

2018

## A Deviance Regulation Theory Intervention to Reduce Alcohol Problems Among First-Year College Students

Angelina V. Leary  
*University of Central Florida*

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A DEVIANCE REGULATION THEORY INTERVENTION TO REDUCE  
ALCOHOL PROBLEMS AMONG FIRST-YEAR COLLEGE STUDENTS

by

ANGELINA VITTORIA LEARY

A thesis submitted in partial fulfillment of the requirements  
for the Honors in the Major Program in Psychology  
in the College of Sciences  
and in the Burnett Honors College  
at the University of Central Florida  
Orlando, Florida

Fall Term, 2018

Thesis Chair: Robert Dvorak, PhD

## **ABSTRACT**

**OBJECTIVE:** An alcohol-drinking culture exists among first-time-in-college students, where many of these students come to their university relatively inexperienced with alcohol, which may increase alcohol-related consequences. Several interventions exist to combat this campus problem. The current study investigates the use of a Deviance Regulation Theory (DRT) intervention, presented in a web-based manner, to increase alcohol Protective Behavioral Strategies (PBS), such as monitoring drinks, using a designated driver, and drinking water in between alcoholic beverages, among college freshmen. **METHOD:** College freshmen participants ( $N = 157$ ) completed web-based surveys examining alcohol behaviors once a week for six weeks. Participants were randomly assigned to one of three conditions: a positive frame about individuals who used PBS, a negative frame about individuals who did not use PBS, or a control group that did not receive a DRT intervention. Participants also reported their perception of PBS use among UCF students and friend. Data was analyzed in each PBS subtype: Manner of Drinking, Stop/Limiting Drinking, and Serious Harm Reduction. **RESULTS AND CONCLUSION:** Results indicate a negatively framed message with high perceived norm levels results in increased PBS use, which may suggest college freshmen have a strong drive to “fit in”, or avoid standing out in negative ways. Further, there seems to be little desire to stand out in positive ways among first year students. This may be indicative of individuals who modify their behavior in order to assimilate to a new and unfamiliar environment. Furthermore, some PBS strategies were associated with decreases in alcohol consumption and alcohol-related problems. Results suggest a DRT intervention may be beneficial to first-time-in-college students.

## **DEDICATION**

*For my family*

*For my parents for always guiding me and for providing me with endless support*

*For my brothers for always standing by my side*

*Ti voglio bene*

## **ACKNOWLEDGMENTS**

I would like to express a vast amount of gratitude to my thesis chair, Dr. Robert Dvorak, for his invaluable guidance and mentorship throughout this process.

I would like to thank Dr. Michael Dunn and Mr. Colin Byard for being on my committee and assisting with this thesis.

I would also like to thank UCF's First Year Advising and Exploration for supporting this project by connecting us with current college freshmen, and UCF's Department of Housing and Residence Life for sparking my interest in studying college alcohol use.

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## INTRODUCTION

Alcohol-related consequences continue to be a significant problem among U.S. college campuses (National Institute on Alcohol Abuse and Alcoholism, 2015). About 60% of college students engage in the consumption of alcohol, while only about 50% of non-college persons consume alcohol (Substance Abuse and Mental Health Services Administration, 2015). Of college drinkers, about 40% engage in heavy episodic drinking, consuming 4 or more drinks for females, or 5 or more drinks for males, in two hours (Substance Abuse and Mental Health Services Administration, 2015). It is estimated that about 1,400-1,800 college students die from alcohol-related injuries per year, from 1998-2005 (Hingson, Zha, & Weitzman, 2009). Also, heavy alcohol use appears to be related to more academic problems (Thombs et al., 2009), as well as aggression problems (Hartford, Wechsler, & Muthén, 2003). These problems are even higher among freshmen college students, primarily when first-time-in-college (FTIC) students first arrive at the university (Del Boca, Darkes, Greenbaum, & Goldman, 2004).

### Animal House: The College Freshman

The first year of college is an inimitable life transition where social identities become established (Borsari, Murphy, & Barnett, 2007). According to the Social Identity Theory, an individual will derive their own self-concept from a perceived association of an affiliated social group (Tajfel & Turner, 2004). A sense of belonging to a social group is an essential aspect to social wellbeing for incoming freshmen and has been linked to academic success and holistic health (Shim & Ryan, 2014). An individual may conform to a behavior, such as alcohol consumption, in a social reference group, such as a residential hall or a fraternity, if it is perceived to be normal, and if the individual has a perceived commitment to that reference group (Rinker & Neighbors, 2014). Therefore, it can be expected that college first-year students

tend to consume more alcohol than upperclassmen students (Turrisi, Padilla, & Wiersma, 2000), which place FTIC students at a higher risk for alcohol-related consequences (Substance Abuse and Mental Health Services Administration, 2017).

There is a need for effective brief interventions to reduce risky alcohol consumption on college campuses. Research suggests interventions may be more valuable for underclassman than upperclassman (Strohman et al., 2016). There are web-based interventions currently available, such as AlcoholEdu. AlcoholEdu, an evidence-based program, is one of the most prominent college mandatory alcohol intervention program, with over 800 institutions engaging in this program (AlcoholEdu for College, 2018).

#### Current Interventions

The effectiveness of AlcoholEdu, and other web-based interventions, has been mixed (Bewick, 2008). Some research supports short-term effects for reducing alcohol consequences (Paschall, Antin, Ringwalt, & Saltz, 2011). However, other research shows AlcoholEdu may double the amount of episodic drinking among college students (Robinson, 2011), while other research suggests AlcoholEdu is effective in only reducing engagement in drinking games, with no differences in alcohol consumption, compared to a control group (Croom et al., 2009). Students report clicking through educational segments and ignoring videos, which may make measuring the effectiveness of AlcoholEdu challenging (Barry, Hobbs, Haas, & Gibson, 2016). Even after being taught what a standard drink is, most college students overestimate a standard drink and, in turn, tend to drink more than planned (White et al., 2005). Paschall, Ringwalt, Wyatt, and DeJong (2014) found the perceived social drinking norms aspect of AlcoholEdu may have a more substantial impact on modifying behavior compared to other psychological variables in the program.

### Perceived Social Norms

Neighbors, Lee, Lewis, Fossos, and Larimer (2007) found that perceived social norms may be a strong predictor of alcohol consumption in a FTIC student. In fact, college students tend to overestimate alcohol consumption among their peers (Borsari & Carey, 2003). Moreover, this discrepancy may lead to more alcohol consumption in the individual. Previous experiences, such as watching movies or TV shows portraying college drinking, may cause an increase in a freshman's perceived social norms about college drinking (Osberg, Billingsley, Eggert, & Insana, 2016). Perceived social norms about consuming alcohol in a residential hall and Greek-life affiliation may moderate drinking behaviors and influence opinions about drinking (Hummer, LaBrie, & Pederson, 2012). Furthermore, because FTIC students have not experienced college drinking culture yet, the perceived norms may be elevated based on media use and word of mouth, not from actually experiencing college drinking events (such as a party or football tailgate) (Giese, Stok, & Renner). The link between perceived drinking norms and alcohol consumption is so strong that virtually every college drinking intervention program has incorporated an aspect of personalized normative feedback as a mechanism to reduce college student consumption (EverFi, 2018; e-CHUG; Cronce, Bittinger, Liu, & Kilmer, 2014; Carey, Scott-Sheldon, Carey, & DeMartini, 2007). Furthermore, these interventions rely almost exclusively on modifying consumption levels and alcohol education; these interventions do not target more proximal mechanisms of alcohol-related consequences, such as responsible drinking behaviors (Cronce & Larimer, 2011).

### Alcohol Protective Behavioral Strategies

Alcohol Protected Behavioral Strategies (PBS) are activities that can be used to decrease consequences when consuming alcohol (Martens et al., 2004). Alcohol PBS can be separated

into three categories: Manner of Drinking (MD)(i.e., avoid drinking different types of alcohol, drink slowly rather than gulp or chug), Stopping/Limiting Drinking (SLD)(i.e., determine not to exceed a set number of drinks, leave the bar/party at a predetermined time), and Serious Harm Reduction (SHR)(i.e., make sure you drink with people who can take care of you if you drink too much, use a designated driver). PBS use has been associated with lower alcohol use and fewer alcohol-related consequences across a variety of studies (Linden, Lau-Barraco, & Milletch, 2014; Dousmas, Miller, & Esp, 2017; Martens et al., 2005). However, interventions targeting only PBS use have shown modest effects (Martens, Smith, & Murphy, 2013; Sugarman & Carey, 2009). For example, Martens et al. (2013) found that using a PBS feedback alone did not affect alcohol use nor alcohol problems, and the researches predicted other methods may be better at increasing PBS use (i.e. heightening motivation to change behavior). However, a recent series of studies have shown that PBS use can be enhanced using a social psychology theory known as Deviance Regulation Theory (Dvorak et al., in press; Dvorak et al., 2018; Dvorak, Kramer, Stevenson, Sargent, & Kilwein, 2017; Dvorak, Pearson, Neighbors, Martens, Stevenson, & Kuvaas, 2016; Dvorak, Pearson, Neighbors, Martens 2015).

