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Prototype Willingness Model Drinking Cognitions Mediate Personalized Normative Feedback Efficacy

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Abstract

Personalized normative feedback (PNF) interventions have been shown to be efficacious at reducing college student drinking. Because descriptive norms have been shown to mediate PNF efficacy, the current study focused on examining additional prototype willingness model social reaction cognitions, namely, prototypes and willingness, as mediators of intervention efficacy. We expected the PNF interventions to be associated with increased prototype favorability of students who do not drink, which would in turn be associated with decreased willingness to drink and subsequently, less drinking. The current study included 622 college students (53.2% women; 62% Caucasian) who reported one or more heavy drinking episodes in the past month and completed baseline and three-month follow-up assessments. As posited by the framework of the prototype willingness model, sequential mediation analyses were conducted to evaluate increases in abstainer prototype favorability on willingness on drinking, and subsequently willingness to drink on drinking behavior. Mediation results revealed significant indirect effects of PNF on three-month drinking through three-month prototypes and willingness, indicating that the social reaction pathway of the prototype willingness model was supported. Findings have important implications for PNF interventions aiming to reduce high-risk drinking among college students. Study findings suggest that we should consider looking at additional socially-based mediators of PNF efficacy in addition to perceived descriptive norms.

Keywords

Prototype willingness model; Social norms; Prototypes; Willingness to drink; College students; Alcohol use; Intervention; Personalized normative feedback

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Compliance with Ethical Standards

Conflicts of Interest None of the authors have any conflicts of interest.

Research Involving Human Participants and/or Animals This study has been approved by the appropriate institutional committee and has been performed in accordance with the ethical standards.

Ethical Approval Informed consent was obtained from all individual participants included in the study, and the study was performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards.

Alcohol consumption among college students continues to be a public health concern with estimates suggesting that four out of five students have ever consumed alcohol, nearly two thirds have been drunk in the past year, almost half have been drunk in the past month, with approximately 4% reporting daily drinking (Johnston et al. 2015). Moreover, college students report heavy episodic drinking at higher rates than their non-college attending peers (Johnston et al. 2015). Heavy alcohol consumption among college students can result in serious consequences including academic neglect, psychological or interpersonal problems, unsafe driving, vandalism, risky sexual behavior/victimization, physical injuries/harm, illness, and even death (Hingson et al. 2005, 2009; Nelson et al. 2009).

A considerable body of research indicates that decisions regarding drinking among college students are highly influenced by normative perceptions of others' behaviors and beliefs (Borsari and Carey 2003; Neighbors et al. 2007). This research is consistent with the social norms approach (Berkowitz 2004; Perkins 2002), which has provided an important framework for understanding college student drinking. Students routinely and consistently overestimate the amount of alcohol their peers consume (Borsari and Carey 2003; Lewis and Neighbors 2004; Perkins et al. 1999), with estimates of others' drinking being approximately double the actual rates for both quantity and frequency (Neighbors et al. 2006). These perceptions of peers' drinking are one of the strongest predictors of personal drinking behavior by college students, even when controlling for other known predictors of drinking including demographics, motives, and expectancies (Neighbors et al. 2007; Pedersen et al. 2009).

Based on data demonstrating the strong association between perceived descriptive norms and alcohol use in college populations, correction of normative misperceptions using personalized normative feedback (PNF) is a prominent focus of many college drinking intervention studies (for reviews see Carey et al. 2007; Crounse and Larimer 2011; Lewis and Neighbors 2006; Miller and Rollnick 2013; Walters and Neighbors 2005). Personalized normative feedback (PNF) interventions typically provide graphs and text-based feedback contrasting an individual's own self-reported drinking, perception of other peoples' drinking, and actual drinking rates for a typical person their same age. PNF provided to students who engage in heavy drinking communicates social comparison information (i.e., on average other people drink less than the student drinks) and normative misperceptions (i.e., on average other people drink less than the student thinks other people drink). Both stand-alone and multi-component computerized and web-based interventions that incorporate PNF have been found to reduce alcohol use in randomized clinical trials (Dumas et al. 2010; LaBrie et al. 2013; Lewis and Neighbors 2007; Lewis et al. 2014; Martens et al. 2013; Neighbors et al. 2004, 2010a, b). Several studies found that reductions in descriptive drinking norms mediated changes in alcohol use (Lewis and Neighbors 2007, 2014; Neighbors et al. 2004, 2006; Walters et al. 2007).

