



Strengthening personalized norm feedback interventions: The ambivalent-attitude effect

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ABSTRACT

This study investigated the effect of induced attitude ambivalence on the relationship between the personalized norm feedback (PNF) intervention and heavy drinking by college students. College students consume more alcohol and engage in binge drinking at greater rates than most segments of the population. Given the harmful effects of binge drinking and other risky drinking behaviors, it is important to implement effective interventions to reduce alcohol consumption. PNF is an effective intervention for reducing heavy drinking where students compare their drinking and perceptions of normative drinking with actual drinking norms. Past research suggests that inducing ambivalence makes norms a stronger predictor of behavior. We hypothesized that induced attitudinal ambivalence before the PNF intervention would lower intentions to consume alcohol. This study was a one-way design with ambivalence about drinking (high vs low) as the independent variable and intentions to drink alcohol in the future as the dependent variable ($N = 338$, 76 % female, $M_{age} = 19.76$, $SD = 2.61$). All participants received the PNF intervention after the ambivalence manipulation and before the intentions to drink alcohol measure. Results from the generalized linear model revealed a significant effect for ambivalence, $p = .028$. As predicted, participants in the high ambivalence condition intended to drink fewer drinks in one sitting in the future compared to those in the low ambivalence condition. These results suggest that ambivalence may play an important role in make PNF interventions more effective, though more research is necessary to untangle the relationship between ambivalence and norms.

1. Introduction

Heavy drinking on college campuses is a serious issue. Research suggests that 75 % of college students have consumed alcohol in the last year and 60 % in the last month (Schulenberg et al., 2020). Both of these values are greater than the percentages of same-aged non-college student counterparts (Schulenberg et al., 2020). In addition to high drinking rates, 29 % of college students engaged in binge drinking, defined as having five or more drinks at least once in the prior two weeks (Schulenberg et al., 2020). Additionally, research indicates that heavy drinking, drunk driving, and deaths related to drinking have all increased over the last several decades (Hingson, Zha, & Weitzman, 2009). In short, the need to reduce heavy drinking, especially on college campuses, remains a high priority. There have been several intervention approaches to reduce heavy drinking in college-aged populations, among which personalized norm feedback (PNF) has received the most consistent empirical support (Reid & Carey, 2015).

1.1. Personalized normative feedback

College students typically overestimate their peers' alcohol consumption. This is especially true among heavy drinkers whose perceptions of the norm tend to be significantly higher than the actual norm (Borsari & Carey, 2003; Lewis & Neighbors, 2004; Perkins, Meilman, Leichter, Cashin, & Presley et al., 1999). These misperceptions are problematic because college students tend to conform to perceived behavioral norms of their peers, especially drinking norms (Borsari & Carey, 2003). PNF is an intervention that was created to correct heavy drinkers perceptions to be in line with actual behavior of the broader college population (Neighbors et al., 2016; Reid & Carey, 2015; Walters & Neighbors, 2005). This approach involves providing individuals feedback about their own drinking, their perception of how much others drink, and how much other people actually drink. This approach makes clear to heavy drinkers that they tend to drink more than their peers (i.e., that their behavior is non-normative) and that their perception of

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normative drinking is an overestimate of actual levels of drinking within their group. When individuals are made aware of this, they engage in a social comparison process, wherein the discrepancy between their behavior and the norm leads to them shifting towards the norm (Miller, Leffingwell, Claborn, Meier, Walters, & Neighbors, 2013; Walters & Neighbors, 2005). Following this intervention, participants tend to report lower intentions to drink. Additionally, college students tend to report drinking less in follow-up surveys, typically assessed from three to six months after receiving feedback (Dotson et al., 2015; Neighbors et al., 2004, 2016). Furthermore, these interventions are effective in online contexts as well as in-person contexts (Neighbors et al., 2009, 2016).

However, the effect sizes from past iterations of this intervention have consistently been small (Carey et al., 2007, 2012). This suggests that seeking to improve this intervention is important, given the significant benefit to individuals and their communities when drinking is reduced. Inducing ambivalence before PNF is a potential method for improving its efficacy.