#### Deviance Regulation Theory

Deviance Regulation Theory (DRT) presents a two-fold model that uses social identity and perceived social norms to predict behavior (Blanton & Christie, 2003). DRT assumes individuals strive to portray a positive identity while suppressing a negative identity in their social group, mainly avoiding deviation that would have social consequences. As per DRT, an individual that believes that the majority engages in a socially positive behavior, the individual would not want to be a part of the minority that does not participate in the behavior. However, if an individual believes the majority does not engage in a socially positive behavior, the

individual may try to be a part of the minority and engage in the behavior to stand out, or deviate, in positive or meaningful ways (Blanton, Stuart, & Van den Eijnden, 2001).

## **HYPOTHESES**

Previous research has shown DRT interventions can increase PBS use, decrease alcohol consumption, and, ultimately, decrease alcohol-related consequences in college student populations (Dvorak et al., in press; Dvorak et al., 2017; Dvorak et al., 2016; Dvorak et al., 2015). However, no studies have been previously conducted that use a DRT intervention specifically for incoming college freshmen. Due to the increased risk for alcohol consequences among FTIC students, it may be beneficial to investigate DRT as an intervention to improve PBS, hopefully, to decrease alcohol-related problems. Based on the previous research, we yielded the following hypotheses:

*Hypothesis 1:* Following DRT, participants that perceive low PBS norms would modify behavior with a positive frame message. Inversely, participants that perceive high PBS norms would have behavioral changes from a negative frame message.

*Hypothesis 2:* The use of DRT will increase PBS use in freshmen college students, which in turn will decrease alcohol use and alcohol-related consequences.

## METHOD

### 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 state university in the southeast, which will be most participants' first semester at a university (or second if they began during a summer term). All participants will be recruited by email, which was provided by the university's First Year Advising and Exploration office. Participants received a five-dollar Amazon gift card per survey successfully completed as an incentive, allowing a participant to receive up to \$30 for Phase 2.

The analyzed sample ( $N = 147$ ) ranged in age 18 to 20 ( $M = 18.11$ ,  $SD = .34$ ). Eighty percent of participants identified as white or Caucasian, 12.9% identified as biracial, 4.3% identified as black or African American, and 2.9% identified as Asian; 28.6% of participants identified as ethnically Latino. Seventy-seven percent of participants identified as female. For sexual orientation, 82.1% of participants identified as heterosexual, 3.5% identified as homosexual, 12.1% identified as bisexual, and 2.1% identified as queer or pansexual. Only two participants indicated they have not completed the required AlcoholEdu module for the university, while 9.5% of participants were unsure if they have completed it. Grade point averages ranged from 1.10 to 4.00 ( $M = 3.38$ ,  $SD = .52$ ).

### Procedure

The present study included a screener phase (Phase 1), and an intervention phase (Phase 2). Informed consent was given in the beginning of each survey. In Phase 1, the screener, participants were asked to provide information on alcohol-related perceptions and behaviors. The online screener survey, which was sent to all freshmen students, assessed information

including demographics, weekly alcohol usage (measured by the Modified Daily Drinking Questionnaire [DDQ-M]), alcohol-related issues (measured by the Young Adult Alcohol Consequences Questionnaire [YAACQ]), use of PBS (measured by the Protective Behavioral Strategies Scale [PBSS]), and perceived norms of PBS usage. Participants who indicated consuming alcohol at least twice a month will be invited to participate in Phase 2.

Phase 2 consisted of a six-week intervention. Each week on a Monday, participants were emailed a link to an online survey that asked about their previous week's alcohol use (beginning on the previous Monday and ending on the most recent Sunday), problems experienced, and PBS usage, followed by the intervention for the experimental groups. Participants were randomly assigned a condition prior to Phase 2 using a random number generator. Then, all groups were asked for planned PBS for the following week.

### Intervention

Participants were randomly assigned to receive one of three treatments: a positive-framed message about PBS (Group A), a negative-framed message about PBS (Group B), or control that did not receive a message about PBS (Group C). Participants in Group A and Group B received the brief DRT Intervention. The intervention begins with, in the positive frame: "Last year, we started examining the perceptions of people who use these strategies by other UCF students. In general, we have found 10 basic perceptions about UCF students who DO USE these strategies regularly. Here is what UCF students have told us. People who report that they do use these strategies..." followed by socially positive statements (i.e., "tend to be seen as more responsible as their peers", "are seen as leaders by their peers", "are less impulsive and have better self-control").

In the negative frame, participants were told, “Last year, we started examining the perceptions of people who use these strategies by other UCF students. In general, we have found 10 basic perceptions about UCF students who DO NOT USE these strategies regularly. Here is what UCF students have told us. People who report that they do not use these strategies...” followed by socially negative statements (i.e., “are seen as outsiders by their peers”, “have worse long-term outcomes”, “tend to be seen as less responsible by their peers”). Participants in Group A and Group B received the same statements each week. Participants would indicate if they knew, did not know, or choose not to respond to the statements.

### Measures

#### *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, Baer, Kivlahan, & Marlatt, 1999). In Phase 1, it was used to measure alcohol usage and time spent drinking of a typical week over the past three months, composed in a free-text box grid. In Phase 2, the DDQ-M was used to measure alcohol usage and time spent drinking of a typical week over the past week, also composed in a free-text box grid. Each grid began with Monday and ended with Sunday.

#### *Young Adult Alcohol Consequences Questionnaire (YAACQ)*

The YAACQ, a 48-item survey, is used to measure alcohol-related consequences during a specific period (Read, Kahler, Strong, & Colder, 2006). The consequences range from mild consequences (i.e., hangover, embarrassment) to more extreme consequences (i.e., driving after consuming too much alcohol, alcohol dependence symptoms). 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, to measure the frequency of alcohol-related problems experienced. Participants also recorded which days of the week they encountered a problem, beginning with the previous Monday (Yes, I had a problem this day/ No, I had no problems this day/ I do not wish to respond).

Previous research has found the YAACQ to be reliable and valid when used to assess the college student population (Read, Merrill, Kahler, & Strong, 2007). Previous research also demonstrated the effectiveness of using the YAACQ in an online diary format to record alcohol problems for college students (Dvorak et al., 2015; Pearson, D’Lima, & Kelley, 2013).

#### *Protective Behavioral Strategies Survey (PBSS)*

Current PBS use and intentions to use was measured by the PBSS. This measure has been found to own validity and reliability (see Martens et al., 2005). The PBSS consists of 20 statements about three realms of protective strategies: Manner of Drinking, Stopping/Limiting Drinking, and Serious Harm Reduction. Frequency of PBS use will be 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.

Intentions to use PBS in the following week were also examined in Phase 2. Each week, after the PBS use of the previous week and the intervention (only for Group A and Group B), participants were asked “How frequently do you PLAN to engage in the following strategies over the NEXT WEEK?” using the same five-point Likert-scale. This allowed measuring of

discrepancies between intentions to use PBS, and actual PBS use. Previous research has also used the planned PBS format (Dvorak et al., 2016).

### *Normative Use of Protective Behavioral Strategies*

As per DRT, how actively an individual will respond to an intervention depends upon how much the individual perceives the behavior as being the norm (Blanton & Christie, 2003). To measure this, participants were asked “What percent (%) of the student body at UCF (i.e., UCF students in general) do you think use these types of strategies?”. Participants were also asked “What percent (%) of your close group of college student peers (i.e., your friends at UCF or other colleges/Universities) use these types of strategies when they drink?”. Participants also recorded how often they believe UCF students and their peers engaged in PBS on a five-point Likert scale of ‘Never’ to ‘Always’ (Note: the University of Central Florida, or UCF, is where the study will be conducted).

### Analysis Overview

Using the software G\*Power 3.0.10, a statistical power analysis was conducted. By using an effect size of .12, a power of .80, and an alpha level of .05, the necessary sample size was calculated to be 102 participants. We enrolled 157 participants in the study to allow for a maximum of 35% attrition. There were 51 participants in the positive-framed group, 52 participants in the negative-framed group, and 54 participants in the control group.

