced more safe drinking behaviors and subsequently lower alcohol-related risk. However, they did not examine the ways in which this prevention program may exert influence on PBS, alcohol consumption, and alcohol consequences at the subject-level.

Current Concerns

Standing Out (Approach) or Fitting In (Avoid)? DRT posits two motivational systems and it provides guidance on what messages to apply, within a given normative context. With PBS, for instance, DRT posits that a communicator should emphasize the positive qualities of people who practice PBS strategies in populations that broadly perceive such actions to be uncommon. This messaging will communicate PBS can be a positively defining choice. In contrast, DRT posits that a communicator should emphasize the negative qualities of people who do not practice PBS strategies in populations that perceive PBS actions to be common. This messaging will communicate failure to PBS can be a negatively defining choice. Unclear in this analysis, however, is what one should do in populations where PBS norms are *not* known. Such a concern is relevant to message design to promote PBS in first-year college students. First-year college students enter college with no strong sense of the PBS norms, and so should a communicator reinforce the perception that (a) PBS is normative (common) and that failure to observe this norm is bad (a negatively framed message), or that (b) PBS is counter-normative (uncommon) and that breaking from this norm is good (a positively framed message)?

Blanton and Hall (2011) argued that there will typically be value in adopting a negative frame for two reasons. First, wide-ranging research suggests people are more strongly motivated to avoid negative outcomes than achieve positive outcomes (Baumeister et al., 2001; Tversky &

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Kahneman, 1974), and so this particular framing might engage a stronger self-regulatory mechanism. Second, by choosing to describe an unhealthy choice as bad, a communicator also communicates that the unhealthy choice is uncommon, a message that is consistent with the messaging goal. In contrast, by choosing to describe a healthy choice as good, a communicator also communicates that it is the healthy choice that is uncommon, a message that is consistent with the messaging goal (Stuart & Blanton, 2003). This analysis suggested to Blanton and Hall that, although there are risks of framing messages negatively (primarily message resistance), that negatively framed messages have greater potential to impact behavior, all other things being equal.

Norms in DRT interventions. The early empirical tests of DRT operationalized behavioral norms in terms of prevalence – actions are more normative to the extent that they are practiced by larger numbers of individuals. Research applying this framework to promote responsible drinking has considered a wider range of operationalizations. For example, in their original study, Dvorak and colleagues (Dvorak et al., 2015) divided participants into high and low norms groups based on perceptions of PBS use quantity (the percent of peers that use PBS from 0-100). However, in their most recent study, Dvorak and colleagues (Dvorak, Troop-Gordon, et al., 2018) used a norm based on the frequency of PBS use (e.g., how often do people use PBS), rather than the quantity of peers that use PBS. This may explain why the 2018 study found changes across time while the 2015 study did not. Indeed, a recent study showed changes in PBS norms across time as a function of a DRT prevention program (Dvorak, Kramer, et al., 2018). Thus, the intervention itself may influence norms. Finally, two different studies have examined normative discrepancy (the difference between norms for two different drinking occasions) as the driver of messaging effects (Dvorak et al., 2017; Sargent et al., 2018). These latter studies found that discrepancies in norms from a typical drinking environment to an atypical environment may differentially influence messaging, though in DRT consistent ways. Taken together, these results

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seem to suggest that perceptions of how often individuals are using PBS (i.e., frequency norms) may be especially useful across time as a way to increase individual use frequency. In contrast, the number of people using PBS on a given drinking occasion, relative to the average, (i.e., quantity norms) may be especially important at the event-level. The current study seeks to examine this possibility.

Overview

The current study seeks to replicate previous research on DRT-based prevention programs and extend this work in three important ways. First, it focused on a sample of *at-risk* drinkers, FTIC students. Second, predictions were tested longitudinally, over a six-week period. Finally, it tested whether or not DRT predictions would hold if behavioral norms measured as a perception of the prevalence of PBS behaviors among college students (PBS frequency norm) or the number of PBS behaviors typically practiced by college students (PBS quantity norm). Participants were a sample of FTIC students who were randomly assigned to receive a positive message about PBS users, a negative message about PBS non-users, or an assessment-only control. It was hypothesized that frequency norm would interact with messaging to influence both immediate and long-term growth in PBS. Specifically, it was hypothesized that among individuals who believed PBS are practiced infrequently by peers (low PBS frequency norm), a positive message would result in immediate increases in PBS use, which would be sustained across time. In contrast, among individuals who believed PBS are frequently used by peers (high PBS frequency norm) a negative message would result in growth in PBS use across time, but not in immediate changes. At the event-level, it was hypothesized that quantity of PBS use would interact with messaging to increase PBS use. Specifically, we hypothesized that when PBS use quantity was low for a given week, individuals who received a positive message would engage in more PBS use. In contrast, when PBS use was high for a given week, individuals who received a negative message would engage

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in more PBS use. Further, we expected PBS use at the weekly level to be inversely associated with both alcohol consumption and alcohol consequences. Finally, we examine changes in PBS norms across time as a function of the intervention as a way to explain changes in PBS use across time.

Methods

Participants

Participants were current freshmen who indicated drinking alcohol at least twice a month. Participants were recruited at the beginning of the Fall semester from a large, Southeastern state university. The analyzed sample ($n = 147$) ranged in age 18 to 20 ($M = 18.11$, $SD = .34$). The sample was predominately female (77.68%), with 77.48% of participants identifying as white or Caucasian, 13.89% identified as biracial, 5.30% identified as black or African American, and 3.31% identified as Asian; 27.58% of participants identified as ethnically Latino/a. This study was approved by the University's institutional review board.