1.2. Ambivalence

Attitudinal ambivalence occurs when people feel both positively and negatively about an attitude, object or behavior (Conner & Sparks, 2002). Ambivalence creates a sense of cognitive discomfort due to the experience of having conflicting evaluations of the same attitude object (Newby-Clark, McGregor, & Zanna, 2002) and increases biological markers (salivary cortisol, alpha-amylase, heart rate) of discomfort (Hohman, Keen, Harris, Niedbala, & Berke, 2017). The discomfort associated with ambivalence creates a negative drive state wherein an individual is motivated to reduce their attitudinal ambivalence to reduce their discomfort.

To reduce ambivalence, research suggests that people pay close attention to information that will facilitate resolution of the conflict (Briñol, Petty, & Wheeler, 2006; Clark, Wegner, & Fabrigar, 2008; Hohman, Crano, Alvaro, & Siegel, 2014; Maio, Bell, & Esses, 1996). Specifically, research demonstrates that people with highly ambivalent attitudes look for and use consensus information to resolve ambivalence (Hodson, Maio, & Esses, 2001). Thus, people seek information in the social context to reduce the discomfort aroused by ambivalence. A valued source for resolving ambivalence is one's social group (Hogg, 2006). Groups help define how members should think and act by supplying norms for appropriate behavior that define expected and opposite attitudes and actions of group members (Hogg & Reid, 2006). Because attitudes are important features of group life, individuals look to their groups to determine the correct attitudes in circumstances of high ambivalence.

Given that norms define group-related attitudes, they provide a viable means of reducing ambivalence. This idea is supported by considerable research demonstrating that when ambivalence is aroused people are more persuaded by norms compared to when ambivalence is low (Hohman et al., 2014, 2016, 2017). For example, Hohman and colleagues (2016) manipulated ambivalence about tobacco use and then provided a persuasive communication that contained (or did not contain) anti-tobacco norms. Results indicated participants intended to use tobacco less when they were high in ambivalence and received the anti-tobacco norms. The relationship between increased ambivalence and normative conformity has also been demonstrated in the context of environmental behaviors (Mouro, Lomba, & Duarte, 2021), adolescent drug use (Hohman et al., 2014), and college prescription drug abuse (Hohman et al., 2017). Taken together, this work suggests that manipulating ambivalence before the PNF intervention should increase its effectiveness, as people should use information about norms to reduce their ambivalence.

1.3. Current study

This study investigated if participants intended to drink less after the PNF intervention when they had their attitude ambivalence induced first. Participants were college students at a large midwestern university, and data were collected using an online survey format. We hypothesized that participants would report lower intentions to drink when ambivalence was induced before the PNF intervention, compared to when ambivalence was not induced before the PNF intervention.

2. Methods

2.1. Participants

Eighty-four male and 258 females ($N = 338$, $M_{age} = 19.76$, $SD = 2.61$) participated in the study. The ethnic breakdown was African American (6.6 %), Asian (3 %), White non-Hispanic (82.7 %), Native Hawaiian/Pacific Islander (0.5%), or other (7.1 %), and 28.8 % of the sample identified their ethnicity as Hispanic/Latino. To be included in the study, participants had to report at least one heavy drinking episode in the last month, defined as five drinks in one sitting for males and four drinks for females (Neighbors, Larimer, & Lewis, 2004). We predicted an effect size of $f = 0.20$ based on similar previous research (Hohman et al., 2016). To have 95 % power to detect our effect, we needed 327 participants for this study. The study was approved by the university's Institution Review Board prior to data collection.

2.2. Procedure and materials

This study was a one-way design with ambivalence about drinking (high vs low) as the independent variable and intentions to drink alcohol in the future as the dependent variable. Gender was a covariate in analyses. The study was completed online using Qualtrics, and data collection began in August 2020 and ended in May of 2021.

2.2.1. Procedure

The research was introduced as a study about previous alcohol use and perceptions of others' alcohol use. To begin, participants identified their gender, age, race, and ethnicity. After providing demographic information, participants completed a baseline assessment. Included in the baseline assessments were measures of perceived drinking norms and drinking behavior, social motives, expectancies, and evaluations of the social effects of alcohol. After the baseline assessment, participants were randomly assigned to the high or low ambivalence conditions and then answered questions measuring ambivalence as a check to make sure the ambivalence manipulation worked. After the ambivalence manipulation check, all participants received the PNF intervention. Finally, the study finished with a measure of intentions to drink in the next 30 days.