Using Stata-15 (StataCorp, 2017), Hypothesis 1 and Hypothesis 2 was evaluated by using multi-level modeling, using the *mixed* function (StataCorp, 2013). For Hypothesis 1, we expected to find significant relations between perceived low PBS norms, PBS use, and a positive message. We also expected to find significant relations between perceived high PBS norms, PBS use, and negative frame message. The multilevel equation for Hypothesis 1 was:

$$\text{Level 1: } PBS\ Use_{ij} = \beta_{0j} + \beta_{1j}(\text{Time in Weeks}_{ij}) + r_{ij}$$

$$\text{Level 2: } \beta_{0j} = \gamma_{00} + \gamma_{01}(\text{Biological sex})_j + \gamma_{02}(\text{Positive Frame})_j + \gamma_{03}(\text{Negative Frame})_j +$$

$$\gamma_{04}(\text{PBS Norm})_j + \gamma_{05}(\text{Positive Frame x PBS Norm})_j + \gamma_{06}(\text{Negative Frame x PBS Norm})_j + U_{0j}$$

$$\beta_{1j} = \gamma_{10} + \gamma_{12}(\text{Positive Frame})_j + \gamma_{13}(\text{Negative Frame})_j + \gamma_{14}(\text{PBS Norm})_j +$$

$$\gamma_{15}(\text{Positive Frame x PBS Norm})_j + \gamma_{16}(\text{Negative Frame x PBS Norm})_j + U_{1j}$$

In Hypothesis 2, we specified models that will test the effects of changes in PBS use on alcohol use and alcohol-related consequences. For this hypothesis, the following multilevel equations were specified as:

$$\text{Level 1: } Drinks\ Consumed_{ij} = \beta_{0j} + \beta_{1j}(\text{Time in weeks}_{ij}) + \beta_{2j}(\text{Weekly PBS use}_{ij}) + r_{ij}$$

$$\text{Level 2: } \beta_{0j} = \gamma_{00} + \gamma_{01}(\text{Biological sex})_j + \gamma_{02}(\text{Positive Frame})_j + \gamma_{03}(\text{Negative}$$

$$\text{Frame})_j + \gamma_{04}(\text{PBS Norm})_j + \gamma_{05}(\text{Positive Frame x PBS Norm})_j + \gamma_{06}(\text{Negative}$$

$$\text{Frame x PBS Norm})_j + \gamma_{07}(\text{Manner of Drinking PBS})_j + \gamma_{08}(\text{Stop/Limiting}$$

$$\text{PBS}) + \gamma_{09}(\text{Serious Harm Reduction PBS}) + U_{0j}$$

$$\text{Level 1: } Alcohol\ Consequences_{ij} = \beta_{0j} + \beta_{1j}(\text{Time in weeks}_{ij}) + \beta_{2j}(\text{Weekly PBS use}_{ij}) +$$

$$\beta_{3j}(\text{Weekly Drinks consumed}_{ij}) + r_{ij}$$

$$\begin{aligned}
\text{Level 2: } \beta_{0j} = & \gamma_{00} + \gamma_{01}(\text{Biological sex})_j + \gamma_{02}(\text{Positive Frame})_j + \gamma_{03}(\text{Negative} \\
& \text{Frame})_j + \gamma_{04}(\text{PBS Norm})_j + \gamma_{05}(\text{Positive Frame x PBS Norm})_j + \gamma_{06}(\text{Negative} \\
& \text{Frame x PBS Norm})_j + \gamma_{07}(\text{Manner of Drinking PBS})_j + \gamma_{08}(\text{Stop/Limiting} \\
& \text{PBS}) + \gamma_{09}(\text{Serious Harm Reduction PBS}) + \gamma_{10}(\text{Alcohol consumption rate})_j + \\
& U_{0j}
\end{aligned}$$

For the analysis, alcoholic drinks, alcohol-related problems, and norms were all mean-centered. Analysis was only done on individuals that drank alcohol on a given week. To examine Hypothesis 1, we sparse out the perceive norms of UCF Students engaging in PBS behaviors to high, mean, and low perceived norms.

## RESULTS

### Descriptive and Bivariate Statistics

Descriptive statistics and bivariate correlations are located in Table 1 and Table 2, respectively. Sex ( $p = .44$ ) and age ( $p = .54$ ) did not differ across conditions. However, there were more females ( $n = 122$ ) than males ( $n = 35$ ) enrolled in the study. Participants drank an average of 5.95 alcoholic beverages ( $SD = 7.91$ , range 0 - 60) and experienced an average of 6.75 alcohol-related problems ( $SD = 6.75$ , range 0 - 40) per week. Alcohol use and alcohol-related problems were strongly correlated ( $r(157) = .51, p < .01$ ), which is consistent with previous research. Higher perceived norms of friends ( $r(157) = -.20, p < .01$ ) and general UCF students ( $r(157) = -.07, p < .05$ ) correlated with lower alcohol-related problems. Throughout the whole study, participants tended to believe that their friend group ( $M = 67.30\%$ ,  $SD = 24.33$ ) engaged in PBS behaviors significantly higher than the general UCF population ( $M = 55.56\%$ ,  $SD = 20.00$ ;  $t(822) = 17.87, p < .001$ ).

During Phase 2, there was 833 person-weeks out of a total possible 942 person-weeks (6 weeks  $\times$  157 participants) for a completion rate of 88.43%. There was a total of 147 participants that indicated consuming alcohol during the six-week intervention. Ten participants never consumed alcohol during the duration of the intervention, so they were removed from the analyzed sample.

In the pre-intervention week, there were no differences in weekly alcohol-related problems ( $p = .12$ ), weekly alcohol consumption ( $p = .50$ ), weekly PBS use ( $p = .22$ ) and perceived norms ( $p = .44$  for UCF students;  $p = .97$ ) across conditions.

### Primary Analysis

The analysis of PBS use, alcohol use, and alcohol problems were broken down to five different multilevel models. The immediate post-intervention effects on PBS-use using a multilevel regression model, as well as changes of PBS across time as a function on the intervention were both examined. We then examined the immediate effects of alcohol use at the week level as a function of the intervention, and the 3 types of PBS use, SLD, SHR, and MD. Finally, we examined alcohol-related consequences at the week level as a function of PBS use and alcohol consumption. Table 3 and Table 4 contains the coefficients obtained from the multilevel analysis of weekly PBS.

#### *Manner of Drinking PBS*

To examine the effects of the intervention on MD PBS, we specified a multilevel regression model with weekly MD PBS as the outcome variable. Weekly MD PBS was predicted by two dummy coded condition predictors (positive message vs. control and negative message vs. control), pre-intervention PBS norms, time (in weeks), and the interaction of these three variables. We controlled for biological sex. Analyses were limited to weeks in which an individual consumed alcohol, as use of PBS occurs in the context of alcohol use. The intra-class correlation (ICC) showed that less than half of the variance in MD PBS was at the between-subjects level (ICC = .42).

There was no significant interaction between PBS use norms and either positive frame ( $B = 0.27, p = .42$ ) or the negative frame ( $B = -0.06, p = .85$ ). However, there was a significant three-way interaction of PBS norm x negative frame x time ( $B = 0.18, p = .01$ ). There was also a significant three-way interaction of PBS norm x positive frame x time ( $B = 0.13, p = .05$ ). Across time, there was no change in MD PBS use in the positive frame ( $B = -0.01, p = .78$ ) and

the negative frame ( $B = 0.03, p = .33$ ), However, there was a significant decrease in MD PBS in the control condition across time ( $B = -0.10, p < .01$ ). These associations are depicted in Figure 1. Next, we examined the change in MD PBS across time at high and low levels of PBS norms in all three conditions. At high norm levels (i.e.,  $+1SD$  PBS norms), there was a significant increase in MD PBS across time in the negative frame ( $B = 0.10, p = .02$ ), a modest (non-significant) increase in MD PBS use across time in the positive frame ( $B = 0.05, p = .06$ ), and a significant decrease in MD PBS use across time in the control condition ( $B = -0.13, p = .01$ ). These associations are depicted in Figure 2. At low norm levels ( $-1SD$  PBS norms), there was no change in MD PBS use across time in the positive frame ( $B = -0.04, p = .48$ ), negative frame ( $B = -0.04, p = .42$ ), or control ( $B = -0.06, p = .10$ ). These associations are depicted in Figure 3.

#### *Stopping/Limiting Drinking PBS*

To study the effects of the intervention on SLD PBS, we specified a multilevel regression model with weekly SLD PBS as the outcome variable. We used two dummy coded condition predictors (positive message vs. control and negative message vs. control), pre-intervention PBS norms, time (in weeks), and the interaction of these three variables to predict SLD PBS. Biological sex was controlled. Because PBS use can only occur when using alcohol, analyses were limited to weeks in which an individual consumed alcohol. According to the ICC, about 34% the variance in SLD PBS was between-subjects ( $ICC = .34$ ).

There were no significant interactions on SLD PBS and PBS norms in the positive frame ( $B = -0.06, p = .86$ ) nor the negative frame ( $B = -0.04, p = .88$ ). However, there was a main effect of the negative frame on the immediate post-intervention intercept ( $B = 0.33, p = .05$ ; Cohen's  $d = 0.47$ ). Post-intervention SLD PBS use was higher in the week immediately after the intervention in the negative frame ( $M = 2.88, SE = 0.18$ ) than in the control ( $M = 2.55, SE =$

0.18). This effect did not vary by PBS use norms ( $B = -0.04, p = .88$ ). Additionally, there was a significant effect of the negative frame (relative to control) on SLD PBS use across time ( $B = 0.13, p = .02$ ). In the control condition there was a non-significant decline in SLD PBS use across time ( $B = -0.05, p = .11$ ); however, in the negative frame there was an increase in SLD PBS use across time ( $B = 0.08, p = .04$ ). As with the main effect on the intercept, the effect on time did not vary by PBS norms as predicted by DRT ( $B = 0.07, p = .37$ ). These associations are depicted in Figure 4.