Despite the strong evidence supporting descriptive norms as a PNF mediator, it is also likely that other social drinking cognitions are involved. Specifically, it is probable that individuals' drinking decisions often follow cognitions that are more general and more heuristically based than descriptive normative perceptions of how much the typical student drinks. Exposure to information suggesting that one's own drinking is excessive may also

influence other heuristic-based drinking cognitions, such as prototype favorability and willingness to drink. For example, college students may consider how favorable they view the typical student who drinks (i.e., how attractive, smart, mature they consider the typical student who drinks to be) or college students may consider how willing they are to drink alcohol if given the opportunity based on exposure to normative information. Based on the content of the PNF intervention (i.e., descriptive normative comparisons) and that perceived descriptive norms have been shown to be reduced by the intervention (Neighbors et al. 2016), it is logical to focus on other social cognitions that may be influenced by PNF content. The prototype willingness model (PWM; Gibbons et al. 2003; Gerrard et al. 2008; see Fig. 1) offers two potential variables that could also mediate PNF efficacy. The PWM was designed to address the social nature of adolescent or young adult risk behaviors by acknowledging that risk behaviors are often reactions to risk-conducive environments one may encounter rather than intentionally planned behaviors (Gibbons et al. 2003). The social reaction pathway of the PWM pertains to unplanned behaviors, which are posited to follow directly from behavioral willingness, which varies in part as a function of descriptive norms, but also varies according to prototypes (Blanton et al. 1997; Gerrard et al. 2008; Lewis et al. 2016; Litt and Lewis 2016; Litt and Stock 2011; Pomery et al. 2005; Teunissen et al. 2014). Willingness to drink reflects openness to opportunity to drink in situations that are conducive to that behavior. A prototype is defined as the image of the type of person who engages in a risk behavior, such as a typical male your same age who drinks alcohol.

It is important to note that studies have also shown that adolescents and young adults hold mental representations, or images, of the type of person who *abstains* from engaging in health risk behaviors (Gerrard et al. 2002; Litt and Lewis 2016; Wills et al. 2003). Among adolescents and young adults, abstainer prototypes have been shown to predict behavioral willingness to use alcohol as strongly as user prototypes (Rivis et al. 2006). In a series of studies that examined the relationship between adolescents' images of typical drinkers and non-drinkers and their subsequent alcohol consumption, Gerrard and colleagues (2002) concluded that abstainer prototypes primarily exert an inhibiting effect on risk behavior such that positive images of non-drinkers inhibit willingness to drink. Furthermore, research has shown more favorable prototypes of abstainers to be directly and positively associated with greater willingness to refuse substances (Wills et al. 2003), lower willingness to use alcohol, and subsequently, decreased actual use (Litt and Lewis 2015). Other cross-sectional and longitudinal studies suggest that positive abstainer prototypes are related to lower willingness and intentions to drink, and lower self-reported alcohol consumption among adolescents and young adults respectively (Gerrard et al. 2002; Zimmermann and Sieverding 2010, 2011). Together, there is growing evidence that abstainer prototypes may have a significant impact on decisions to engage in, or abstain from, alcohol use.