2.2.2. Ambivalence manipulation

To manipulate ambivalence, we had participants write about the pros or cons of continuing or reducing drinking. The manipulation was based on decisional balance (Collins, Carey, & Otto, 2009). First, participants were randomly assigned to either write about the pros or cons of continuing drinking as they currently do. Next, participants were randomly assigned to write about the pros or cons of reducing their drinking. The high ambivalence condition consisted of participants who wrote about the pros of continuing and the pros of reducing drinking or participants who wrote about the cons of continuing and the cons of reducing drinking. The low ambivalence conditions consisted of participants who wrote about the pros of continuing drinking and the cons of reducing drinking or the cons of continuing drinking and the pros of reducing drinking. Thus, the high ambivalence conditions consisted of participants who wrote about contradictory aspects of drinking (e.g., pro keep drinking and pro reducing drinking), whereas the low ambivalence participants wrote about aspects that were not contradictory (e.g., pro

keep drinking and cons of reducing drinking). A 2 (pro v. con continuing drinking) \times 2 (pro v. con reducing drinking) analysis of the main dependent measure did not reveal any significant effects, thus supporting the collapsing of these two variables into a single ambivalence (high v. low) variable.

2.2.3. Ambivalence manipulation check

After ambivalence manipulation, participants answered questions to measure their attitude ambivalence using the felt ambivalence measure (Priester & Petty, 1996). Felt ambivalence measures the extent to which people feel evaluative tension associated with ambivalence. To measure felt ambivalence, participants answered three questions on a 1 to 9 likert scale ("Please identify the amount of *conflict/mixed feelings/indecision* you feel when you think about drinking alcohol."). To create a single felt ambivalence measure we summed the three items, $\alpha = 0.886$.

2.2.4. Personalized normative feedback

Participants received personalized normative feedback immediately following the ambivalence manipulation. The format of personalized normative feedback was modeled from previous studies using gender-specific PNF (Miller et al., 2013; Neighbors et al., 2004, 2009, 2016; Reid & Carey, 2015; Walters & Neighbors, 2005). PNF, which aims to correct overestimation of other students' drinking and to reveal that the participant's drinking exceeds the typical drinking of their peers, consisted of presenting feedback regarding (a) a participant's own drinking behavior; (b) the participant's perceptions of other students' drinking behavior at their university; and (c) students at their university's actual drinking behavior. Participants saw this feedback regarding drinking behavior in both text and bar graphs. Each bar graph included bars for one's own drinking, perceptions of others' drinking, and others' actual drinking. The feedback was presented on four screens, the first displaying weekly drinking frequency, the second showing typical drinks consumed per occasion, the third consisting of the number of drinks consumed in a week, and the last screen presenting the participant's percentile rank based on their reported number of drinks per week when compared to other same-gender students at their university. Information for the data from each campus was provided at the bottom of the screen, noting that the norms information came from a previous survey conducted at the university.

2.2.5. Intentions to drink

To measure intentions to consume alcohol in the future, participants answered a single item asking them to identify the number of drinks they plan to consume when they drink again, "during the next month when you consume alcohol, how many beverages on average do you plan on drinking in a given occasion? ($M = 3.91$, $SD = 2.77$; $M_{male} = 5.23$, $SD_{male} = 3.82$, $M_{female} = 3.50$, $SD_{female} = 2.20$). This single item was chosen because it mirrored the item used to screen heavy drinkers for the study.

The data are available upon request to the first author.

3. Results

3.1. Manipulation check

To analyze the impact of our ambivalence manipulation on felt ambivalence, we conducted a generalized linear model with felt ambivalence using a Poisson distribution and the Wald χ^2 test. Comparing log-likelihood values across multiple distributions (normal, negative binomial, Poisson, Gamma) indicated that Poisson was the best distribution to fit the felt ambivalence variable. Results from the generalized linear model revealed a significant effect for ambivalence Wald $\chi^2(1) = 4.79$, $p = .029$, $d = 0.15$. As predicted, participants in the high ambivalence condition had higher felt ambivalence ($M = 9.81$, $SE = 0.232$) compared to those in the low ambivalence condition ($M = 9.34$, $SE = 0.228$).