Procedure

Screening. In Phase 1, participants were recruited via emails sent to all FTIC students at the university. The online screening survey assessed demographics, weekly alcohol consumption, alcohol consequences, use of PBS, and perceived norms of PBS use. Participants who indicated consuming alcohol at least twice a month were invited to participate in Phase 2.

Intervention and Follow-ups. Phase 2 consisted of a six-week program (1 pre-intervention week followed by 5 post-intervention weeks). In the first week, participants reported on past week alcohol use, PBS use, alcohol consequences, and PBS frequency and quantity norms. After this, they were randomly assigned to an experimental condition. Those in the positive message condition received 10 brief messages about PBS users. Those in the negative condition received 10 brief messages about PBS non-users. Each Monday for the next five weeks, participants were emailed a link to a secure online survey that assessed the same variables from

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the pre-intervention week. The assessment period for each week asked the student to report on drinking, consequences, PBS use, and PBS norms from the past week. In the intervention groups, this was followed by a brief intervention reminder.

Intervention Description

Participants were randomly assigned to one of three conditions: positive messages about people that use PBS, negative messages about people that DO NOT use PBS, or assessment-only control (no messaging). The messages were adapted from previous DRT studies and focus groups with FTIC students. The assessment control received no messaging. The messages followed the rating of PBS use (i.e., the PBS-20) and stated: “Last year, we started examining the perceptions of [removed] students about other [removed] students who DO USE these strategies. In general, we have found 10 basic perceptions about [removed] students who DO USE these strategies regularly. Here is what other [removed] students have told us. People who DO USE these strategies...” followed by socially positive statements (i.e., “tend to be seen as more responsible by their peers”, “are seen as leaders by their peers”, “are less impulsive and have better self-control”). In the negative message condition, the message stated: “Last year, we started examining the perceptions of [removed] students about other [removed] students who DO NOT USE these strategies. In general, we have found 10 basic perceptions about [removed] students who DO NOT USE these strategies regularly. Here is what other [removed] students have told us. People who DO NOT USE these strategies...” followed by socially negative statements (i.e., “tend to be viewed as less responsible by their peers”, “are seen as outsiders by their peers”, “are more impulsive and have worse self-control”).

Measures

Demographics. Demographic information including biological sex, gender, age, race, ethnicity, and high school and college GPA.

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Modified Daily Drinking Questionnaire (DDQ-M). The DDQ-M was used to evaluate alcohol consumption over a period of time and has shown to have ample reliability and validity (see Dimeff et al., 1999). In Phase 1, the DDQ-M was used to measure average alcohol consumption and time spent drinking during a typical week over the past three months. The DDQ-M is composed of a free-text grid where individuals report the number of drinks typically consumed for each day of the week for the past three months. In Phase 2, the DDQ-M was used to measure the number of drinks consumed for each day of the past week. Each grid began with Monday and ended with Sunday, as surveys were sent out on Mondays.

Young Adult Alcohol Consequences Questionnaire (YAACQ). The YAACQ, a 48-item survey, is used to measure alcohol consequences during a specific period (Read et al., 2006). Items in the YAACQ represents eight categories of alcohol consequences (Social-Interpersonal, Impaired Control, Self-Perception, Self-Care, Risk Behaviors, Academic/Occupational, Physical Dependence, and Blackout Drinking). During Phase 1, participants recorded alcohol consequences (Yes/No/ I do not wish to respond) from the past three months. During Phase 2, participants reported alcohol consequences experienced in the past week. Previous research has found the YAACQ to be reliable and valid in college student samples (Read et al., 2007). Research has also demonstrated the validity of using the YAACQ in an online diary format to record alcohol consequences for college students (Dvorak, Troop-Gordon, et al., 2018; Pearson et al., 2013).

Protective Behavioral Strategies Survey (PBS-20). Current PBS use was measured by the PBS-20 (Treloar et al., 2015). The PBS-20 consists of 20 statements covering three factors of protective strategies: Manner of Drinking, Stopping/Limiting Drinking, and Serious Harm Reduction. Frequency of PBS use was reported on a five-point Likert-scale from ‘Never’ to ‘Always’. In Phase 1, participants were asked to record their PBS use from the past three months. In Phase 2, participants reported their PBS use from the previous week. Previous research supports

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the reliability and validity of PBS assessment in a weekly diary format (Dvorak et al., 2015; Dvorak, Troop-Gordon, et al., 2018; Pearson et al., 2013).

PBS Norm Frequency. PBS frequency norms were assessed by asking, “How often do you think students at [removed] use these types of strategies?” This item was rated on a 5-point Likert-type scale (1= *never*, 5 = *always*). Consistent with previous DRT interventions, the pre-intervention norm was used as a moderator of the intervention effects. In addition, we examine norm frequency each week, to test within-week intervention effects as well as changes in PBS norm frequency across time.

PBS Norm Quantity. PBS quantity norms were assessed by asking, “What percent of students at [removed] do you believe use these types of strategies?” Participants were presented with a slider that ranged from 0% to 100%. Consistent with previous DRT interventions, the pre-intervention norm was used as a moderator of the intervention effects. In addition, we examine norm quantity each week, to test within-week intervention effects as well as changes in PBS norm quantity across time.

