

# Integrating Self-Affirmation and Implementation Intentions: Effects on College Student Drinking

Phillip J. Ehret, MA, David K. Sherman, PhD

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## Abstract

**Background** High levels of alcohol consumption are an enduring health risk among college students. Integrating multiple, complementary behavior change theories may offer a promising approach to promote reductions in alcohol consumption.

**Purpose** The current study tested if integrating self-affirmation and implementation intentions would be more effective than a self-affirmation only, implementation intentions only, or control condition at reducing alcohol consumption in college students over a 2-week period.

**Method** Two hundred and ninety-three college students who reported drinking in the past month were randomly assigned to a condition in a 2 (self-affirmation: values vs. control writing task) × 2 (implementation intentions: formed vs. not formed) between-subjects factorial design. Participants first completed a self-affirmation or control writing task, then read an article describing the risks of drinking. Next, all participants reported their common drinking behaviors and contexts, and then selected two harm-reduction strategies forming (or not forming) implementation intentions to use the strategies. Alcohol consumption was measured 1 and 2 weeks after the experiment.

**Results** Participants in the integrated self-affirmation and implementation intention condition were most likely to abstain from drinking 1 week later. Affirmed

participants continued to be more likely to abstain from drinking 2 weeks later.

**Conclusions** The findings support the efficacy of integrating self-affirmation and implementation intentions to reduce college student drinking (ClinicalTrials.gov number NCT02926794).

**Keywords** Self-affirmation • Implementation intentions • College students • Alcohol integrated interventions

## Introduction

Alcohol consumption by a college students results in a range of negative consequences from academic impairment to physical injury and death [1]. Although these negative outcomes are widely known, problematic drinking persists because students face both motivational and volitional barriers to reducing their drinking. Prior research has demonstrated the efficacy of self-affirmation (reflecting on important personal values) in reducing defensiveness and increasing motivation to change health behaviors [2, 3] and implementation intentions (creating specific *If... Then...* plans to change behaviors) in providing volitional strategies to change behavior [4, 5]. Despite theoretical calls for the integration of these approaches [2], the extant research combining self-affirmation and implementation intentions to change unhealthy behaviors has produced mixed results [6–8]. The current report analyzes potential theoretical and methodological reasons for these mixed results, and builds on these prior findings by integrating self-affirmation and implementation intention approaches in a comprehensive and easy to complete online activity that is specifically designed to provide empirically validated

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Phillip Ehret  
[ehret@psych.ucsb.edu](mailto:ehret@psych.ucsb.edu)

Department of Psychological & Brain Sciences, University of California Santa Barbara, Santa Barbara, CA 93106–9660, USA

harm-reduction strategies to reduce college student drinking.

### Self-Affirmation and Health Behavior

Self-affirmation theory posits that individuals seek to maintain an overall sense of adequacy, reflected in rational, adaptive, and healthful behaviors [2, 9]. When individuals are presented with information that challenges this perception of adequacy, such as learning that their alcohol consumption places them at a greater risk of negative consequences, they may resist engaging with this information [10]. This resistance helps to preserve individuals' perceptions of adequacy, but does so at the cost of leading them to ignore important health-risk information. However, self-affirmation theory also posits that reflecting on important personal values (i.e., self-affirming) before being presented with potentially threatening information can enable people to reinforce their overall sense of adequacy. This in turn allows people to see potentially threatening information in a broader context [11] and reduces their need to respond defensively to protect a sense of adequacy [12].

Two recent meta-analyses show self-affirmation's impact on health behavior change, where self-affirmation relative to control had a small-to-medium strength effect on health behavior change in response to health information ( $d+ = .32$ ; [3], see also, [13]). Research considering alcohol use has shown self-affirmation to be effective at reducing drinking [14–16]. Thus, self-affirmation may be an effective tool to overcome students' resistance to changing their drinking behaviors by increasing their motivation to change.

### Implementation Intentions and the Potential for Integrating Approaches

A motivational approach such as self-affirmation may be able to increase individuals' intentions to change their behavior, but intentions do not necessarily equate to behavior change [5]. Implementation intentions are specific plans, often in *if/then* statements that specify when, where, and how an individual will engage in behavior change (e.g., "If I am at a party, then I will not take shots of liquor."). Previous research has shown that participants who construct implementation intentions are more likely to engage in target behaviors [5], and specific studies with college students have shown implementation intentions to be effective in reducing drinking [17, 18]. For example, one study found that students who constructed implementation intentions after reading a message describing the safe limits of drinking and consequences of binge drinking were more likely to reduce their drinking 2 weeks later compared to the control group who only read the health message [17].

Despite the ability of self-affirmation and implementation intentions to address motivational and volitional behavior change barriers, respectively, and theoretical suggestions of the utility of integrating self-affirmation and implementation intentions [2, 19], empirical research has yielded mixed findings on whether an integrated approach can promote healthful behavior change. One study found that a combined condition was effective at increasing fruit and vegetable intake 30 days after the experiment [6]. However, another study found the opposite result that a combined condition decreased exercise behavior [7]. Further, a third study found that only implementation intentions were effective in reducing alcohol consumption and that the addition of self-affirmation had no effect on drinking [8].