#### *Serious Harm Reduction PBS*

We specified a multilevel regression model with weekly SHR PBS as the outcome variable to examine the effects of the intervention on SHR PBS. Two dummy coded condition predictors (positive message vs. control and negative message vs. control), pre-intervention PBS norms, time (in weeks), the interaction of these three variables were used to predict SHR PBS; biological sex was controlled. Analyses were only limited to days participants endorse drinking alcohol because PBS use can only occur in the context of alcohol use. The ICC indicated about 25% of the variance seen in SHR was between-subjects ( $ICC = .25$ ).

There were no significant interactions between PBS use norms and either positive frame ( $B = 0.07, p = .72$ ) or the negative frame ( $B = 0.14, p = .54$ ). However, there was a significant three-way interaction of PBS norm x negative frame x time ( $B = 0.18, p = .02$ ). At mean levels of PBS norms, there were nonsignificant changes in SHR PBS use across time in the positive frame ( $B = -0.05, p = .26$ ), negative frame, ( $B = -0.03, p = .34$ ), and control condition ( $B = -0.08, p = .08$ ), depicted in Figure 5. Next, we examined the change in SHR PBS across time at high and low levels of PBS norms in all three conditions. At high norm levels (+1 *SD* PBS norms), there were no changes in the positive frame ( $B = -0.04, p = .45$ ) nor negative frame ( $B =$

0.00,  $p = .92$ ), but there was a significant decrease of SHR PBS across time in the control group ( $B = -0.15$ ,  $p = .03$ ). These associations are depicted in Figure 6. At low norm levels ( $-1$  SD PBS norms), there were no changes in SHR PBS across time in the positive frame ( $B = -0.06$ ,  $p = .48$ ), negative frame ( $B = -0.06$ ,  $p = .16$ ), nor control ( $B = -0.01$ ,  $p = .90$ ). These associations are depicted in Figure 7.

### *Alcohol Use*

In order to investigate the relationship of the DRT intervention and PBS use with alcohol use, we developed a multilevel regression model with weekly alcohol consumption as the outcome variable. We used two dummy coded condition predictors (positive message vs. control and negative message vs. control), pre-intervention PBS norms, the interaction of norms and the DRT message, time (in weeks), and each type of PBS (MD PBS, SLD PBS, and SHR PBS) at the individual and global level. We controlled for biological sex. According to the ICC, about 40% of variance in alcohol consumption is between-subjects ( $ICC = .40$ ).

There were no significant interactions between PBS perceived norms and either the positive frame ( $B = 0.59$ ,  $p = .68$ ) or the negative frame ( $B = -0.09$ ,  $p = .96$ ). In a given week for a given person, SLD PBS had a significant, negative relationship with alcohol use ( $B = -0.87$ ,  $p = .03$ ), while SHR PBS had a significant, positive relationship with alcohol use ( $B = 1.10$ ,  $p = .02$ ). Globally, SLD PBS had a significant, negative, and robust relationship with alcohol consumption ( $B = -2.69$ ,  $p < .01$ ).

### *Alcohol Problems*

Lastly, we investigated the impact of the DRT intervention, alcohol use, and all three PBS use types on alcohol-related consequences. We tested a multilevel regression model with weekly alcohol consequences as the outcome variable. We used two dummy coded condition

predictors (positive message vs. control and negative message vs. control), pre-intervention PBS norms, the interaction of norms and the DRT message, time (in weeks), and each type of PBS (MD PBS, SLD PBS, and SHR PBS) at the individual and global level. Since alcohol-related problems can only occur when consuming alcohol, analyses were limited to weeks in which an individual consumed alcohol. We controlled for biological sex and weekly drink consumption. About 44% of the variance seen in alcohol consequences is between-subjects, according to the ICC (ICC = .44).

There were no significant interactions of PBS perceived norms with alcohol consequences in the positive frame ( $B = 5.60, p = .10$ ) nor the negative frame ( $B = 3.26, p = .33$ ). Across time, participants had significantly less alcohol-related problems in all conditions ( $B = -0.51, p < .01$ ). Individually, in a given week, SHR PBS had a significant, positive relationship with alcohol consequences ( $B = 0.70, p = .01$ ). Alcohol consumption also had a significant, positive relationship with alcohol problems, consistent with previous research ( $B = 0.41, p < .01$ ), this is also the case globally ( $B = 0.29, p < .01$ ). Furthermore, even though SHR PBS had a significant positive relationship with alcohol-related problems individually, global SHR PBS had a robust, significant negative relationship with alcohol consequences ( $B = -1.70, p < .01$ ).

## DISCUSSION

According to DRT, negatively framed messages should be most likely to influence the behavior of people that believe many individuals engage in that behavior, a high perceived norm. In contrast, positively framed messages should be most influential for individuals that believe only the minority engages in a behavior, a low perceived norm (Blanton & Christie, 2003). Results in the current study suggest the negatively framed message is related to an increase of SLD PBS generally. Further, the interaction of PBS perceived norm x negative frame x time (in weeks) is related to a variation of MD PBS and SHR PBS across time and condition. Similarly, the interaction of perceived PBS x positive frame x time (in weeks) is related to a variation in MD PBS across time and condition. At high PBS norms, there was an increase in MD PBS use in the negative frame across time, and a modest increase in the positive frame. The former effect is consistent with DRT, the latter is the opposite of what would be predicted by DRT. At low PBS norms, there were no changes in any of the three PBS types; this is largely inconsistent with DRT predictions.

PBS norms seem to interact with the negative framed message (for MD PBS and SHR PBS) to modify behaviors in a DRT consistent manner. This is the study's most interesting finding, as this pattern is consistent with the idea that personal identity, and perhaps self-esteem, in college freshmen, stems from "fitting in" to the student's perceived social group (Crocker, Luhtonen, Cooper, & Bouvrette, 2003). FTIC students may want to assimilate into their new social groups without standing out, either positively nor negatively, possibly for a sense of belonging in their new environments (Freeman, Anderman, & Jensen, 2007).

There were no DRT effects observed on SLD PBS, however, there were direct effects of the negative message on both immediate post-intervention SLD PBS use as well as an increase

in SLD PBS use across time for those who received a negatively framed message. This again seems to highlight that first-year college students may be especially susceptible to messages that might reduce the chances that they would stand-out in a negative way. Indeed, research has shown that impression management is especially important in unknown or uncertain environments (see Foulk & Long, 2016). The fact that there was growth across time suggests that the message may actually become more important with time, regardless of initial norms.

Alcohol use was negatively associated with SLD PBS, individually and globally. Because the Negative Framed message positively related to an increase in SLD PBS, the Negative Frame may have indirectly influenced a decrease in alcohol use, which was not tested in the current study. SHR PBS was positively related to alcohol use and alcohol consequences individually in a given week. Globally, SHR PBS was robustly, negatively related to alcohol consequences. Similar to SLD PBS, SHR PBS was positively related to the Negative Frame message across time. While we did not test for indirect effects (due to power), an indirect effect may exist. This is an important finding, as a goal of this study was to reduce alcohol-related consequences in the FTIC population. Global SHR PBS use may be related to that reduction, supporting Hypothesis 2.

Because a major goal of this study was to reduce alcohol problems in FTIC students, we found a large change in behavior with SHR PBS globally in our experimental groups. Continuing, there was a 1.00 decrease of alcohol-related consequences for every 1.70 increase in SHR PBS use. There was a strong, significant decrease in SHR PBS in the control condition, which, according to the regression model, would increase alcohol problems in high norm levels; the intervention groups had no significant decreases at any norm levels.

In the control condition, the use of MD PBS and SHR PBS appears to be decreasing in high PBS norms across time. These results might be caused by a ceiling effect. It may also be possible that individuals over-estimate the amount of SHR PBS behaviors they engage in prior to the intervention. The repetition of questions may have brought an awareness to the participant about PBS behaviors, resulting in an overreporting of SHR PBS use in order to appear in an overly positive light. This remains a question for future research. Regardless of why this happens in the control condition, it is important to note that this same effect does not occur in either of the intervention conditions. Thus, the intervention may decrease the likelihood of a decline in PBS use across time in individuals with high PBS norms.

One interesting observation is the fairly robust effect of the negative frame, with virtually no effect of the positive frame. As noted above, this may be partially explained by an especially salient fear of standing out in a negative way in a new or unfamiliar environment. The growth across time, which was consistent with DRT for MD PBS and SHR PBS, may be indicative of a third factor associated with this type of intervention. Some recent research has shown that DRT interventions may actually result in a change in normative perceptions (see Dvorak, Kramer, & Stevenson, 2018). If individual's normative perceptions are increasing across time, then the effect of the negative message may become more robust. This would be consistent with DRT and was even predicted by Blanton and Christie in their initial paper on the theory (2003). If this is the case, then this intervention may be most effective if individuals are able to receive adaptive messages that become increasingly more negative (or switch from negative to positive) across time. This remains a question for future research.

## Limitations

The results of the study should be interpreted within the scope of the limitations. First, our study consisted of predominantly white female, stable students at a Southeastern university. Therefore, our results may not be generalizable to all FTIC students, or FTIC students that have a more problematic alcohol use disorder. Future research should aim to have a more diverse sample, and possibly a clinical sample. Furthermore, future research should use a stratified random sample to ensure equal amounts of males and females in the study.