Analysis Overview

The analysis was broken into three parts and conducted in *Mplus* 8.4 (Muthén & Muthén, 2017). All models used full information maximum likelihood information. We first analyze overall change in PBS use across time as a function of the intervention messaging and pre-intervention normative beliefs. To do this, we specified a multilevel growth model with each type of PBS as an outcome variable. As PBS use co-occurs with alcohol consumption, weeks with no drinking were omitted. The slopes and intercepts for each PBS subtype were regressed onto two dummy coded conditions. In one dummy coded variable, the positive message condition was coded as 1 and all others as 0. In the other dummy coded variable, the negative message condition was coded as 1 and all others as 0. Thus, in the primary analysis the control condition is set as the comparison

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group. Next, we added the interactions with frequency and quantity norms to each dummy coded condition. Amount of alcohol consumed each week (person centered) was added as a model covariate on the slope and intercept.

The first analysis is restricted to change in the intervention target (PBS use) across time as a function of the pre-intervention norms. However, it is plausible that norms fluctuate within-weeks. Thus, the second analysis examined the associations between the intervention (message x norm), PBS use, alcohol consumption, and alcohol consequences within-week in a multilevel framework. Participants reported on norms each week. Weekly PBS use was regressed onto cross-level interactions of weekly norms x condition. Alcohol consumption and problems were then regressed onto PBS use to examine mediated effects from norms across conditions.

Finally, we conducted a *post-hoc* analysis to further probe the potential mechanisms of change across time. We hypothesized that the effects of the negative message condition may grow across time due to increases in PBS norms. If norms increase, this should result in more robust effects of negative messaging, as negative messaging is most effective when norms are high. Thus, we examined a multilevel growth model of PBS norms across time.

Data Preparation

A total of $n = 157$ participants enrolled in the study and received the intervention. Of those enrolled, $n = 10$ participants never consumed alcohol during the course of study and were removed from the analysis. Thus, there were $n = 147$ participants for the initial analysis of intervention effects. Of the $n = 147$ participants who received the intervention, $n = 9$ (2.55%) never returned for a post-intervention assessment. Thus, the second analysis, which examines post-intervention effects within-person weeks, is limited to $n = 138$. Among the analysis sample, there were 7 within-subject observations (1.60% of total within-subject observations) identified as extreme outliers and/or exerting extreme influence on model parameters. These observations were excluded from

analysis. For the final analysis, we examined PBS norms across the entire 6 weeks (1 pre-intervention week, 5 post-intervention weeks). This analysis includes all weeks, regardless of alcohol consumption. Unlike PBS use, PBS norms do not rely on alcohol consumption.

Results

Descriptive and Compliance Statistics

Descriptive statistics are listed in Table 1. Bivariate correlations are in Table 2. The CONSORT diagram is in Figure 2. As noted above, this study had data from $n = 147$ participants. There was a total of 770 weeks of data out of a possible 882 weeks ($147 \text{ participants} \times 6 \text{ weeks}$) for a compliance rate of 87.30%. Drinking was reported on 550 person-weeks (71.43% of weeks). The initial analysis, examining change in PBS use across time, utilizes all 550 weeks in which alcohol was consumed. The within-subject examination of weekly PBS use, alcohol consumption, and alcohol consequences post-intervention was limited to 430 post-intervention person-weeks in which individuals reported some alcohol consumption. Of the analysis sample, $n = 138$ completed at least one follow-up assessment (94%); though, only $n = 124$ completed the final assessment (84%). Although the prevention program did not target abstinence, the likelihood of drinking in a given week declined across time ($OR = 0.57, p < .001$): pre-intervention week = 28.03% abstinence, week 1 post-intervention = 23.29% abstinence, week 2 post-intervention = 39.86% abstinence, week 3 post-intervention = 22.97% abstinence, week 4 post-intervention = 41.22% abstinence, week 5 post-intervention = 47.58% abstinence. This effect was not moderated by condition ($ps = .492-.607$) and there was no difference in proportion of abstaining weeks by condition, $\chi^2(2) = 1.67, p = .437$. Thus, while there were fewer drinking weeks for analysis across time, this was largely a function of abstinence rather than attrition. Finally, there was a positive mean correlation in PBS frequency (FRQ) norms and PBS quantity (QNT) norms across the study

($r = .48, p < .001$), with correlations within week ranging from $r_s = .37$ to $.59$ (all $p_s < .001$) suggesting these two concepts are different but strongly related. Similarly, the three PBS indicators were strongly correlated across weeks $r_s = .57$ to $.79$ (all $p_s < .001$).

Intervention Effects on PBS Use Across Time

We first examined immediate effects on PBS use and changes in PBS use over the subsequent 5 weeks post-intervention. We specified a multi-level growth model, with time structured as -1 (pre-intervention week), 0 (first post-intervention week) ... 4 (final post-intervention week). The three PBS outcomes (MD, SLD, SHR) were examined simultaneously. We regressed the Intercept and Time Slope of each PBS type onto Condition 1 (positive message), Condition 2 (negative message), Pre-intervention FRQ norms, Pre-intervention QNT norms, Condition 1 $\times$ FRQ norms, Condition 1 $\times$ QNT norms, Condition 2 $\times$ FRQ norms, and Condition 2 $\times$ QNT norms. Biological sex was added as a Level 2 covariate. Total number of drinks consumed each week was added as a Level 1 covariate. As PBS use occurs in the context of alcohol consumption, weeks with no alcohol consumption ($n = 220$ person-weeks) were omitted from the analysis. There was a total of $n = 147$ participants across 550 drinking person-weeks. The results of the analysis are shown in Table 3.