According to the PWM, there is an important link between perceptions of peers' behaviors (i.e., descriptive norms) and prototypes (Gibbons et al. 2003). This link suggests that peer norms may play a key role in the formation of prototypes. This assumption is supported by longitudinal research showing that affiliation with drinking peers and higher perceived drinking norms of friends are related to the development of more favorable drinker prototypes (Blanton et al. 1997; Gerrard et al. 1999; Ouellette et al. 1999). Experimental research indicates that believing more of one's peers use alcohol predicts more favorable

drinker prototypes (Litt and Stock 2011; Teunissen et al. 2014) and believing fewer peers use alcohol predicts more favorable abstainer prototypes (Litt and Lewis 2015). It is therefore reasonable to propose that reductions in normative perceptions through an intervention such as PNF may exert influence on abstainer prototypes. As such, the primary aim of the present paper is to determine whether PNF interventions have an impact on other PWM social reaction pathway cognitions. Specifically, we expected the PNF interventions to be associated with increased prototype favorability of students who do not drink (abstainer prototypes) which was in turn expected to be associated with decreased willingness to drink and less drinking over time. Neighbors and colleagues (2016) examined the impact of two PNF interventions on college student drinking. The present study conducts secondary data analyses to examine abstainer prototype favorability and willingness to drink as sequential mediators of PNF intervention efficacy. We focused on sequential mediation of abstainer prototype favorability and willingness on drinking as a sequential relationship as suggested by the social reaction pathway framework of the PWM (see Fig. 1).

Method

Participants

The participants of this study consisted of 622 undergraduate students from two Westcoast campuses and southern university. Approximately half (53.2%) of the students were female and 62.9% were Caucasian, 15.6% mixed race, 14.9% Asian, 5.0% African American, 0.8% Alaska Native/American Indian, 0.8% Native Hawaiian/Pacific Islander, and 21.4% identified as Latino/a. Students were randomly selected from a list of all students and emailed a link to a screening survey. In order to participate, students had to be between the ages of 18 and 26 and have had at least one heavy drinking occasion in the last month, which was defined as four drinks in one sitting for females and five drinks in one sitting for males. Those who met both criteria were invited to participate in the longitudinal portion of the study. They were then randomized to one of three conditions: the personalized normative feedback condition (PNF), the social comparison condition (PSCF), or the attention-control condition. Because intervention content was similar and we did not have differing hypotheses based on intervention condition, for the purpose of the present study, we examined all intervention conditions in comparison to the attention control condition. Further, because Neighbors et al. (2016) demonstrated the impact of PNF intervention on drinking was not present at the 6-month follow-up, participants were included in the present analysis if they completed baseline and the 3-month follow-up assessment (91.3%). Additional procedural details and individual intervention outcomes on drinking behavior are available in Neighbors et al. (2016).

Procedure

Participants were invited to participate in scheduled in-lab sessions where they took the baseline survey on a lab computer in a solitary room and were provided with their respective feedback, depending on the condition into which they were placed. Participants received one of three feedback types: full personalized normative feedback (PNF), which included one's own drinking, campus drinking rates, and perceived norms; social comparison PNF, which included only one's own drinking and campus drinking rates; or, attention control feedback

that was unrelated to drinking. Web-based follow-up surveys were emailed to the participants 3 and 6 months after completion of the baseline survey.

Intervention Procedure

Personalized Feedback—Because this study was less interested in the specific way in which the intervention worked, participants in one of two intervention conditions were analyzed together. The two interventions were both based on previously used PNF interventions (Lewis and Neighbors 2007; Neighbors et al. 2004, 2010b). The first intervention intended to correct misperceptions of drinking norms by presenting the participant with their typical drinking behavior, the average drinking behavior on campus, and what they had previously thought the average drinking behavior on campus was. The other intervention administered in this study was the same with one less component: those participants were only presented with their own drinking and typical students' drinking. The second intervention focused more on the social comparison aspect rather than on the correction of misperception aspect of personalized normative feedback. The feedback for both interventions was presented in both text and in bar graph form. Four different aspects of drinking were presented in this manner: weekly drinking frequency, typical number of drinks per occasion, number of drinks consumed in a week, and the participant's percentile rank based on their own reported number of drinks per week.