Building on the prior research, the current study proposed three theory-driven factors that are necessary for an effective integration of self-affirmation and implementation intentions: (a) contextual flexibility; (b) relative difficulty of the target behavior(s); and (c) personal relevance of the target behavior(s). Consider first the contextual flexibility of the integrated condition, which is the degree to which an integrated self-affirmation and implementation intentions condition provides multiple strategies or ways of approaching the goal of behavior change in different contexts. In the study that combined self-affirmation and implementation intentions to increase fruit and vegetable intake [6], participants engaged in a contextually flexible activity where they created multiple implementation intentions that could be effective for different challenges. In contrast, in the study that the combined self-affirmation and implementation intentions condition led to decreased exercise [7], participants created only one implementation intention that would add one 30-min exercise session in the next week. Because most health behaviors occur in multiple and distinct contexts (e.g., drinking at home vs. out; exercising alone or with a team), the integrated self-affirmation and implementation intentions condition should be flexible enough to be appropriate for the diversity of situations where behavior change is needed, particularly since implementation intentions require contextual cues to activate their use and lead to behavior change [4].

The second proposed factor for an effective integration is the degree of difficulty of changing the target health behavior. The degree of perceived difficulty of the behavior is particularly important in the context of affirmation as previous work has demonstrated that when affirmed individuals are faced with a very difficult or impossible task, it can lead to increased disengagement from that task [20]. Again, consider the study where a negative effect of the self-affirmation and implementation intentions condition was found [7]. The behavioral outcome (adding one 30-min exercise session in the next week) and all that it entails (e.g., finding extra

time in one's schedule to go workout, getting to the gym, planning a workout, showering, etc.) may have been perceived as a large challenge that only one *if/then* plan was not sufficient to help solve them. Indeed, Jessop and colleagues raised this point regarding the difficulty of the behavior change and setting unachievable goals [7]. The present study built off this insight and sought to develop an implementation intentions manipulation that provided people with opportunity to develop volitional plans in such a manner as to minimize them perceiving it as an unachievable task.

The third consideration for integrating self-affirmation and implementation intentions is the relevance of the integrated self-affirmation and implementation intentions condition. Prior self-affirmation theorizing has posited and empirical work has shown that without a relevant personal threat, self-affirmation may not have an effect [21, 22] or may even backfire, leading to reduced persuasion [23, 24]. In the self-affirmation and implementation intentions study most relevant to the present investigation [8], participants read about the risks of binge drinking and the need to reduce or avoid that harmful behavior. However, not all participants were binge drinkers, meaning that for those not binge drinking, the health message was not relevant nor would the binge drinking information be threatening. This suggests one theoretical explanation for why self-affirmation may not have had a main effect in this empirical integration (see also [25]). By contrast, self-affirmation and implementation intentions led to increased fruit and vegetable consumption among participants who did not meet recommendations and, hence, for whom the message was relevant [6].

## Current Study

The goal for the integrated self-affirmation and implementation intentions condition deployed in this study was to provide information as well as increase motivation and behavioral skills and to do so in a way that ensured that the self-affirmation and implementation intentions condition was flexible with regards to drinking context, presented an achievable behavior change goal, and was personally relevant for all participants. The prediction was that the integrated self-affirmation and implementation intentions condition would be most effective at reducing drinking compared to a self-affirmation or implementation intentions only condition.

We also explored typical drinking and drinking refusal self-efficacy (i.e., individuals' perceived ability to say no to drinking) as moderators of the relationship between the conditions and alcohol consumption. Prior self-affirmation studies have found average drinking to moderate the effects of self-affirmation, but one study found that affirmation was most effective with heavier drinkers [25] and another study that it was most effective

with moderate drinkers [26]. It could also be that the conditions would be differentially effective depending on individuals' drinking refusal self-efficacy, with those reporting lower efficacy prior to the study benefitting most from the manipulations and reporting greater reductions in drinking. We also investigated how drinking refusal self-efficacy at the follow-ups might explain the reduced drinking, where self-affirmation or implementation intentions might increase participants' drinking refusal self-efficacy, which could lead to decreased drinking.

## Method

### Design and Procedure

The study featured a 2 (self-affirmation: values vs. control writing task)  $\times$  2 (implementation intentions: formed vs. not formed) between-subjects factorial design. First, participants were randomly assigned to complete a values affirmation or control writing task before reading a message about the risks of alcohol consumption. Next, all participants read a message about drinking risks for all levels of drinkers (personal relevance) and then engaged in a mental simulation task, imagining different personal drinking behaviors and drinking contexts as well as how specific harm-reduction strategies (i.e., Protective Behavioral Strategies; [27]) could be applicable (achievable goal). Finally, participants were randomly assigned to create generic intentions to use their selected strategies or to create implementation intentions that were relevant to previously imagined drinking situations and incorporated their selected strategies (contextual flexibility). Self-reported drinking was measured 1 and 2 weeks later. We conducted a 30-participant pilot study with these procedures and asked participants to report any parts of the study that were difficult. No participants reported any concerns regarding the manipulations. The pilot study and all materials from the main study are reported in the Supplementary Material.

All baseline and experimental materials were administered via an online survey completed in a psychology laboratory. Participants were emailed follow-up surveys. Response rates were high (95%) for both follow-ups. This study was approved by the University's Institutional Review Board and consent was obtained before participants began the study. This study is registered at ClinicalTrials.gov, protocol number NCT02926794.