SLD PBS. At the weekly level (Level 1), drinks consumed were negatively associated with SLD PBS ($b = -0.02, p = .001$). SLD PBS was positively correlated with both MD PBS ($b = .18, p < .001$) and SHR PBS ($b = .16, p = .001$). The model parameters are listed in Table 3, column 1. QNT norms were positively associated with the SLD PBS intercept (mean SLD PBS immediately post-intervention). Relative to men, women used more SLD PBS in the initial post-intervention week ($b = 0.30, p = .051$). There was a modest effect of the Negative message, relative to Control, on the SLD PBS intercept (i.e., immediate post-intervention SLD PBS, $b = 0.30, p = .064$); however, this did not vary by either norm. No other variables predicted the SLD PBS

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intercept. There was a significant main effect of the Negative message on the SLD PBS slope relative to Control ($b = 0.14, p = .005$; see Figure 3). Though this effect was not moderated by either norm, when both norms were set at $+1SD$ above the mean, the growth in SLD PBS in the Negative condition was more robust ($b = 0.14, p = .016$), consistent with DRT. In contrast, when both norms were set at $-1SD$ below the mean, there was no growth in SLD PBS across time ($b = 0.01, p = .885$), which is also consistent with DRT.

MD PBS. At the weekly level (Level 1), drinks consumed were not associated with MD PBS. MD PBS was positively correlated with SHR PBS ($b = .16, p < .001$). The model parameters are listed in Table 3, column 2. QNT norms were positively associated with the MD PBS intercept (mean MD PBS immediately post-intervention). No other variables predicted the MD PBS intercept. There were significant main effects of both the Positive message and the Negative message (relative to Control) on the MD PBS slope. These effects were both moderated by FRQ norms. Figure 4, panels a-c, depict the trajectories of MD PBS across time at low, average, and high FRQ norms. At average levels of FRQ norms (Figure 4, panel b), participants in the Control condition reported a decrease in MD PBS use across time ($b = -0.10, p = .004$). In contrast, participant receiving the Negative message ($b = 0.04, p = .28$) and Positive message ($b = 0.01, p = .683$) reported no change in MD PBS. When FRQ norms were high, participants in the Control condition again reported a decrease in MD PBS ($b = -0.16, p = .032$), and participants receiving the Positive message reported an increase in MD PBS across time ($b = 0.11, p = .014$). Consistent with DRT, and previous research, participants receiving the Negative message reported growth in MD PBS use across time ($b = 0.13, p = .001$). At low levels of FRQ norms, participants in the Control ($b = -0.07, p = .078$), Negative message ($b = -0.06, p = .251$), and Positive message ($b = -0.08, p = .191$) conditions reported no change in MD PBS across time. The finding with regard to

the Positive message at both high and low levels are not only counter to hypothesis, but directionally opposite of prediction.

SHR PBS. At the weekly level (Level 1), drinks consumed were positively associated with SHR PBS ($b = 0.01, p = .031$). The model parameters are listed in Table 3, column 3. QNT norms were positively associated with the SHR PBS intercept (mean SHR PBS immediately post-intervention). Gender was significantly associated with the SHR PBS intercept and slope. Women used more SHR PBS in the initial post-intervention week than men ($b = 0.57, p < .001$) and reported a steeper decrease in SHR PBS use ($b = -0.13, p = .036$). There was a significant interaction of Negative message $\times$ FRQ norms predicting the SHR PBS slope ($b = 0.19, p = .010$). Figure 5, panels a-c, depict the trajectories of SHR PBS across time at low, average, and high FRQ norms. At average levels of FRQ norms, participants in the Control ($b = 0.02, p = .736$), Positive message ($b = 0.04, p = .585$), and Negative message ($b = 0.08, p = .233$) conditions reported no change in SHR PBS (see Figure 5, panel b). Similarly, at low levels of FRQ norms, participants in the Control condition ($b = 0.07, p = .187$), Positive message ($b = 0.03, p = .784$), and Negative message ($b = -0.01, p = .892$) conditions reported no change in SHR PBS (see Figure 5 panel c). At high levels of FRQ norms, participants in the Control ($b = -0.03, p = .742$) and Positive message ($b = -0.05, p = .577$) conditions reported no change in SHR PBS use. However, consistent with DRT, participants in the Negative message condition reported a significant increase in SHR PBS use over time ($b = 0.14, p = .049$).

Within Week Intervention Effects: PBS Use, Alcohol Consumption, Alcohol Consequences

Next, we tested a multilevel structural equation model of weekly PBS use, alcohol consumption, and alcohol consequences as a function of PBS frequency (FRQ) and quantity (QNT) norms across conditions. We initially specified a fully mediated model, whereby PBS FRQ and PBS QNT predicted the three PBS variables, the three PBS variables predicted alcohol

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consumption, and alcohol consumption predicted alcohol consequences. At both levels, SHR PBS also directly predicted alcohol consequences, consistent with past research on this strategy. Variance was parsed across levels for all variables. At Level 1, FRQ and QNT was assessed each week and centered within person. Variance was decomposed across levels via between- and within- subject centering; thus, interactions between condition and the level 1 FRQ and QNT variables represent weekly deviations from average FRQ and QNT norms. The initial model showed good fit to the data: $\chi^2(33) = 43.50, p = .105$, RMSEA = .027, CFI = 0.97, SRMR_{within} = .022, SRMR_{between} = .050. Examination of modification indices indicated a significant path from the Positive message condition to alcohol consequences. This path was added, and the model was re-estimated. The final model (see Figure 3). showed excellent fit to the data: $\chi^2(31) = 39.00, p = .153$, RMSEA = .024, CFI = 0.98, SRMR_{within} = .022, SRMR_{between} = .044.