Attention Control—In the attention control condition, instead of receiving feedback on how much the typical student at their university consumed alcohol, participants were presented with how much time a typical student at their university spent in non-drinking related activities, like exercising, playing video games, texting, or working. The attention control feedback was similar to the personalized alcohol feedback in that the information was presented in text and bar graph form; however, none of the information presented was related to alcohol.

Measures

Alcohol Consumption—Participants' weekly drinking habits were assessed with the Daily Drinking Questionnaire (DDQ; Collins et al. 1985; Kivlahan et al. 1990). For the present study, we utilized the weekly items, which read, "Consider a typical week during the last three months. How much alcohol, on average (measured in number of drinks), do you drink each day of a typical week?" Typical weekly drinking was the sum of the standard number of drinks for each day of the week. Participants also filled out the quantity/frequency/peak alcohol index (QFP; Baer 1993; Marlatt et al. 1995), which asked participants to indicate how many days of the past month they drank.

Abstainer Prototype Favorability—In order to determine abstainer prototype favorability (Gerrard et al. 2002, 2006), participants were asked a series of questions regarding their perceptions of students who chose not to drink alcohol (ex. "How much does the word 'SMART' describe your image of a typical university (campus specific) male/female student who chooses not to drink alcohol?") (Litt and Lewis 2015; Teunissen et al. 2014). Questions asked how smart, popular (cool), mature, and attractive the participant considered someone who chose not to drink alcohol. All items were rated on a Likert-type

scale from 0 (not at all) to 6 (extremely). The means of participant responses to these four questions were used to represent prototype favorability. Alphas for baseline and the three-month follow-up were .75 and .82, respectively.

Willingness to Drink—In order to measure a participant's willingness (Gerrard et al. 2002, 2008) to engage in drinking behaviors, they were asked two questions. One, which was reverse-scored, asked, "Suppose you are at a party. After 2 drinks you've had enough and are getting ready to leave. A friend you haven't seen for a while offers to get you another drink. How willing would you be to choose a non-alcoholic drink instead?". The second question was similar, starting with the same initial hypothetical, but ending instead with "How willing would you be to stay and have 1 more drink?" Again, both were rated on a Likert-type scale from 0 (not at all willing) to 6 (very willing). The means of the two questions were used to represent a participant's willingness to drink. Alphas for baseline and the 3-month follow-up were .80 and .79, respectively.

Results

Statistical analyses focused on evaluating mediation using SPSS PROCESS (Hayes 2013). Mediation was assessed by evaluating indirect effects between the PNF interventions (coded dichotomously; 0 = control, 1 = PNF) and three-month drinking behavior through three-month abstainer prototype favorability and willingness to drink. Standard errors for indirect effects were bootstrapped (10000 samples), which provides a more accurate evaluation of mediation tests (Hayes 2013). In the PROCESS model, based on the PWM, abstainer prototype favorability and willingness to drink were examined as sequential mediators between intervention and drinking outcomes (drinks per week and drinking frequency).

Table 1 provides a detailed description of means and standard deviations by condition at baseline and the three-month follow-up. Findings indicate there was a significant direct effect of the intervention on drinks per week at the three-month follow-up ($c' = -0.95$, $SE = 0.412$, 95% CI: $-1.754 - -0.137$; see Fig. 2). Cohen's d was included as an index of effect size using the formula $d = 2t / \sqrt{df}$ (Rosenthal and Rosnow 1991). By convention, effect sizes of .2, .5, and .8 are typically considered small, medium, and large, respectively (Cohen 1992). The effect size for feedback condition on drinks per week ($d = -.17$) at the three-month follow-up was in the small range. In line with our hypotheses and the PWM, results indicated a significant indirect, sequential path of intervention on drinks per week through three-month abstainer prototype favorability (M1) and willingness to drink (M2; $a_1 d_{21} b_2 = -0.011$, $SE = 0.009$, bootstrap CI: $-0.044 - -0.001$). When examining indirect effects for individual mediators, there was not a significant indirect effect of abstainer prototype favorability ($ab = 0.014$; $SE = 0.039$; 95% bootstrap CI: $-0.051 - 0.117$) or of willingness to drink ($ab = -0.067$; $SE = 0.052$; 95% bootstrap CI: $-0.208 - 0.003$) on drinks per week. Because we had only two time points in the analyses, we tested an alternative sequential path of intervention on drinks per week through willingness to drink (M1) and abstainer prototype favorability. The results for this alternative model were not significant (M2; $a_1 d_{21} b_2 = 0.001$, $SE = 0.006$, bootstrap CI: $-0.005 - 0.021$).