### Participants

Participants were drawn from the university's psychology department subject pool. To ensure that all participants were active alcohol drinkers, they were screened twice for alcohol consumption. First, participants were

asked in a prescreening measure, “Did you consume alcohol in the last 30 days?” (“yes,”  $N = 1,388$ ). Second, when participants began the first survey they reported if they had consumed alcohol in the last 30 days, and any participants reporting that they had not consumed alcohol were screened out. The final sample for the study ( $n = 293$ ) were college students who chose to participate in a “health strategies” study and reported drinking at least one alcoholic drink in the past month. Eight participants were not included in the analyses because they spent less than 5 s viewing the health message article. Inclusion of these participants does not significantly change the results. Overall, 70.0% were female and 54.3% were Caucasian/white, 20.0% Asian, 12.1% multiracial, 7.9% other, 2.9% African American/black, 1.4% Native American, and 1.4% Native Hawaiian/Pacific Islander. With a separate question, 23.2% of participants reported that they were Hispanic or Latino/a. Participants received course credit for participating. Age was not asked to avoid concerns for participants about reporting underage drinking.

## Materials

### Baseline Measures

Participants first reported their sex and ethnicity, typical weekly drinking, and drinking refusal self-efficacy. Typical weekly drinking was measured with the Daily Drinking Questionnaire [28] where participants estimated their typical weekly drinking for each day of the week over the past month. The number of drinks across the 7 days was summed for an estimate of participants’ typical weekly drinking. Eleven participants reported drinking over 30 drinks in a typical week ( $>2 SD$  above the mean). Although not necessarily inaccurate, these outliers have the potential to bias the results. As such, all responses over 30 were rounded down to 30 drinks. Analyses that did not round down these values resulted in directionally stronger effects, but no new significant effects. In an effort to report less biased and more conservative effect sizes, the typical weekly drinking values, with a maximum of 30 drinks per week, were used. Participants were also shown a graphic, on the page they reported their drinking, that had a definition of a standard drink and examples of different types of alcohol and their conversion to standard drinks. Six items from the Drinking Refusal Self-Efficacy Questionnaire Revised measured participants’ confidence that they could resist a drink if it was offered to them when in a negative emotional state (e.g., How sure are you that you could resist drinking when you are upset?) and in a social context (e.g., How sure are you that you could resist drinking when your friends are drinking?) [29]. These six items had strong internal reliability,  $\alpha = .82$ .

### Self-Affirmation Manipulation

The study used a standard values affirmation procedure (for a methodological review, see [30]). Participants in the affirmation condition were asked to rank 11 different values in the order of personal importance. Afterwards, they were asked to describe why their top ranked value was an important personal characteristic or life domain. Those assigned to the control writing task ranked the same 11 values and were asked then to write about why their 10th most important value might be important to someone else. Complete manipulations are provided in the Supplementary Material.

### Health Message

After completing their respective writing tasks, all participants were then told, “Most students know that drinking alcohol has risks. However, not all are fully aware of just how common these risks can be. On the next page, we have included a brief excerpt from a recent article that underscores the importance of drinking responsibly.” On the next page, participants read a veridical article that highlighted both moderate and severe risks of drinking, and the frequency of these consequences. The article is provided in the Supplementary Material.

### Drinking Context and Risk Reduction Strategies

After reading the article, students reviewed a list of 27 different alcohol-related harm-reduction strategies (e.g., not playing drinking games; counting my drinks; eating before and while drinking). These strategies were based on the Protective Behavior Strategies Scale [31, 32]. First, students selected which of the strategies they already employed when drinking. Next, they were asked to report two of their most common drinking situations (e.g., drinking at a bar; drinking in my dorm room) and how they typically drink (e.g., take shots; drink cocktails) to help participants later select strategies or design implementation intentions that were appropriate for their personal drinking contexts. Afterwards, students were presented with the list of harm-reduction strategies and selected two strategies that they did not currently use but could realistically see themselves using in the future.

### Implementation Intentions Manipulation

In the no implementation intentions condition, participants viewed a page that displayed their selected strategies and were then asked to write why each strategy would be helpful. Thus, they did not form specific *if/then* plans to use their selected harm-reduction strategies. For participants in the implementation intentions condition, they viewed their selected strategies, and the information

they reported about where and how they typically drink. Further, they were given an example of an implementation intention in the form of an *if/then* plan and asked to create two *if/then* plans for themselves (following the standard implementation intentions manipulation [5]). This was designed to help make completing the implementation intentions both easy and relevant to their personal drinking contexts. In order to help link the specific plans to their larger goals of reducing drinking-related consequences, participants wrote why the plan would be useful to them. Participants were then shown another screen where their completed implementation intentions were displayed.

### Intentions to Use Harm-reduction Strategies

After being presented with their selected harm-reduction strategies or their specific implementation intentions, depending on participants' condition, all participants indicated their intentions to use these strategies. Participants who did not form implementation intentions were shown a screen that redisplayed their two selected harm-reduction strategies and were asked to indicate "How likely are you to actually use the strategies you selected?" for each strategy on a 7-point scale from 1 (*very unlikely*) to 7 (*very likely*). Similarly, participants who constructed implementation intentions were shown a screen that redisplayed their specific *if/then* plans and then indicated how likely they were to use each plan.