At the weekly level, SHR PBS was positively associated with weekly alcohol consumption and weekly alcohol consequences. SLD PBS was inversely associated with alcohol consumption. Alcohol consumption was positively associated with alcohol consequences. SHR PBS had a positive mediated effect on alcohol consequences via alcohol consumption (IND = 0.56; 95% CI = 0.21, 1.03) as well as a significant direct effect on alcohol consequences ($b = 1.06, p = .002$). SLD PBS also had a significant negative indirect effect on alcohol consequences via alcohol consumption (IND = -0.34; 95% CI = -0.80, -0.02). The indirect effect between MD PBS and alcohol consequences was not significant (IND = 0.04, 95% CI = -0.42, 0.62). In the Negative message and Control conditions neither PBS norm predicted PBS use. The Positive message $\times$ QNT norms interaction significantly predicted all three weekly PBS variables (MD PBS: $b = -0.03, SE = 0.013, p = .038$; SHR PBS: $b = -0.04, SE = 0.014, p = .012$; SLD PBS: $b = -0.03, SE = 0.016, p = .037$). Consistent with DRT, in the Positive message condition there was an inverse

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association between the QNT norm and all PBS use (MD: $b = -0.02$, $SE = 0.008$, $p = .015$; SHR: $b = -0.02$, $SE = 0.010$, $p = .011$; $b = -0.01$, $SE = 0.010$, $p = .173$); though for SLD PBS, this association was not statistically significant. Thus, if fewer peers were perceived to be using PBS during the week (relative to the persons average perception of QNT norms), individuals engaged in more PBS use (across all PBS types) that week if they had also received a positive message about individuals who use PBS.

At the between-subjects level, SLD PBS were inversely associated with alcohol consumption ($b = -3.00$, $p = .007$). Alcohol consumption was positively associated with alcohol consequences ($b = 0.24$, $p = .013$), resulting in a significant indirect effect between SLD PBS and alcohol consequences (IND = -0.60 , 95% CI = -1.48 to -0.09). Being in the Positive message condition was inversely associated with alcohol consequences ($b = -1.88$, $p = .037$). Neither FRQ nor QNT norms predicted any of the three PBS use variables. Nor did any of the norm $\times$ condition interactions. However, both the Positive message ($b = 0.33$, $p = .037$) and Negative message ($b = 0.47$, $p = .010$) conditions were associated with higher mean SLD PBS use across the entire study, relative to the control. This resulted in significant indirect associations between the Negative message condition and both alcohol consumption (IND = -1.25 , 95% CI = -3.54 , -0.16) and alcohol consequences (IND = -0.27 , 95% CI = -0.98 , -0.02). The indirect association between the Positive message condition and alcohol consumption was also significant (IND = -1.11 , 95% CI = -2.78 , -0.04); as was the total association (indirect + direct) between the Positive message condition and alcohol consequences (IND = -2.12 , 95% CI = -4.22 , -0.02). Thus, simply receiving either intervention message, regardless of normative beliefs, resulted in more average SLD PBS use which translated to lower alcohol risk across the course of the study. Finally, there was a direct negative association between SHR PBS and alcohol-related consequences across the entire study ($b = -2.63$, $p = .017$). Thus, while SHR PBS was associated with higher weekly alcohol

consumption and consequences, those who used more SHR PBS experienced fewer alcohol consequences overall.

Post hoc Examination of Change on PBS Norms Across Time

Previous research has shown that PBS norms may change as a function of DRT messaging (Dvorak, Kramer, et al., 2018). After observing increases in the Negative message condition, which replicated an earlier finding (Dvorak, Troop-Gordon, et al., 2018), we hypothesized this may be due to increases in PBS norms across time. Thus, we conducted a multilevel growth model of FRQ and QNT norms, as a function of condition. Time was structured as -1 (pre-intervention week), 0 (first post-intervention week) ... 4 (final post-intervention week). We regressed the Intercept and Time Slope of each norm onto Condition 1 (positive message) and Condition 2 (negative message), Biological sex was added as a Level 2 covariate. We included all 770 person-weeks in the analysis.

FRQ Norms. There was significant growth in FRQ norms across time ($b = 0.02$, $SE = 0.01$, $p = .019$, 95% CI = 0.004, 0.041). This trajectory did not vary by Positive message ($b = -0.02$, $SE = 0.02$, $p = .348$, 95% CI = -0.07, 0.02) or Negative message ($b = -0.01$, $SE = 0.02$, $p = .63$, 95% CI = -0.06, 0.04). Thus, across all conditions there was growth in FRQ norms.

QNT Norms. For QNT norms, there was also significant growth across time ($b = 1.28$, $SE = 0.17$, $p < .001$, 95% CI = 0.94, 1.62) for the entire sample. There were no significant differences in trajectories between the control condition and the Positive message condition (control condition trajectory: $b = 0.84$, $SE = 0.30$, $p = .005$, 95% CI = 0.26, 1.42; positive condition trajectory: $b = 1.04$, $SE = 0.29$, $p < .001$, 95% CI = 0.46, 1.61; difference between control and positive trajectories: $b = -0.20$, $SE = 0.41$, $p = .64$, 95% CI = -1.01, 0.62). However, the trajectory in the Negative condition ($b = 2.03$, $SE = 0.31$, $p < .001$, 95% CI = 1.43, 2.64) was more robust than both the control condition (difference between Negative and control trajectories: $b = -1.19$, $SE = 0.43$, $p =$

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.005, 95% CI = -2.04, -0.35) and Positive message condition (difference between Positive and Negative trajectories: $b = -1.00$, $SE = 0.43$, $p = .019$, 95% CI = -1.83, -0.16). Thus, changes in QNT norms also increased for all groups, but this was especially pronounced for those receiving a negative message.