3.2. Main analysis

To analyze the impact of ambivalence on intentions to drink alcohol, we conducted a generalized linear model with intentions to drink modeled using a negative binomial distribution with a log link and estimating the parameter value to correct for overdispersion and the Wald χ^2 test, with gender, age, and drinks consumed in a typical week entered as covariates. Comparing -2 log-likelihood values across multiple distributions (normal, -2 log likelihood = 1,682; negative binomial, -2 log likelihood = 1,660; Poisson, -2 log likelihood = 1,542) indicated that Poisson was the best distribution to fit the intentions to drink variable. However, the Poisson distribution was over dispersed (dispersion statistics, deviance = 556.47, $df = 331$, deviance/ $df = 1.68$, thus over 1 suggesting a slight overdispersion). For that reason, we used the negative binomial distribution with a log link and estimated parameter value (dispersion statistics, deviance = 379.81, $df = 331$, deviance/ $df = 1.15$).

Results from the generalized linear model revealed a significant effect for ambivalence Wald $\chi^2(1) = 4.85$, $p = .028$, $d = 0.24$ see Fig. 1 and Table 1. As predicted, participants in the high ambivalence condition intended to drink fewer drinks in one sitting in the future ($M = 3.54$, $SE = 0.179$) compared to those in the low ambivalence condition ($M = 4.12$, $SE = 0.192$). There was no interaction between ambivalence and gender (Wald $\chi^2(1) = 0.026$, $p = .872$, $d = 0.01$), however, breaking it down within each gender, males in the high ambivalence condition intended to drink less ($M = 4.88$, $SE = 0.427$) compared to males in the low ambivalence condition ($M = 5.58$, $SE = 0.524$), Wald $\chi^2(1) = 3.81$, $p = .050$, $d = 0.12$. As well, females in the high ambivalence condition intended to drink fewer drinks ($M = 3.20$, $SE = 0.195$) than the low ambivalence condition ($M = 3.75$, $SE = 0.203$), Wald $\chi^2(1) = 4.24$, $p = .039$, $d = 0.22$.

4. Discussion

College students consume alcohol and engage in risky drinking behaviors at higher rates than most other groups (Schulenberg et al., 2020). This contributes to issues related to alcohol consumption which are detrimental to society, including drunk driving. Because of this, it is important to reduce alcohol consumption, and especially risky drinking behaviors, among college students. This study adds to the existing literature by demonstrating that an ambivalence manipulation before PNF interventions could possibly improve its effectiveness, though more research is necessary before making strong recommendations to include ambivalence in PNF interventions. Specifically, this study demonstrated that PNF in conjunction with a writing task that induced high attitudinal ambivalence resulted in lower intentions to consume alcohol relative to PNF in conjunction with low attitudinal ambivalence writing task. This pattern of results held for both male and female college students.

Ambivalence has been demonstrated to cause an aversive mental state which individuals may reduce through seeking information that clarifies the source of their ambivalence (Jonas, Diehl, & Brömer, 1997). This study induced ambivalence regarding alcohol consumption through a writing task that provided participants with information about their peer's alcohol consumption, resulting in lower intentions to consume alcohol compared to the low ambivalence condition.

4.1. Limitations

Due to the use of online, cross-sectional design, this study does have some intrinsic limitations. This format was chosen due to the timeframe in which data was collected, as public health measures precluded the possibility of in-person data collection and physiological measurement. Measurement of drinking intentions over time was also not possible due to the use of a cross-sectional design. Future work should address limitations by replicating this effect using more varied forms of measurement, e.g., physiological measurement of biomarkers associated with