### Follow-up Materials

Follow-up surveys were emailed to participants 1 and 2 weeks after the experiment. They each contained the same six items from the drinking refusal self-efficacy questionnaire and a measure of past week drinking where participants were asked to report how many total alcoholic drinks they consumed over the past 7 days. On this page was a graphic defining a standard alcoholic drink and conversion of different types of alcohol to standard drinks. Participants were debriefed and provided information about the university's alcohol programs.

## Results

### Analytic Plan

First, we reported descriptive statistics. Next, we analyzed the main dependent variables, the number of weekly drinks participants reported consuming 1 and 2 weeks after the experiment. These dependent variables consisted of count data and were highly skewed with large 0 counts. To analyze these data, we used hurdle models with negative binomial distributions as this approach most appropriately accounts for the

response distributions (for more information, see [33]). Supplementary Material reports alternative models and justifications for the models presented in the main text. To test for robustness, we supplemented these models with a general estimating equations model that included data at both follow-ups in a single model. Next, we analyzed participants' expectations to use their selected strategies or implementation intentions. Last, we conducted exploratory analyses of moderators and mediators. Sex was not a significant covariate in any models and its inclusion did not change results, so it is not included in any reported analyses.

### Randomization and Manipulation Checks

There were no differences by condition for those randomized to each condition based on sex ( $X^2(3) = 5.12, p = .163$ ) or baseline alcohol consumption ( $F(3, 289) = 0.58, p = .629$ ). There were no differences by condition for attrition rates at either the first or second follow-up survey (first follow-up:  $X^2(3) = 1.03, p = .795$ ; second follow-up:  $X^2(3) = 4.59, p = .204$ ). One of the authors and a research assistant unaware of the condition verified whether all the constructed implementation intentions were completed correctly and were harm-reduction plans.

### Reductions in Drinks Consumed

#### *Descriptive statistics*

On average, students reported drinking 10.90 drinks (median = 10; including outliers trimmed to 30) in a typical week before the experiment ( $SD = 7.18$ ). Further, based on guidelines from the National Institute on Alcohol Abuse and Alcoholism, the majority of the sample (57.7%) met the criteria for "heavy" college drinking [34]. Mean drinks consumed and frequencies of abstinence at both follow-ups are presented in Table 1 and Figure 2. One week after the experiment, nearly 41% of those in the integrated self-affirmation and implementation intentions condition chose to abstain from drinking compared to about 31% in the implementation intentions, 26% in the self-affirmation, and 17% in the control conditions. Two weeks later, about 35% of those in the integrated self-affirmation and implementation intentions condition abstained from drinking compared to about 23% in the implementation intentions, 28% in the self-affirmation, and 17% in the control conditions.

#### *Inferential statistics*

Two hurdle models were conducted to test if those in the integrated self-affirmation and implementation intentions condition were significantly more likely to reduce their drinking compared to the other conditions. The hurdle model is a mixed model where a logistic

**Table 1** Mean Drinks, Number of Abstainers, and Predicted Probability of Abstaining

	Baseline				1 week postexperiment				2 weeks postexperiment			
	Nonaffirmed		Affirmed		Nonaffirmed		Affirmed		Nonaffirmed		Affirmed	
	Control <i>n</i> = 75	IIs <i>n</i> = 72	Control <i>n</i> = 76	IIs <i>n</i> = 70	Control <i>n</i> = 71	IIs <i>n</i> = 70	Control <i>n</i> = 74	IIs <i>n</i> = 66	Control <i>n</i> = 69	IIs <i>n</i> = 69	Control <i>n</i> = 74	IIs <i>n</i> = 68
Mean ( <i>SD</i> ) number of drinks	11.11 (7.13)	10.12 (7.32)	10.74 (6.77)	11.67 (7.58)	7.35 (6.91)	5.76 (6.97)	7.12 (7.39)	5.55 (6.58)	7.35 (6.47)	5.68 (6.42)	6.25 (6.38)	5.75 (6.82)
Number of abstainers					12	22	19	27	12	16	21	24
Probability of abstaining from drinking					14.86%	27.66%	23.70%	40.43%	16.08%	21.04%	27.83%	34.91%

Predicted probability of abstaining from drinking calculated from hurdle models that control for baseline drinking.

regression estimates the probability of 0 drinks, or, 1 or more drinks, and a regression model with a negative binomial distribution estimates the number of drinks consumed for those who drank 1 or more drinks. Two dummy coded variables were included in the models for the two manipulations: affirmation (affirmation writing task (1), control writing task (0)) and implementation intentions (formed (1), not formed (0)). Prestudy drinking, grand mean centered, was also included as a covariate.

For the 1-week follow-up, there was a significant main effect for both self-affirmation and implementation intentions on alcohol abstinence (i.e., reporting 0 drinks consumed; self-affirmation:  $B = -0.57$ ,  $z = -2.02$ ,  $p = .043$ ; implementation intentions:  $B = -0.78$ ,  $z = -2.77$ ,  $p = .006$ ) (see Table 2 for all coefficients). These two main effects demonstrate that those in the integrated self-affirmation and implementation intentions condition were more likely to abstain than those in the other conditions. We calculated the predicted probabilities of choosing to abstain from drinking for more easy to interpret effects. One week after the experiment, those in the integrated self-affirmation and implementation intentions condition were 25.57% more likely to abstain than those in the control condition. Those completing only the affirmation manipulation were 8.84% more likely to abstain from drinking, and those completing only the implementation intentions manipulation were 12.80% more likely to abstain from drinking than those in the control condition (see Table 1 for mean drinking and predicted probabilities of abstaining). There were no significant effects of the manipulations for reductions in drinking counts above 0 (all  $ps > .569$ ). That is, the manipulations showed a significant effect at reducing drinking specifically to 0, but not reducing by a certain count.