There was also a significant direct effect of intervention on three-month drinking frequency ($c' = -0.33$, $SE = 0.162$, 95% CI: $-0.643 - -0.005$; see Fig. 3). The effect size for feedback condition on drinking frequency ($d = -.20$) at the three-month follow up was in the small range. As found with drinks per week, results indicated a significant indirect, sequential path of intervention on drinking frequency through three-month abstainer prototype favorability (M1) and willingness to drink (M2; $a_1 d_{21} b_2 = -0.005$, $SE = 0.004$, bootstrap CI: $-0.020 - -0.001$). When examining indirect effects for individual mediators, there was not a significant indirect effect of abstainer prototype favorability ($ab = 0.014$; $SE = 0.018$; 95% bootstrap CI: $-0.070 - 0.002$) or of willingness to drink ($ab = -0.027$; $SE = 0.028$; 95% bootstrap CI: $-0.091 - 0.003$) on drinking frequency. As with drinks per week, we tested an alternative sequential path of intervention on drinking frequency through willingness to drink (M1) and abstainer prototype favorability. The results for this alternative model were also not significant (M2; $a_1 d_{21} b_2 = -0.002$, $SE = 0.003$, bootstrap CI: $-0.012 - 0.002$).

Thus, findings for both drinks per week and drinking frequency support the sequential model based on the social reaction pathway of the PWM. The results suggested that PNF interventions led to increased abstainer prototype favorability and subsequent reductions in willingness to drink, which was associated with reduced drinks per week and drinking frequency.

Discussion

Research has indicated that the more similar to the self and the more favorably the prototype is perceived, the more the individual will be willing to or intend to engage in the behavior (Gibbons et al. 2003). However, Gibbons and Gerrard (1997) suggested that, under the right circumstances, college students will attempt to *distance* themselves from risky prototypes, which in turn could decrease their willingness to engage in risky behavior. The present data support this model suggesting that PNF interventions result in more favorable images of nondrinkers, which leads to decreased willingness to engage in heavy alcohol use, and subsequent decreased drinking. These findings are in support of the role of the social reaction pathway variables of the PWM for college student drinking and suggest that they are potential mediators of PNF efficacy.

Sequential mediation is suggested by the PWM (see Fig. 1), which posits that health-risk behaviors follow directly from behavioral willingness, which varies, in part, as a function of prototypes. We tested both prototypes and willingness as individual mediators to further support the posited sequential framework of the PWM. It is interesting to note that neither mediator alone was sufficient to account for the intervention effect on drinking. The pattern of findings presented in the figures suggests two related reasons. First, willingness did not mediate the intervention effect on drinking by itself because there was not a direct effect of the intervention on willingness. Rather, the effect on willingness was only indirect through abstainer prototypes. Similarly, abstainer prototypes did not mediate the intervention effect on drinking because there was not a direct association between prototype and drinking. Rather the association between prototype and drinking was only indirect through willingness. These findings provide relatively compelling evidence for the sequential process model.