Discussion

The current study tested a brief Deviance Regulation Theory intervention among college freshmen drinkers. The results showed that negative messages about individuals that do not use PBS broadly led to increases in PBS use in a DRT consistent manner (i.e., when PBS norms were high). Further, higher PBS use was broadly associated with less alcohol use and fewer alcohol-related consequences. In contrast, positive messaging did not result in changes in PBS across time in a DRT consistent manner. However, simply receiving a positive message was broadly protective against alcohol-related consequences. In addition, the positive message was associated with more PBS use at the event-level when individual's perceived that PBS norms were lower than usual – a finding that is consistent with DRT. Finally, we observed growth in PBS norms across time, some which varied by condition. This may explain why the negative message resulted in more PBS use across time while the positive message (and control) did not. Each of these issues are discussed in greater detail below.

Between-Person Changes

The strongest evidence supporting the efficacy of the DRT intervention came from the negative message condition. Receiving the negative message was predictive of an immediate jump in using SLD PBS and increased use of this strategy over the course of the study. Consistent with DRT, those increases were stronger when participants perceived a greater number of their peers as using PBS. The downstream effect of this increased use of SLD PBS was lower alcohol consumption over time and, in turn, fewer consequences related to alcohol. The pattern further

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suggested a snowball effect such that the negative messaging led to increased perceived quantity norms, which then amplify the positive effects of the negative messaging on the use of SLD PBS. Although not a mechanism for decreased consumption or negative consequences, receiving the negative message also led to increased use over time of MD PBS and SHR PBS while drinking.

These findings raise two interesting distinctions. First, the greatest protective benefit was found for SLD PBS. This finding is somewhat surprising. Previous research has suggested that MD PBS engender greater protective benefits (e.g., Frank et al., 2012; Maarten et al., 2005; Pearson et al., 2012, 2013). However, much of these previous studies relied on cross-sectional data. Longitudinal data have suggested that stopping/limiting drinking leads to benefits through reduced drinking over time (Martens et al., 2011; however, see Napper et al., 2014, for contrasting findings using a sample of heavy drinkers). It is possible that SLD is a strategy that is rarely used at first among college freshmen, and, therefore, its increased use is particularly beneficial following the transition to college. However, any explanations for the mixed findings regarding the efficacy of different PBS remain speculative and require future testing.

Second, negative messaging was most effective at high levels of frequency norms, but not quantity norms. And this was only observed for the MD and SHR PBS types. This may be due to the fact that frequency norms increased across time regardless of condition. Consistent with DRT, a steady and consistent perceived increase in frequency norms should result in more PBS use across time. However, the same was not observed for quantity norms, despite stronger growth in this norm across time in the negative message condition. This may be due to the fact that quantity norms seem to be more important and the event-level (though, as noted in the SLD analysis, higher levels of BOTH quantity and frequency norms produced DRT consistent effects on SLD PBS). With regard to the lack of DRT consistent effects (i.e., no condition by norm interactions) for SLD PBS, perhaps limiting or stopping drinking is a highly visible behavior which does not translate to

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“typical PBS frequency norms.” It may be that seeing PBS as widely used is critical in the decision to stop or limit alcohol use specifically, and thus Freshmen may be particularly sensitive to which behaviors are widely accepted among their college peers. Future research should seek to differentially assess norms for each type of PBS.

At a between-person level, the findings for the positive message condition did not conform to expectations based on DRT. Overall, the effects of the positive message condition were relatively sparse. Moreover, the few findings that did emerge were not consistent with DRT or previous studies (Blanton & Christie, 2003; Dvorak, Troop-Gordon, et al., 2018). For example, results suggested that participants receiving the positive message had an increased use of SLD PBS resulting in lower levels of alcohol consumption, but this effect was not stronger at lower levels perceived norms. In addition, receiving the positive message was predictive of increased use of MD PBS, but at high frequency norms, rather than low frequency norms as predicted. Interestingly, these findings paralleled those found for the negative message condition. This seems to suggest, that at the broadest level, any sort of messaging may result in greater PBS use, at least for MD PBS. This latter finding may suggest that theories which posit alternative interactions between descriptive and injunctive norms (e.g., Focus Theory of Normative Conduct; Cialdini et al., 1991) may be equally influential, depending on the behavior and/or visibility of that behavior. This remains a question for future research. Finally, there was a direct effect of the positive message on lower alcohol-related consequences, and this did not operate via changes in PBS use. This message highlights the positive qualities of people that use these strategies. Perhaps, this approach leads to an adoption of personal responsibility as a safe drinker. This may, consequently, result in lower problem rates by changing one’s overall perception of themselves in the context of drinking environments. Indeed, past research has suggested that peer approval (i.e., injunctive norms) are intertwined with alcohol involvement (Reed et al., 2007). Future research should

examine how injunctive messaging, such as that used here, results in changes in personal identification as a “safe” or “responsible” drinker.