For the 2-week follow-up, there was again a significant main effect for self-affirmation on alcohol abstinence ( $B = -0.70$ ,  $z = -2.44$ ,  $p = .015$ ), but not for implementation intentions ( $B = -0.33$ ,  $z = -1.17$ ,  $p = .243$ ). Thus, only those who completed the affirmation were more likely to abstain from drinking. Those who were in the integrated self-affirmation and implementation intentions condition were 18.83% more likely to abstain than those in the control condition, but this was driven by the main effect of self-affirmation. Those who completed only the self-affirmation task were 11.75% more likely to abstain from drinking than those who completed the control writing task. Those who completed the implementation intentions were no more likely to abstain than those who did not form implementation intentions. Again, there were no significant effects of the manipulations for reductions in drinking counts above 0 ( $ps > .205$ ; all predicted

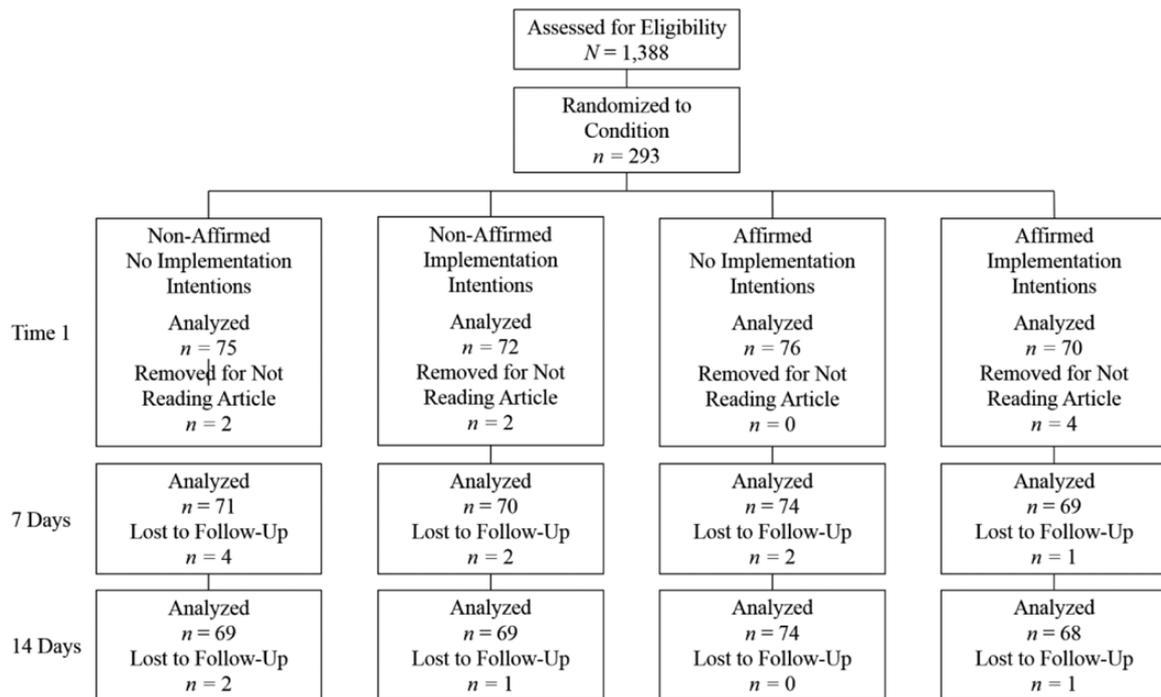


Fig. 1. Participant flow through the experiment.

probabilities and coefficients are in Table 1 and Table 2, respectively).

Two additional hurdle models that included an interaction between the two manipulations were conducted. At both follow-ups, there was no evidence of an interaction between the two manipulations, (1 week later: hurdle interaction term,  $B = -0.08$ ,  $z = -0.14$ ,  $p = .886$ ; count model interaction term,  $B = -0.09$ ,  $z = -0.51$ ,  $p = .612$ ; 2 weeks later: hurdle interaction term,  $B = -0.13$ ,  $z = -0.22$ ,  $p = .826$ ; count model interaction term,  $B = 0.14$ ,  $z = 0.77$ ,  $p = .450$ ).

To test the robustness of the findings of the abstinence outcomes, a generalized estimating equations model was run that estimated the effects of the manipulations

across both follow-ups simultaneously. This type of model accounts for the correlated drinking outcomes at 1 week and 2 weeks later, and reduces Type I errors compared to using separate regressions for each follow-up. Similar to the hurdle models, the generalized estimating equations model predicted abstinence from two dummy coded variables for the affirmation and implementation intentions conditions, respectively, and also included the covariate for typical weekly drinking at baseline. Both self-affirmation ( $B = -0.63$ , Wald  $\chi^2 = 8.55$ ,  $p = .006$ ) and implementation intentions ( $B = -0.55$ , Wald  $\chi^2 = 6.53$ ,  $p = .012$ ) were significant predictors of an increased likelihood of abstinence. No significant interactions between the two manipulations or interactions