Clinical Implications

Results suggest that we should consider looking at additional socially based mediators of PNF efficacy in addition to perceived descriptive norms and that we should do so from a theoretically informed framework, which may involve sequential processes. Although descriptive norms are routinely thought of as the mediating mechanism behind PNF efficacy, strategies that take into account the role of the social reaction pathway of the PWM may increase overall efficacy. Perhaps altering the perception of prototypes can be used as a strategy to cultivate changes in willingness and subsequent behavior such as, contemplation of or accentuating the negative or positive characteristics attributed to the prototypes (Blanton et al. 2001; Ouellette et al. 2005); encouraging social comparison and distancing from health-risk prototypes (Lane et al. 2011; Gerrard et al. 2005); and consideration of the favorable characteristics of people who abstain from alcohol use. Preliminary experiments and intervention studies revealed that prototype alteration using the above described methods were effective in changing alcohol use among adolescents (Werch et al. 2008) and college undergraduates (Gerrard et al. 2006; Teunissen et al. 2012, 2014), but it is unclear what mechanism is behind these findings. The current intervention had effect sizes in the small range on drinking outcomes at 3 months. Future research should examine intervention effects on PWM sequential mediators to determine if the impact on mediators is temporary. Moreover, future research should determine whether standalone PNF interventions are sufficient for altering prototypes and reducing willingness to drink, or if enhanced PNF that specifically targets altering prototype favorability leads to greater intervention efficacy and longer lasting effects on sequential mediators and subsequent alcohol use.

Limitations and Future Directions

Limitations for the present study include the focus on college students. It is unknown if the current findings would generalize to a young adult population not attending college. In addition, the present study only looked at outcomes at 3 months, so it is unclear how long these effects last. Future research should determine whether increases in abstainer prototype favorability and the subsequent impacts on behavior persist over time.

Conclusions

A recent review (Reid and Carey 2015) identified 22 potential mediators of college student drinking interventions. Findings from this review suggested that only descriptive norms consistently mediated normative feedback interventions. Thus, it makes sense for future interventions to examine future mediators that are theoretically linked to descriptive normative perceptions. The present study examined two such norms-related cognitions, prototypes and willingness and found support for mediation.

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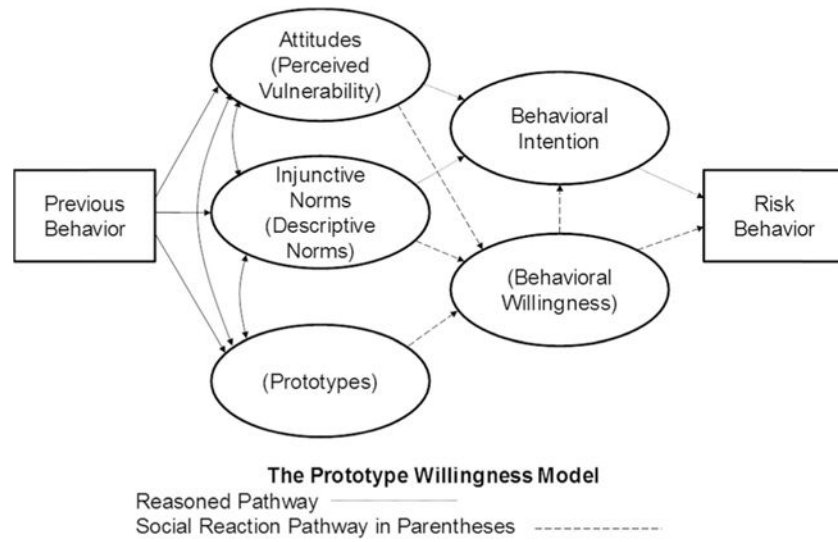