In our screener survey, we emailed the survey to the entire entering FTIC population at the University of Central Florida, 6874 students, and 805 students responded, which is only about 12% of the FTIC population at our university. Again, the students that responded to our screener, and therefore were randomly selected for our study (if they reported consuming alcohol in the past month), may make our results not generalizable. For example, Ha, Joa, Gabay, and Kim (2018) found, while about 85% of college students check (but not necessarily read) their emails daily, 72% of students in their study reported treating emails from organizations as spam, and 54% of respondents do not read departmental emails. Our screener survey email was sent from a departmental email (of the lab the study was conducted in). Because our screener invitation email was recruiting participants, some freshmen who received the email may assumed the email was spam or the freshman may have simply deleted our email without reading the email. It may be the case that the students that did respond to our email (and is in our study's sample), always check their email, maybe to not miss out on university opportunities as a way to further "fit in", which would skew our results. Regardless of why certain students may have responded to our screener survey or not, this is a limitation in our

study. To overcome this limitation, Ha et al. (2018) suggests connecting with students via social media and text messages, where students report a much higher engagement than emails.

We did not control for where the participant lived (either in freshmen-only residential halls or at home with family), which may be a confounding variable. Perceived norms may have a stronger effect in a residential hall, where the FTIC student interacts with other FTIC students, and assimilates to the hall's perceived norms (Hummer, LaBrie, & Pederson, 2012).

Fourth, attrition was an issue. The study originally enrolled 157 participants. One-hundred and twenty-four participants completed Week 6 of the intervention, which was 21.02% attrition. Some participants participated in alternating weeks (such as completing Weeks 1 and 3, but not 2), which may be related to a lack in checking email for the weekly study survey.

While weekly diaries of alcohol use and problems have been used for previous studies, weekly recall may still result in retrospective recall bias, impacting the study's results (Gmel & Daeppen, 2007). Participants may not have accurately recalled number of drinks, problems, nor PBS in a given 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.

Finally, the current study found effects on both alcohol and problems that were consistent with previous literature (see Pearson, 2013). However, we were unable to examine mediated effects due to sample size and attrition. Thus, examining the indirect effects of this intervention in a larger clinical trial are warranted.

### Conclusion

The goal of the current study was to investigate a DRT intervention to increase PBS behaviors, and reduce alcohol consumption and problems in the first-time-in-college population. High perceived norms of PBS in both positive-framed and negative-framed message conditions

were related to an increase of PBS behaviors across time, but this was particularly robust in the negatively framed condition. Furthermore, DRT-framed messages may have also indirectly related to reductions in alcohol use and alcohol-related problems by increasing PBS use. Results suggest a DRT intervention may be an effective alcohol intervention for FTIC students, but primarily as a way to avoid standing out in a negative way.

**Table 1:** Descriptive Statistics

<b>Variable</b>	<b>Mean</b>	<b>SD</b>	<b>Skewness</b>	<b>Range</b>
Age	18.11	.34	2.96	18 - 20
Biological Sex	.79	.41	-1.37	0 - 1
Condition	1.00	.81	.00	0 - 2
Drinking Days per Week	1.23	1.20	.89	0 - 6
Drinks per Week	5.95	7.91	2.56	0 - 60
Problems per Week	4.45	6.75	2.10	0 - 40
PBS per Week	4.70	4.67	1.00	0 - 24
SLD PBS	2.66	1.28	.19	1 - 5
MD PBS	2.47	1.27	.44	1 - 5
SHR PBS	3.74	1.59	-.90	1 - 5
Norms of UCF	55.56%	20.00	-.01	15% - 95 %
Norms of Friends	67.30%	24.33	-.69	10% - 100%
Depressed Mood	1.72	.95	1.22	1 - 5
Anxious Mood	1.69	.94	1.25	1 - 5

*Note:* Gender is coded: 0= Female, 1 = Male; Condition is coded: 1 = Positive, 2 = Negative, 0 = Control. These descriptive statistics are between-subjects.

**Table 2:** Bivariate Correlations of Between-Subjects Data

Variable	1	2	3	4	5	6	7	8	9	10
1. Age	-									
2. Biological Sex	-.06	-								
3. Condition	.02	.01	-							
4. Total Drinks per Week	.05	.02	.01	-						
5. Total Problems per Week	-.02	.08*	-.03	.51**	-					
6. Norms of UCF	-.07*	.12**	.03	-.09**	-.07*	-				
7. Norms of Friends	-.07*	-.03	.01	-.13**	-.20**	.40**	-			
8. Weekly Total PBS	-.01	.06	.08*	.64**	.37**	-.03	-.01	-		
9. SLD PBS	-.03	.15**	.10**	.03	.05	.16**	.15**	.24**	-	
10. MD PBS	.00	.10**	-.01	.08*	.10**	.14**	.09**	.26**	.71**	-
11. SHR PBS	.02	.17**	-.04	.34**	.25**	.08	.09*	.48**	.68**	.67**

Note: \* denotes  $p \leq .05$ ; \*\* denotes  $p \leq .01$

**Table 3: Multilevel Regression Analysis of Weekly PBS Use**

Model Parameter		MD PBS <i>B</i> (SE)	SLD PBS <i>B</i> (SE)	SHR PBS <i>B</i> (SE)
<u>Effects on the Intercept</u>				
Model Intercept	$\beta_{0j}$	2.68 (0.19)**	2.55 (0.18)**	4.20** (0.16)
Biological Sex	$\gamma_{01}$	0.08 (0.17)	0.24 (0.17)	0.42** (0.16)
Positive Frame	$\gamma_{02}$	0.06 (0.19)	0.31 (0.18)	-0.06 (0.13)
Negative Frame	$\gamma_{03}$	-0.01 (0.19)	0.33 (0.17)*	-0.17 (0.13)
PBS Norm	$\gamma_{04}$	0.15 (0.23)	0.24 (0.23)	0.19 (0.12)
Positive Frame x PBS Norm	$\gamma_{05}$	0.27 (0.33)	-0.62 (0.35)	0.07 (0.20)
Negative Frame x PBS Norm	$\gamma_{06}$	-0.06 (0.19)	-0.04 (0.28)	0.14 (0.23)
<u>Effects on the Time Slope</u>				
Time (in weeks)	$\beta_{1j}$	-0.10 (0.03)**	-0.05 (0.03)	-0.08 (0.04)
Positive Frame	$\gamma_{12}$	0.10 (0.05)*	0.04 (0.05)	0.02 (0.06)
Negative Frame	$\gamma_{13}$	0.13 (0.05)**	0.10 (0.28)**	-0.05 (0.05)
PBS Norm	$\gamma_{14}$	-0.06 (0.05)	0.02 (0.05)	-0.13 (0.06)*
Positive Frame x PBS Norm	$\gamma_{15}$	0.13 (0.07)*	0.01 (0.08)	0.14 (0.12)
Negative Frame x PBS Norm	$\gamma_{16}$	0.18 (0.07)*	0.07 (0.08)	0.18 (0.08)*

Note: \* denotes  $p \leq .05$ ; \*\* denotes  $p \leq .01$

The norm used in this model was the mean perceived amount of general UCF students also engaging in PBS

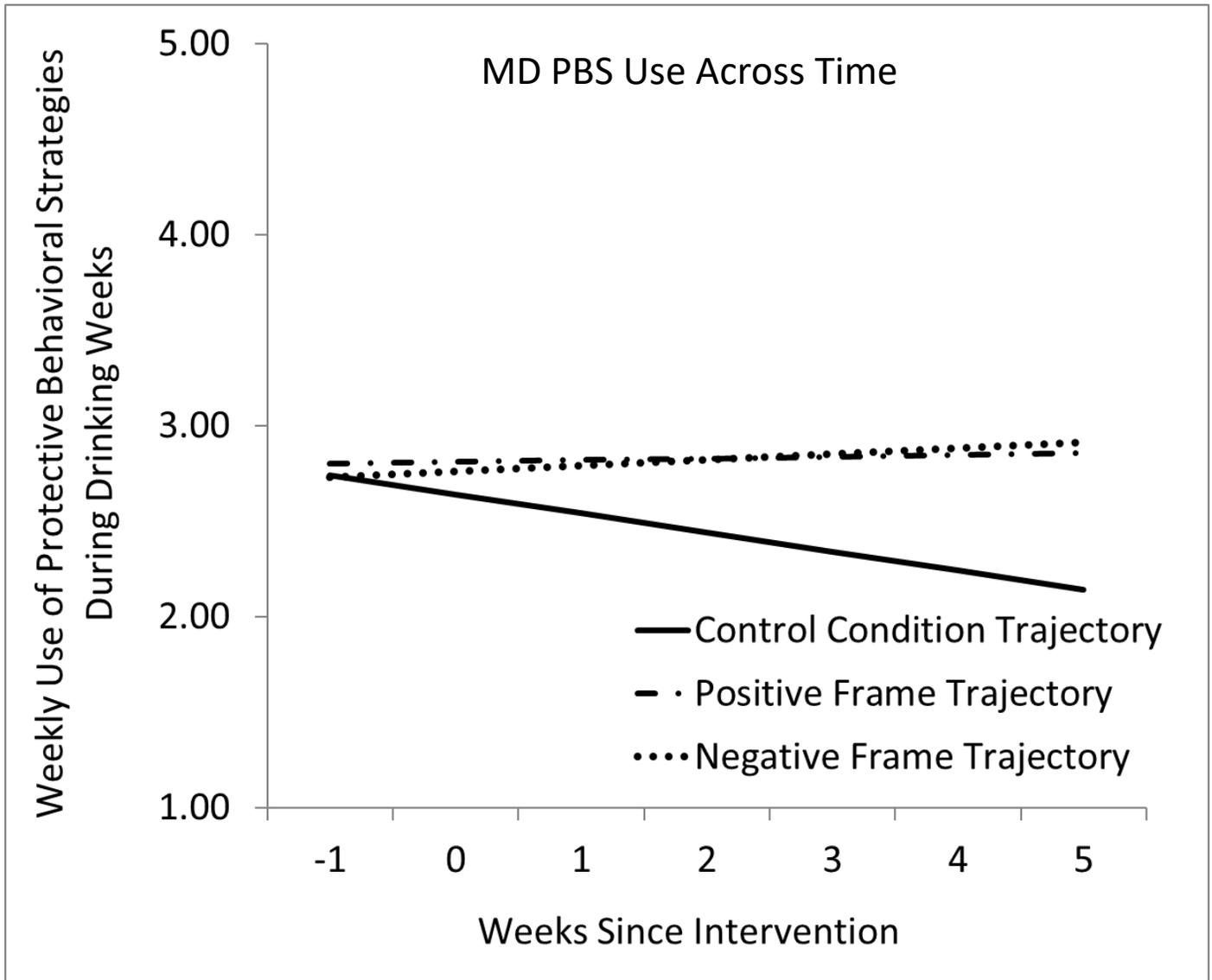
**Table 4:** Effects from DRT Frame to Alcohol Outcomes