Within-Person Changes

The current study also allowed for an examination of how within-person weekly changes in PBS use is associated with alcohol consumption and alcohol-related consequences. Consistent with the between-person effects, significant protective effects emerged for SLD PBS which was associated with both lower levels of weekly drinks consumed and indirectly with weekly experienced alcohol consequences. Interestingly, weekly use of SHR PBS was associated with greater weekly alcohol consumption and directly with alcohol related problems. It is possible that, after considering overlapping use with other strategies, SHR PBS is a reactive strategy implemented when alcohol consumption is high and problems are detected. Pearson, D'Lima, and Kelley (Pearson et al., 2013) drew similar conclusions after finding positive within-person associations between SHR PBS and alcohol consumption and consequences. However, in the current study, at a between-person level the use of SHR PBS was found to be negatively related to alcohol-related problems, suggesting that over time this approach may actually limit overall experiences of adverse alcohol consequences.

Additionally, the positive message condition interacted with quantity norms in predicting all three forms of PBS use. This negative interaction is consistent with DRT. Indeed, for those participants receiving the positive message, viewing few people as engaging in PBS was associated with greater use of MD and SHR strategies. However, this finding also suggests that viewing many people as engaging in PBS and hearing the positive message was associated with lower MD and SHR strategy use. This highlights two important aspects of DRT messaging. First, this suggests that targeted just-in-time messaging may be able to nudge the use of more PBS when individuals believe that, in the moment, PBS norms are lower than usual – offering a window for just-in-time

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adaptive interventions. Second, the wrong message could potentially backfire, resulting in higher risk. These findings provide a roadmap for using DRT to develop in-the-moment adaptive messaging as a function of normative beliefs, which seem to fluctuate both across time, but also across drinking occasions.

Clinical Implications

These results, though preliminary, have two important clinical implications. First, these results suggest that negative message framing may be broadly effective across time. We found increases in PBS use across time for those that received the negative message. Further, PBS norms appear to grow across time, making the negative message more effective. Second, the positive message appears to most salient during in-the-moment drinking episodes. Thus, an intervention that begins by highlighting negative aspects of PBS non-users at the outset, followed by in-the-moment positive messages when PBS norms are perceived low for a given drinking environment, may offer the most effective approach. Alternatively, a stepped approach whereby normative feedback is used to increase PBS norms followed by a negatively framed message (which should be most effective at high PBS norms), may offer another avenue to enhance messaging effects.

Limitations

The present study is not without its limitations. First, our study consisted of predominantly white, stable, female students at a Southeastern university. Therefore, our results may not be generalizable to all FTIC students, or students that engage in more problematic alcohol use. Future research should aim to have a more diverse sample, use a stratified random sample to ensure equal amounts of males and females in the study, and specifically target more problematic drinkers. Additionally, the data was collected in the fall of students' first semester in college. This was purposeful as student drinking at the outset of college often increases to "fit in" with peers (Pedersen et al., 2010). However, the current study does not address how messages may become

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less salient over longer periods of time (e.g., into their second semester). Future research should examine possible changes in efficacy of the DRT intervention based on time in college. Third, while weekly diaries can be a strength, weekly recall may still result in retrospective recall bias (Gmel & Daeppen, 2007). Participants may not have accurately recalled number of drinks, problems, or PBS in each week. It may be beneficial for future research to include a daily diary, or *in situ* momentary assessments, rather than a weekly diary, to control for retrospective recall bias. Lastly, we used PBS norms to refer to all three types of PBS (SHR, SLD, MD). It might be possible that norms differ among each type of PBS, which, in turn, could impact message salience. Future research should investigate how specific PBS norms would impact the intervention messaging, rather than viewing PBS norms globally.

Summary and Conclusions

The present study examined a brief DRT intervention to increasing PBS use. Broadly, results suggest that negative messages may offer the most protective effects. However, the results also suggest that positive messages can be effective if precisely implemented in the moment, as the positively-framed message led to increased PBS use amongst individuals whose perceived PBS norms were lower than average. Collectively, these findings provide additional evidence for the use of DRT interventions for FTIC drinkers. Future research should strive to replicate these findings with broader college populations and extend these findings to the general population.

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Table 1. *Descriptive statistics and bivariate correlations of between-subject variables*

Variable	1	2	3	4	5	6	7	8	9
1. Age	---								
2. Drinking Days per Week	-.01	---							
3. Drinks per Week	.04	.72**	---						
4. Problems per Week	-.02	.45**	.49**	---					
5. SLD PBS	-.03	.31**	.13**	.13**	---				
6. MD PBS	.01	.31**	.17**	.18**	.69**	---			
7. SHR PBS	.02	.51**	.39**	.28**	.68**	.67**	---		
8. PBS Quantity Norm	-.05	-.17**	-.15**	-.16**	.17**	.08*	.01	---	
9. PBS Frequency Norm	-.07	-.08*	-.08*	-.06	.15**	.15**	.08*	.50**	---
Mean	18.11	1.32	6.35	4.73	2.52	2.36	3.66	55.72	3.41
Standard Deviation	0.33	1.20	8.05	6.88	1.17	1.19	1.61	19.88	0.63
Range: Upper Limit	20	6	60	40	5	5	5	97	6
Range: Lower Limit	18	0	0	0	1	1	1	9	1
Skew	2.90	0.82	2.52	2.02	0.19	0.44	-0.81	-0.01	-0.03

Note.