Fig. 1.
The prototype willingness model

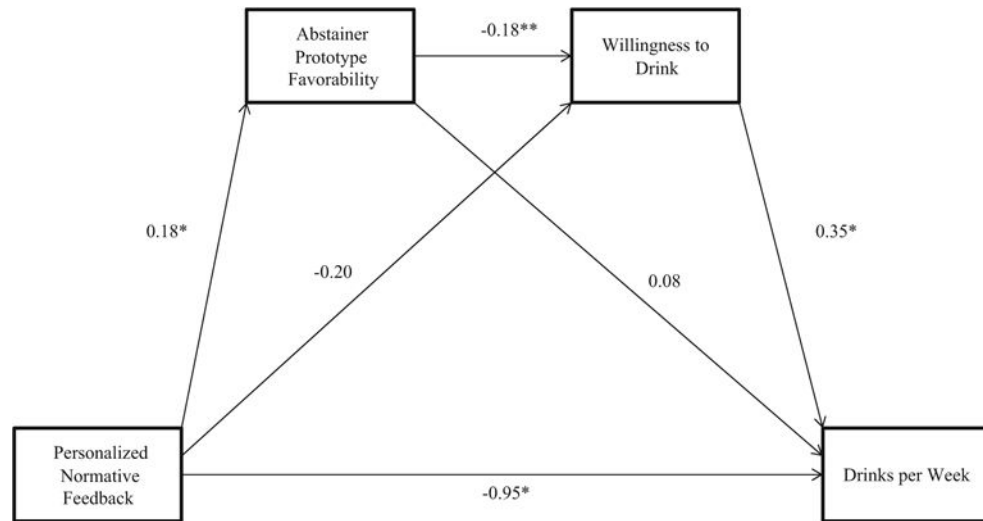


Fig. 2. Abstainer prototype favorability and willingness to drink as mediators of the relationship between personalized normative feedback and drinks per week. Standardized path coefficients are presented in PROCESS mediation model 6 with bootstrapping. * $p < .05$. ** $p < .01$

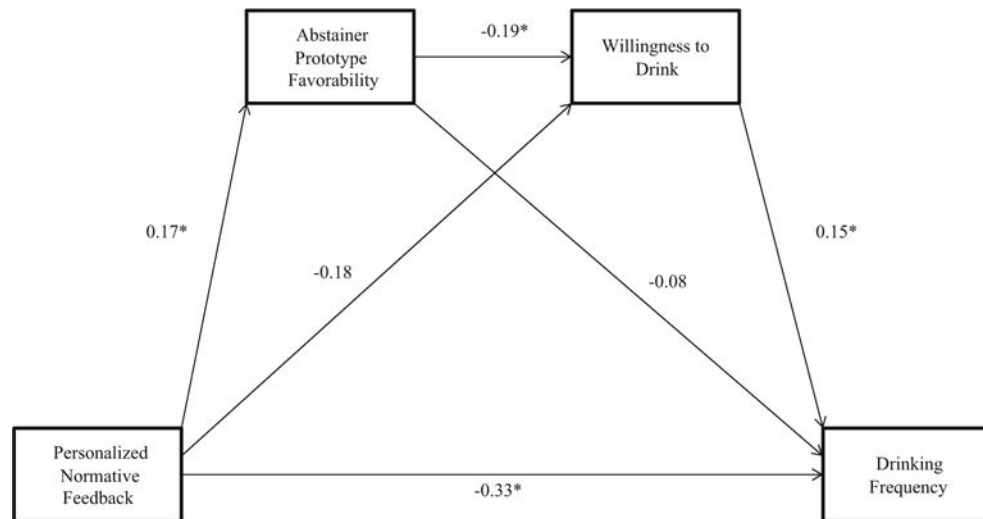


Fig. 3. Abstainer prototype favorability and willingness to drink as mediators of the relationship between personalized normative feedback and drinking frequency. Standardized path coefficients are presented in PROCESS mediation model 6 with bootstrapping. * $p < .05$

Table 1

Descriptive statistics at baseline and three-month follow-up by intervention condition

Variable	<u>Intervention</u>		<u>Control</u>	
	Mean	SD	Mean	SD
Baseline				
Drinks per week	10.36	9.64	9.38	6.87
Drinking frequency	5.25	1.89	5.22	1.66
Three-month follow-up				
Drinks per week	7.71	8.62	8.00	6.98
Drinking frequency	4.43	2.34	4.71	1.91