Model Parameter		Alcohol Consumption	Alcohol Consequences
		<i>B</i> (S.E.)	<i>B</i> (S.E.)
<u>Effects on the Intercept</u>			
Model Intercept	$\beta_{0j}$	7.96( 1.29)**	4.13 (1.22)**
Biological Sex	$\gamma_{01}$	0.41 (1.31)	2.97 (0.94)**
Positive Frame	$\gamma_{02}$	0.59 (1.41)	-1.77 (1.10)
Negative Frame	$\gamma_{03}$	1.67 (1.21)	-0.11 (S1.17)
PBS Norm	$\gamma_{04}$	-1.26 (1.13)	-5.35 (3.15)
Positive Frame x PBS Norm	$\gamma_{05}$	0.39 (1.91)	5.60 (3.41)
Negative Frame x PBS Norm	$\gamma_{06}$	-0.09 (1.96)	3.26 (3.34)
Manner of Drinking PBS	$\gamma_{07}$	-0.02 (0.51)	0.49 (0.44)
Stop/Limiting PBS	$\gamma_{08}$	-0.87 (0.41)*	-0.22 (0.33)
Serious Harm Reduction PBS	$\gamma_{09}$	1.10 (0.45)*	0.71 (0.28)*
Weekly Drinks Consumed	$\gamma_{10}$	---	0.41 (0.06)**
Mean Drinks Consumed	$\gamma_{11}$	---	0.29 (0.07)**
Mean Manner of Drinking PBS	$\gamma_{12}$	0.05 (0.53)	0.46 (0.48)
Mean Stop/Limiting PBS	$\gamma_{13}$	-0.87 (0.41)*	-0.14 (0.69)
Mean Serious Harm Reduction PBS	$\gamma_{14}$	1.64 (0.89)	-1.70 (0.77)*
Time (in weeks)	$\gamma_{15}$	-0.07 (0.16)	-0.51 (0.15)*

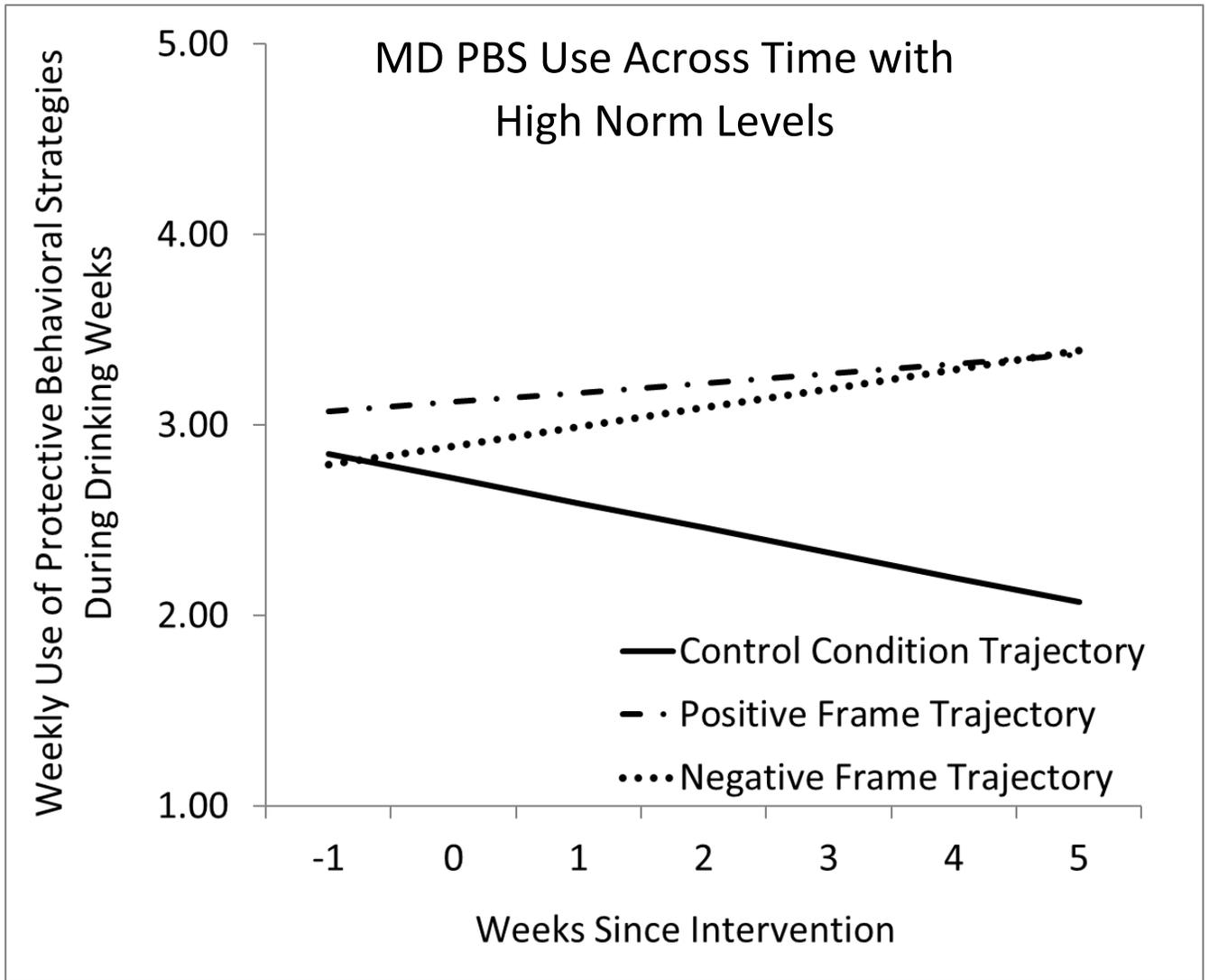
Note: \* denotes  $p \leq .05$ ; \*\* denotes  $p \leq .01$

The norm used in these models was the mean perceived amount of general UCF students also engaging in PBS