* $p \leq .05$

** $p \leq .01$

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Table 2. *Intervention effects on PBS use across time*

Parameter	Manner of Drinking		Stopping Limiting		Serious Harm Reduction	
	Time Slope	Intercept	Time Slope	Intercept	Time Slope	Intercept
	<i>B</i> (SE)	<i>B</i> (SE)	<i>B</i> (SE)	<i>B</i> (SE)	<i>B</i> (SE)	<i>B</i> (SE)
	95% CI	95% CI	95% CI	95% CI	95% CI	95% CI
Intercept	-0.13 (0.03)	2.72 (0.19)*	-0.05 (0.05)	2.69 (0.17)*	-0.05 (0.05)	4.02 (0.16)*
	-0.25, 0.02	2.35, 3.09	-0.14, 0.05	2.36, 3.03	-0.11, 0.15	3.70, 4.34
Sex	0.04 (0.05)	0.12 (0.17)	-0.02 (0.73)	0.30 (0.15)	-0.13 (0.06)*	0.57 (0.16)*
	-0.06, 0.14	-0.23, 0.44	-0.11, 0.08	-0.00, 0.59	-0.24, -0.01	0.26, 0.88
CON1	0.12 (0.05)*	0.02 (0.19)	0.06 (0.05)	0.25 (0.17)	0.02 (0.06)	-0.07 (0.12)
	0.03, 0.21	-0.34, 0.39	-0.03, 0.14	-0.07, 0.58	-0.11, 0.14	-0.31, 0.17
CON2	0.14 (0.05)*	-0.05 (0.18)	0.14 (0.05)*	0.30 (0.16)	0.05 (0.05)	-0.18 (0.12)
	0.04, 0.23	-0.40, 0.30	0.04, 0.23	-0.02, 0.62	-0.05, 0.16	-0.42, 0.07
QNT	-0.00 (0.00)	0.06 (0.01)*	-0.00 (0.00)	0.01 (0.01)*	0.00 (0.00)	0.01 (0.00)*
	-0.01, 0.00	0.03, 0.09	-0.01, 0.00	0.00, 0.03	-0.01, 0.01	0.00, 0.02
FRQ	-0.06 (0.04)	0.03 (0.21)	0.04 (0.06)	0.08 (0.20)	-0.08 (0.05)	0.10 (0.14)
	-0.14, 0.03	-0.38, 0.43	-0.07, 0.15	-0.30, 0.47	-0.20, 0.02	-0.19, 0.37
CON1 x QNT	-0.00 (0.00)	-0.01 (0.01)	-0.00 (0.00)	-0.01 (0.01)	0.00 (0.00)	-0.00 (0.01)
	-0.01, 0.00	-0.04, 0.01	-0.01, 0.01	-0.02, 0.03	-0.01, 0.01	-0.02, 0.01
CON2 x QNT	-0.00 (0.00)	-0.04 (0.03)	0.00 (0.00)	-0.01 (0.01)	-0.00 (0.00)	0.00 (0.01)
	-0.01, 0.01	-0.03, 0.01	-0.00, 0.01	-0.03, 0.01	-0.01, 0.01	-0.02, 0.01
CON1 x FRQ	0.21 (0.08)*	0.39 (0.39)	0.07 (0.10)	-0.42 (0.34)	0.10 (0.13)	-0.02 (0.27)
	0.05, 0.38	-0.37, 1.14	-0.11, 0.26	-1.09, 0.26	-0.14, 0.39	-0.55, 0.50
CON2 x FRQ	0.21 (0.07)*	-0.13 (0.36)	0.01 (0.09)	0.08 (0.31)	0.19 (0.08)*	0.02 (0.28)
	0.09, 0.35	-0.84, 0.59	-0.17, 0.18	-0.51, 0.68	0.05, 0.34	-0.54, 0.58

Note: CON1 = Positive message; CON2 = Negative message; QNT = Protective Behavioral Strategy Quantity Norms; FRQ = Protective Behavioral Strategy Frequency Norms.

* $p \leq .05$

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Figure 1. *Descriptive model of Deviance Regulation Theory.*

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Figure 2. *CONSORT diagram.*

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Figure 3. *Trajectory of Stopping/Limiting Protective Behavioral Strategies across six weeks (1 pre-intervention week, 5 post-intervention weeks).*

Note. SLD = Stopping/Limiting Drinking.

* Statistically significant slope ($p < .05$).

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Figure 4. Trajectories of Manner of Drinking Protective Behavioral Strategies across six weeks (1 pre-intervention week, 5 post-intervention weeks) as a function of PBS Frequency Norms

Note. MD = Manner of Drinking; FRQ = Protective Behavioral Strategy Frequency Norms

* Statistically significant slope ($p < .05$).

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Figure 5. *Trajectories of Serious Harm Reduction Protective Behavioral Strategies across six weeks (1 pre-intervention week, 5 post-intervention weeks) as a function of PBS Frequency Norms*

Note. SHR = Serious Harm Reduction; FRQ = Protective Behavioral Strategy Frequency Norms

* Statistically significant slope ($p < .05$).

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Figure 6. *Post-intervention multilevel structural equation model of DRT effects within-subjects (weekly associations; panel a) and between-subjects (across entire study; panel b)*

Data Transparency Statement

This is an original manuscript that has not been submitted elsewhere. There have been no previous manuscripts published from this dataset and there are no other manuscripts currently under review from this data. This dataset was collected during the Fall of 2017/Spring of 2018. all data, materials, scripts, and analyses are available at: <https://osf.io/akef9/>