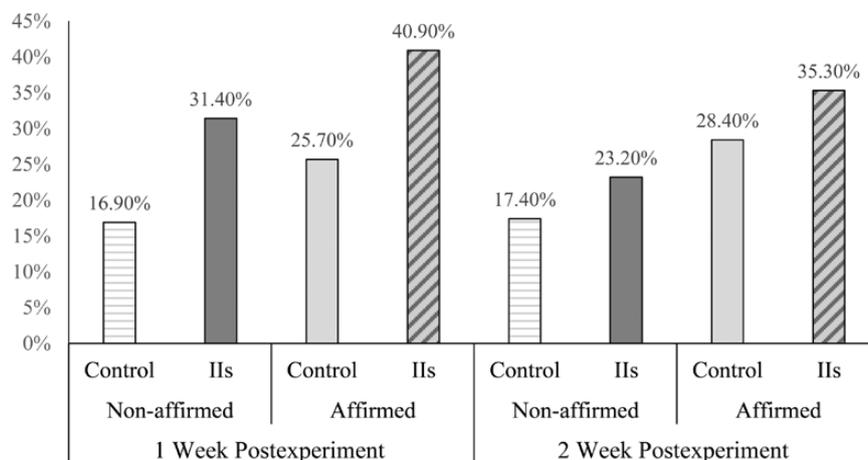


Fig. 2. Frequencies of abstainers by condition at both follow-ups. IIs refers to those who made implementation intentions.

**Table 2** Predicted Drinking 1 and 2 Weeks Postexperiment Using Negative Binomial Hurdle Models

		1 week postexperiment		2 weeks postexperiment	
		<i>B</i> ( <i>SE</i> )	<i>z</i>	<i>B</i> ( <i>SE</i> )	<i>z</i>
Hurdle model	Intercept	1.75 (0.28)	6.30***	1.65 (0.27)	6.04***
	Baseline drinking	0.10 (0.02)	4.23***	0.07 (0.02)	3.25**
	Affirmation	-0.57 (0.28)	-2.02*	-0.70 (0.29)	-2.44*
	Implementation intentions	-0.78 (0.28)	-2.77**	-0.33 (0.28)	-1.17
Count model	Intercept	2.02 (0.07)	29.19***	2.09 (0.08)	26.81***
	Baseline drinking	0.06 (0.01)	10.74***	0.05 (0.01)	7.19***
	Affirmation	0.05 (0.08)	0.57	-0.03 (0.10)	-0.31
	Implementation intentions	-0.04 (0.08)	-0.49	-0.12 (0.09)	-1.27
	Log( $\theta$ )	1.56 (0.17)	8.95***	1.17 (0.16)	7.22***

In the hurdle model, coefficients are predicting count versus a 0, so negative values indicate greater likelihood of a 0. \*\*\* $p < .001$ , \*\* $p < .01$ , \* $p < .05$ .

between each manipulation and typical drinking were significant in follow-up generalized estimating equations models (all  $p$ s for interaction terms  $> .101$ ). A second robustness check compared the self-affirmation and implementation intentions condition to a single condition representing those who received only implementation intentions or only self-affirmation and the control condition. The same pattern of results was found (see Supplementary Material).

### Expectations of Using Harm-Reduction Strategies

Participants' expectations of using their selected strategies were very high in each condition (7 being the scale maximum): affirmed and implementation intentions,  $M = 6.03$ ,  $SD = 1.08$ ; affirmed and no implementation intentions,  $M = 6.38$ ,  $SD = 1.08$ ; nonaffirmed and implementation intentions,  $M = 6.35$ ,  $SD = 0.69$ ; nonaffirmed and no implementation intentions,  $M = 6.45$ ,  $SD = 0.67$ . The measure of expectations was regressed on two dummy coded variables representing the two conditions (affirmation writing task (1), control writing task (0)) and implementation intentions (formed (1), not formed (0)) and found that those in the implementation intentions condition were more likely to report lower expectations ( $B = -0.23$ ,  $SE = 0.11$ , 95% CI:  $-0.43$  to  $-0.02$ ,  $p = .034$ ), and those in the self-affirmation conditions were likely to report marginally lower expectations ( $B = -0.20$ ,  $SE = 0.11$ , 95% CI:  $-0.40$  to  $-0.01$ ,  $p = .066$ ;  $F(2, 290) = 3.94$ ,  $p = .021$ ). An additional model included an interaction term; there was no evidence for a two-way interaction between conditions ( $B = -0.25$ ,  $SE = 0.21$ , 95% CI:  $-0.67$  to  $-0.16$ ,  $p = .230$ ). It appeared that constructing implementation intentions resulted in slightly lower expectations to use the selected harm-reduction strategies. It may have been that those in the implementation intentions condition reported lower expectations

for using two specific *if/then* plans as opposed to general use of the strategies, as the specific *if/then* plans may be perceived to be more difficult to use than the general strategies. Nevertheless, it should be noted that the effects of the conditions on expectations are very small (decreasing intentions by no more than 0.23 scale points on a 7-point scale) and the overall means for each condition are very high (above 6, with 94% of participants reporting that they were somewhat likely to very likely to use each strategy regardless of condition), suggesting that regardless of these effects, participants believed they were likely to very likely to use their selected strategies.