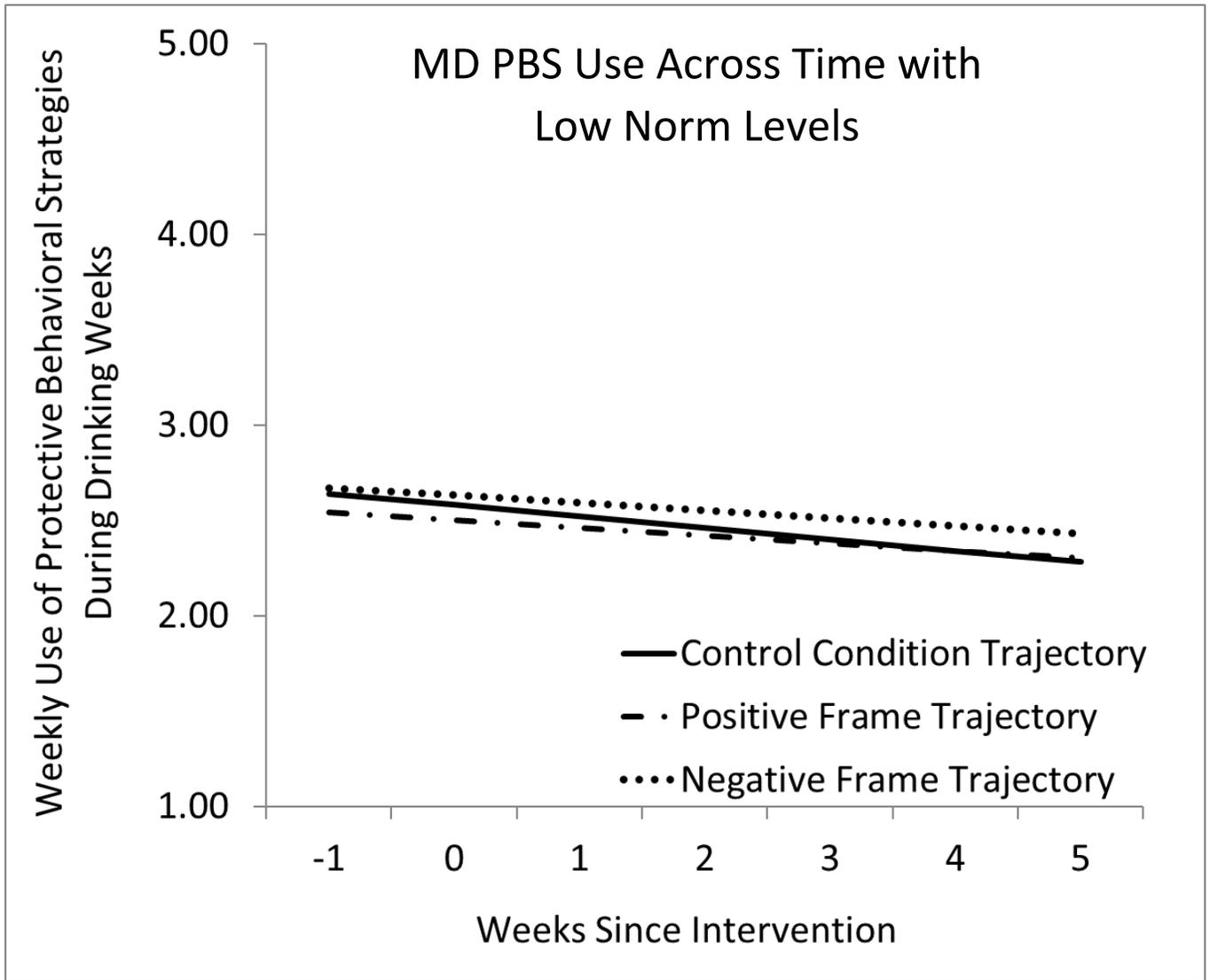
**Figure 1.** MD PBS use across time as a function of perceived PBS norms.



**Figure 2.** MD PBS use across time as a function of high PBS norm levels (+1 *SD* PBS norms).



**Figure 3.** MD PBS use across time as a function of low PBS norm levels (-1 *SD* PBS norms).



**Figure 4.** SLD PBS use across time as a function of perceived PBS norms.

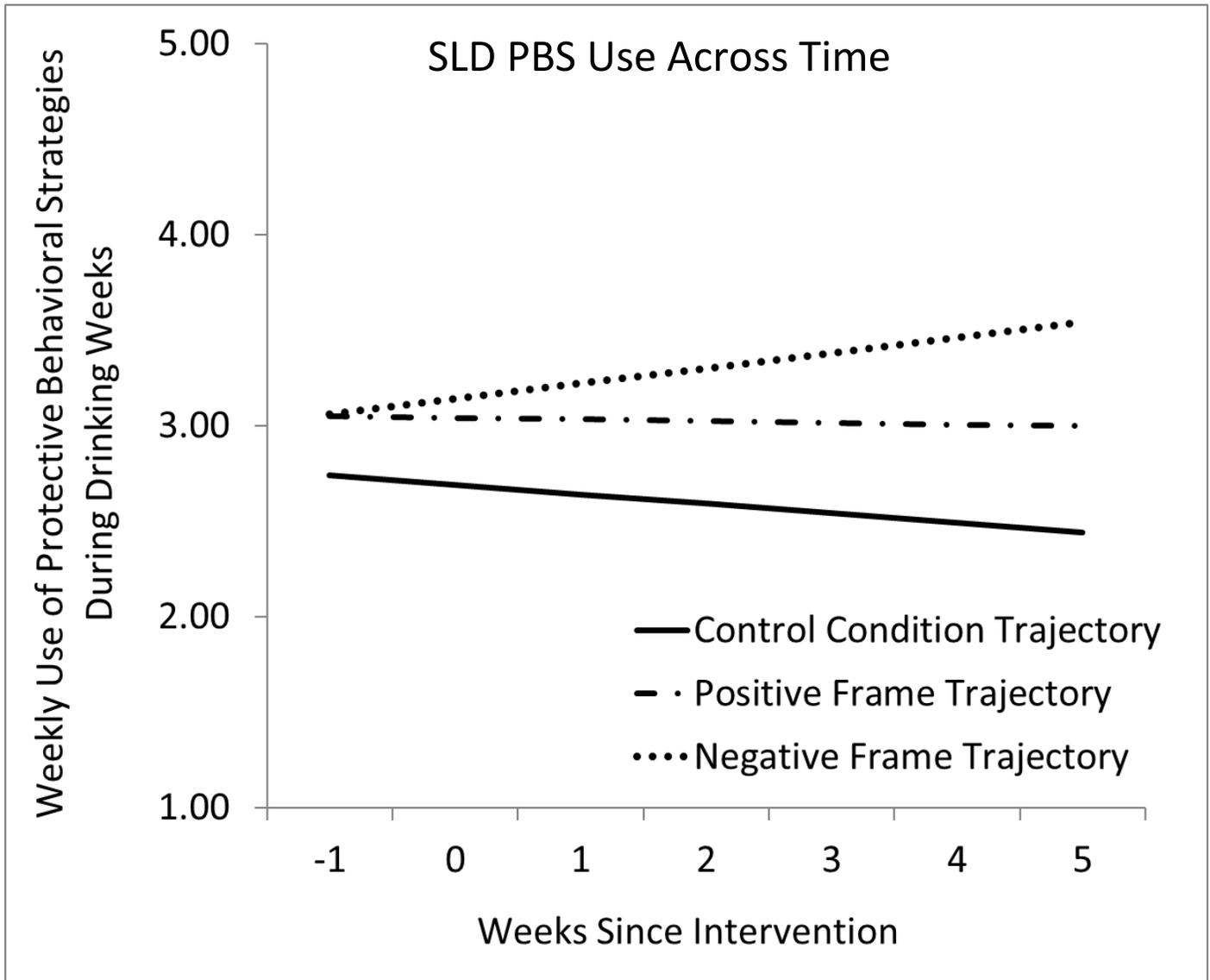
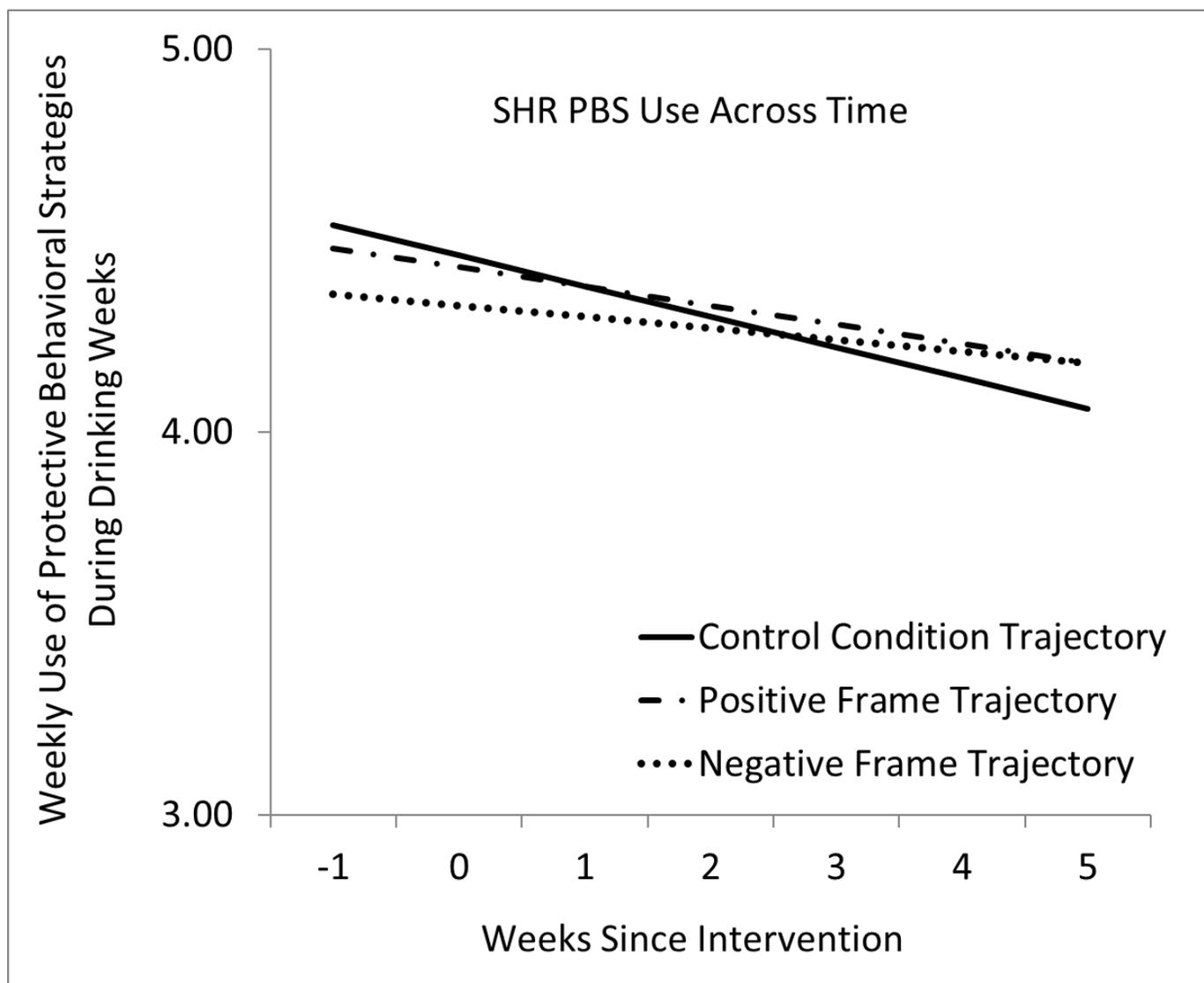
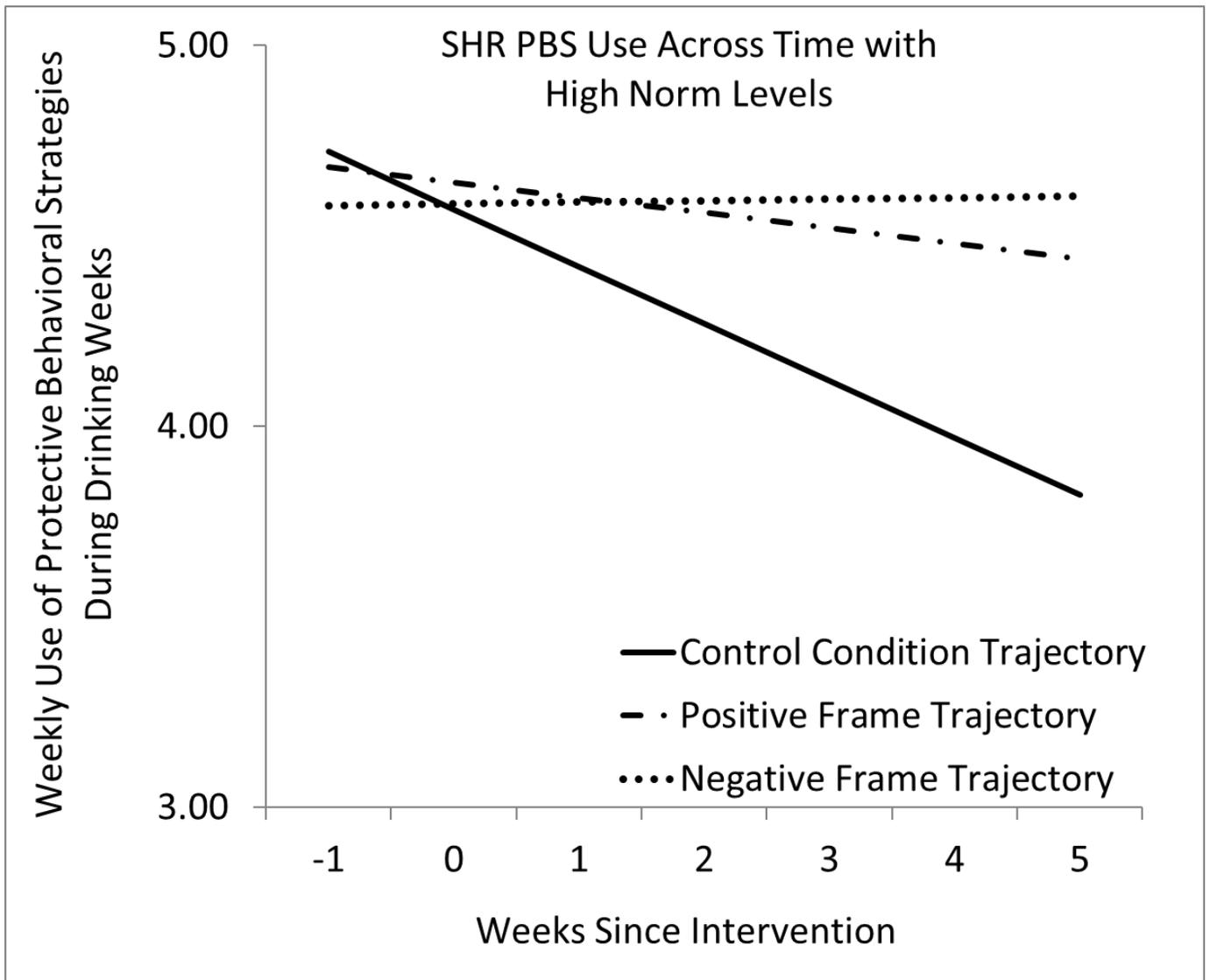