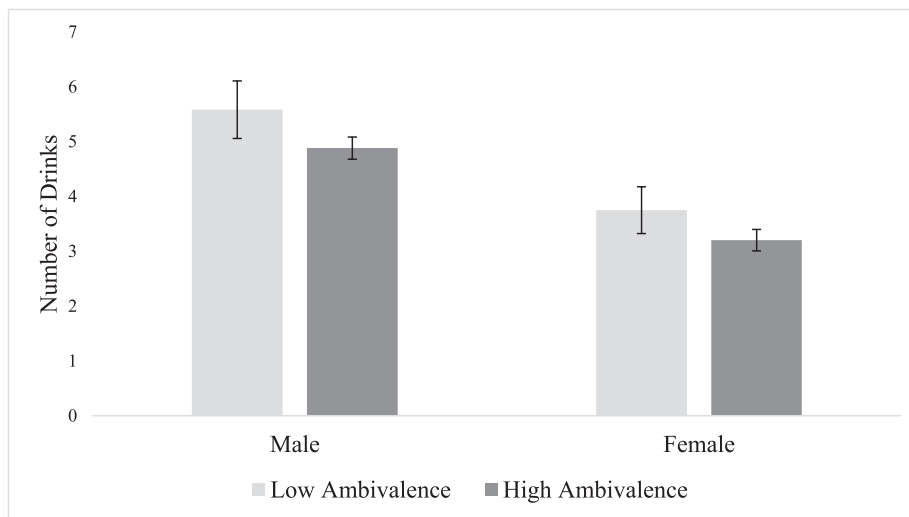


Fig. 1. Intentions to drink as a function of ambivalence and gender, controlling age and drinks consumed in a typical week.

Table 1

Results of the generalized linear model predicting intentions to drink.

Variable	Exp(B)	B	SE	95 %CI[LL,UL]	Wald	df	p	d
Gender	1.51	0.41	0.076	[0.260,,559]	28.67	1	<0.001	0.76
Age	0.95	-0.05	0.018	[-0.085,-0.014]	7.33	1	0.007	0.34
Drinks	1.09	0.09	0.022	[0.045,0.134]	15.73	1	<0.001	0.42
Ambivalence	1.16	0.15	0.069	[0.017,0.285]	4.85	1	0.028	0.25
AmbivxGender	0.97	-0.03	0.152	[-0.323,0.274]	0.026	1	0.872	0.01

ambivalence could be used to further support the validity of the ambivalence manipulation. Additionally, a longitudinal follow-up should be utilized to establish that this effect is enduring over time, and to assess its impact on actual behaviors and not just intentions. Though intentions can be a good proxy for behavior, there is not always the strong correlation between alcohol intentions and use. Regardless of the cross-sectional nature of the work, we were able to demonstrate that high compared to low ambivalence led to lower intentions to drink, which is a good first test of the purpose of the work. As well, past work has linked alcohol intentions and behavior, thus in lieu of actual behaviors, alcohol intentions do serve as a good substitute for behavior (Gardner, Lally, & Rebar, 2020; Glindemann, Geller, & Ludwig, 1996; Johnston & White, 2003; Wolford & Swisher, 1986).

Another limitation is that we did not have a control condition where participants did not receive the PNF intervention, thus we cannot be sure if inducing ambivalence before PNF interventions works compared to just receiving information about the negative implications of heavy drinking. Nonetheless, we were able to demonstrate that reduced intentions to drink alcohol for those high in ambivalence compared to those low in ambivalence when they receive the PNF intervention. That is an important first step in determining if inducing ambivalence before PNF can act as a catalyst to make the PNF intervention more effective. The next step will be to replicate this work by adding in a control condition for the PNF intervention. Also, we used a convenient sample of undergraduate psychology majors who were predominately white females. Future work should examine a more diverse sample of college students. However, the purpose of the PNF intervention is to target undergraduate students, so the study still used the target population in our sample. Finally, we used a novel method for manipulating ambivalence that had never been used before, however, the effect size for that manipulation was small. Thus, future research should attempt to craft and use a stronger manipulation of ambivalence to determine the best method of manipulating ambivalence before the PNF intervention to get the strongest results. The fact that our new manipulation of ambivalence

with a small manipulation worked, suggests that deploying another manipulation with a stronger effect will lead to even greater reductions in intentions to drink.

5. Conclusions

This paper is the first step in demonstrating that inducing ambivalence before a PNF intervention could improve its efficacy in reducing drinking intentions. This is important due to the benefits a community experiences when risky drinking behavior is reduced. Furthermore, these results could reasonably be extended to applications aimed at reducing other forms of substance use, such as tobacco or drug use. However, further work should be conducted to confirm the efficacy of induced ambivalence in conjunction with PNF in these contexts.

We now have, across four studies (Hohman et al., 2014, 2016, 2017, and this study), found consistent and strong evidence that norms buffer or reduce the discomfort associated with attitude ambivalence. The *Ambivalent-Attitude* effect, as we now call it, should be considered when creating persuasive communications to ameliorate negative health behaviors (and in other domains as well).

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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