### Exploratory Analyses of Mediators and Moderators

Potential mediators and moderators of the manipulation effects were explored. Follow-up scores of drinking refusal self-efficacy were tested as mediators of the effect of the conditions on follow-up abstinence rates. There were no between-condition differences in follow-up drinking refusal self-efficacy scores, so there was no evidence of mediation ( $p$ s  $> .220$ ; full model reported in Supplementary Material).

Two potential moderators were tested: typical weekly drinking and baseline drinking refusal self-efficacy. At 1 week after the experiment, there was no evidence of moderation between typical weekly drinking and either the self-affirmation condition or the implementation intentions condition in the count or the hurdle model (all  $p$ s  $> .082$ ). Two weeks after the experiment, there was no evidence of moderation between typical weekly drinking for either condition in the count model, but there was an interaction between typical weekly drinking and affirmation in the hurdle model ( $B = 0.10$ ,  $z = 2.28$ ,  $p = .023$ ). The nature of this interaction suggests that for every increase in one typical drink per week, the probability of those who affirmed choosing to abstain decreases by

1.96%. Among the affirmed, it was more difficult for heavier drinkers to abstain than for less heavy drinkers; the strength of the affirmation is weaker for heavier drinkers 2 weeks after the experiment. However, it is important to note that since there is no interaction between typical drinking at the first follow-up and only a weak relationship for those in the affirmation condition at the second follow-up, this means that the abstinence outcome was largely observed across all levels of drinkers.

At 1 and 2 weeks after the experiment, there was no evidence of moderation between baseline drinking refusal self-efficacy and either the self-affirmation condition or the implementation intentions condition in the count or the hurdle models (all  $p$ s > .05). One moderation term was marginally significant ( $p = .063$ ), but since these were exploratory analyses and the marginal pattern was not found consistently between the two follow-ups, we chose to be more conservative and not treat this as a meaningful pattern. The interaction is reported in Supplementary Material.

## Discussion

The integrated self-affirmation and implementation intentions condition was most effective at reducing drinking compared to self-affirmation only, implementation intentions only, and the control condition at 1 week after the experiment. Self-affirmation remained effective at reducing drinking 2 weeks after the experiment. It should be noted that although we predicted decreased consumption, we did not specifically predict abstinence. Nevertheless, to provide the most accurate description and analyses of the data, we chose statistical techniques (hurdle models with negative binomial distributions) to test for abstinence and drink count reduction [33]. The abstinence finding strongly suggests that the experimental conditions were effective at reducing drinking, and that the reduction of drinking is specifically observed as reductions to zero drinks instead of by a certain number (e.g., three less drinks a week).

Exploratory analyses found only a weak interaction between typical drinking and the self-affirmation manipulation at the second follow-up, suggesting that the abstinence outcomes observed at the first follow-up were not only among lighter drinkers. These results largely supported the predictions that indeed, integrating both approaches, can be effective at reducing drinking among college students. This has important implications both for self-affirmation theory, as well as for approaches combining different theories in integrated interventions. Despite growing evidence that self-affirmation is generally effective at promoting healthful behaviors [3, 13], some recent research has failed to find actual changes in drinking behavior [35, 36]. However, the current study found self-affirmation reduced self-reported drinking up

to 2 weeks after the experiment, and another study also reported reductions in drinking among those that completed a self-affirmation task 1 month later ([14], see also [15]).

The theoretical purpose of combining self-affirmation and implementation intentions was to integrate a motivational technique that reduces the self-threat potential in drinking reduction with a volitional strategy that provides tools to help make change possible. Yet, combining self-affirmation with implementation intentions has yielded mixed results, as our review noted, suggesting that simply putting two approaches together that each have their own independent theoretical pathways to behavior change does not mean they will necessarily work together to change behaviors [7, 37]. The current study focused on three theory-driven factors that prior research suggested were necessary for creating an effective integrated self-affirmation and implementation intentions condition. Specifically, the procedure was designed to be contextually flexible, provide achievable behavior change goals, and be personally relevant. All participants reported very high expectations of using their harm-reducing strategies. This suggests that, overall, the conditions were meaningful and useful to students and, importantly, completing both the affirmation and implementation intentions activities were related to decreased drinking 1 week later. However, the results may suggest that the current design and manipulations were still not powerful or relevant enough to promote enduring change as implementation intentions were only effective at reducing drinking 1 week after the experiment. It may have been that simply creating two implementation intentions does not provide enough contextual flexibility to lead to enduring behavior change. College students likely encounter multiple drinking situations that vary in location, social group, and actual drinking activities (e.g., drinking games [38], theme parties [39]). In order for implementation intentions to be effective, they must be cued by the environment [5], and without the relevant cues the implementation intentions become irrelevant and possibly even forgotten as time progresses. Thus, despite the design to provide contextually flexible tools, only two implementation intentions could not encompass enough of the potential drinking contexts of college students to lead to enduring behavior change, and future research may need to further increase the contextual flexibility of behavior change tools. These findings underscore the difficulty of combining theoretical approaches and the need for continued investigation of mechanisms underlying behavior change effects.