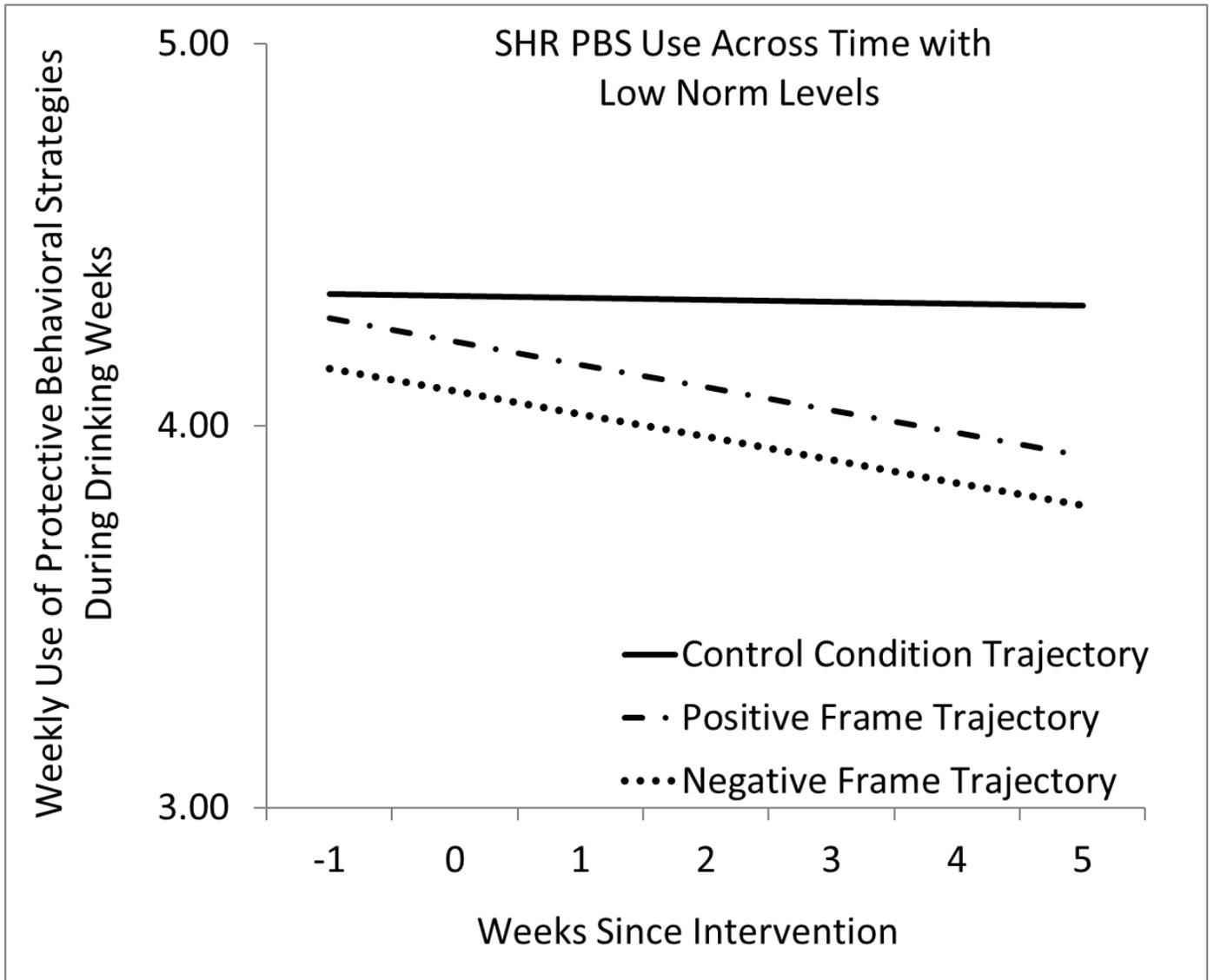
Figure 5. SHR PBS use across time as a function of perceived PBS norms.



**Figure 6.** SHR PBS use across time as a function of high PBS norm levels (+1 *SD* PBS norms).



**Figure 7.** SHR PBS use across time as a function of low PBS norm levels (-1 *SD* PBS norms).



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