Previous self-affirmation theorizing proposes that self-affirmation leads to long-term behavior change when the manipulation places individuals into positive recursive cycles in their environment [2]. For example, affirmation might reduce drinking the week following the

manipulation, which could lead to positive social feedback from friends as relationships are less strained by fights when individuals are intoxicated or improved classroom performance as more time is spent studying than drinking. This positive feedback creates a recursive cycle or feedback loop that can encourage reduced drinking and lead to long-term behavior change. Prior self-affirmation work in the health domain has identified two potential mechanisms (for a review, see [13]) that may be a first step in triggering recursive processes. The first is acceptance of experimental or intervention content. Prior work has found that self-affirmation promotes general and personal health message acceptance (for a review, see [19]), and, importantly, message acceptance has played an integral role in mediating both effects on intentions to stop smoking and behavior (taking an informational leaflet) [40]. In the context of an integrated intervention, acceptance not just of health message content (e.g., the risks of drinking), but of overall intervention content and activities (e.g., implementation intentions formed to reduce the risks of drinking) may be an important mechanism. By completing a self-affirmation task, participants may be more accepting of subsequent information and activities, resulting in greater engagement in the following tasks and, in turn, reduced drinking.

The second potential mediator is response efficacy, the belief that certain actions will reduce undesirable health outcomes (e.g., avoiding binge drinking will reduce the risk of a hangover). Previous work found that the relationship between self-affirmation and increases in fruit and vegetable intake was mediated by response efficacy, such that those who were affirmed were more likely to believe in the beneficial effects of eating more fruits and vegetables and that this increase in belief was related to actual increases of fruit and vegetable consumption [41]. It may be that an integrated intervention may be effective as far as participants accept the intervention content and also find that it will indeed be helpful to them in avoiding undesirable outcomes. Importantly, this needs to be measured over time, as the response efficacy may only become apparent when participants engage in the preventive behavior and experience success doing so, an example of a recursive process. Future research investigating these and other potential mediators over time can demonstrate how brief manipulations can lead to recursive processes fostering long-term behavior change [43].

Future research should also investigate integrating self-affirmation with other approaches beyond implementation intentions. It may be that self-affirmation combined with brief articles about the risks of drinking—more or less the standard self-affirmation health study paradigm [3]—is not always strong enough to lead to actual behavior change. Self-affirmation may be most effective when paired with additional content or

activities. For example, in a study where self-affirmation was paired with a multicomponent intervention that included follow-up phone calls, small gifts, and treatment contracts, affirmation led to greater medication adherence at a 12-month follow-up [43]. Thus, integrating self-affirmation with other behavior change tools (e.g., other interventions, communication campaigns) may be a particularly promising approach regarding changing drinking behaviors, as there are numerous and extensive tools already available. One well established empirical tool is Motivational Interviewing [44], a theoretical therapeutic approach and framework to reduce alcohol use that relies on avoidance of defensiveness and facilitating motivation to change. Pairing self-affirmation with tools such as Motivational Interviewing—effective tools that still have potential for greater efficacy—may be a meaningful means to produce behavior change (see [45] for a discussion).

The current study had several limitations. First, all drinking data were self-report. Prior research has found that self-reported drinking can be biased [46]; thus, our results may not reflect actual drinking behaviors. Nevertheless, self-reports are accepted as reliable and valid measures of behavior [28, 46, 47] and are often a necessity to measure drinking in the natural environments of participants over multiple weeks. Future work that measures blood alcohol content or uses daily drinking reports would be important additions to address the limitations of self-reports. Second, finding reductions in drinking through high abstinence rates (as opposed to reduced drinking levels) was unexpected. It is unclear if abstinence might represent a floor in reduction of drinking or might be a distinct outcome (e.g., students intentionally chose to abstain instead of reduce). Future research with heavier drinkers could provide more room for drinking reductions (i.e., a lower the floor for drinks consumed) and provide an opportunity to investigate if abstinence itself is a distinct outcome. Further, even though we did not find moderation by typical drinking levels, using a heavier drinking sample could directly test if these manipulations remain effective at reducing drinking among those who are most at risk. Finally, future research should also include longer follow-up periods as they provide important information on the durability of the effects of these manipulations, and include more diverse samples to increase the generalizability of future findings.

Despite these limitations and open questions, this study provides evidence that the integration of self-affirmation and implementation intentions can lead to increased abstinence rates, and provides suggestions of why this specific integrated condition was effective and how it informs our understanding, more broadly, of other work in this area. Many health behavior change theories, such as the

information-motivation-behavioral skills model [48] and theory of planned behavior [49], recognize that there are multiple determinants of behavior (e.g., information, motivation, and behavioral skills [information-motivation-behavioral skills model]; attitudes, norms, and perceived control [theory of planned behavior]). Following from these theories, successful interventions will likely need to integrate multiple manipulations or interventions that target each of these behavior change components. This study offers important insights relevant to both researchers and clinicians interested in combining interventions in theoretically cohesive ways to more effectively address problematic behaviors such as college student drinking where there are multiple and distinct barriers to behavior change (e.g., motivational and volitional barriers). The current integration of self-affirmation and implementation intentions illustrates the theoretical challenges present when integrating different approaches and also demonstrates how consideration of these challenges can lead to novel means of changing risky health behaviors.

## Supplementary Material

Supplementary Material is available at *Annals of Behavioral Medicine* online.

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## Compliance with Ethical Standards

**Authors' Statement of Conflict of Interest and Adherence to Ethical Standards** Authors Phillip J. Ehret and David K. Sherman declare that they have no conflict of interest. All procedures, including the informed consent process, were conducted in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000.

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