



Published in final edited form as:

Psychol Addict Behav. 2015 March ; 29(1): 162–167. doi:10.1037/adb0000003.

An Examination of College Student Activities and Attentiveness during a Web-Delivered Personalized Normative Feedback Intervention

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Abstract

Both heavy drinking and related risky sexual behavior among college students are common and are often associated with a number of negative consequences. A previously reported randomized controlled trial showed that a brief personalized normative feedback (PNF) intervention reduced the alcohol consumption and alcohol-related risky sexual behavior of heavy drinking, sexually active college students (Lewis et al., in press). For the present study, we examined what activities students were engaged in when viewing the feedback as well as who they were with and where they were when receiving the intervention. Furthermore, we conducted supplemental analyses with perceived attentiveness as a hypothesized predictor of change using the same sample ($N = 480$). Findings indicated that most students were engaged in activities when viewing the feedback and that most students viewed the feedback alone and at home. Furthermore, results revealed PNF to be most effective in reducing drinks per week among participants who reported greater attention. Clinical implications and suggestions for additional research examining how attentiveness can be increased during web-based interventions are discussed.

Keywords

alcohol; risky sex; personalized normative feedback; attention; distraction

Web-based interventions have been shown to be efficacious in reducing college student drinking and related risky sexual behavior (Carey, Scott-Sheldon, Elliot, Garey, & Carey, 2012; Crouce & Larimer, 2011; Lewis et al., in press). Web-based interventions are less expensive and less difficult (i.e., no training of facilitators or scheduling sessions, etc.) to implement than in-person, group or multi-session interventions, thus they have greater reach, can better include low-incidence or “hidden” populations, and are consequently more generalizable. Web-based interventions reduce participant burden (i.e., not having to come to a clinic or lab) and allow participants to view feedback multiple times, thus make it more feasible for participants to complete the intervention. However, computer-delivered interventions, including those delivered via the web, have been shown to be less efficacious than in-person interventions (Carey, Scott-Sheldon, Carey & DeMartini, 2007). Thus, there

is a need for additional research to examine why this is the case. The present study is the first to examine what college students are doing, who they are with, and where they are at when receiving a web-based intervention. Furthermore, the present study examines participants' subjective reports of attentiveness as a moderator of intervention efficacy.

The primary theoretical basis for the identification of factors likely to be associated with reduced efficacy of web-delivered interventions comes from two prominent theories of persuasive communication: the Elaboration Likelihood Model (ELM; Petty & Cacioppo, 1981, 1986) and the Heuristic-Systematic Model (HSM; Chaiken, Liberman, & Eagly, 1989). Depth of processing refers to the extent to which individuals expend cognitive effort and think more carefully about the information provided in persuasive communication. The ELM is based on the assumption that attitude change and subsequent behavior change can occur as a result of two differing routes of information processing, central and peripheral routes, or a combination of the two routes. When people utilize the central route of information processing, they expend higher cognitive effort, think more carefully about information, and have greater depth of information processing (e.g., explicitly weighing pros and cons), whereas when people pay less attention to the content of persuasive communication they are more likely to be influenced by peripheral cues. Similar to the ELM, the HSM predicts that processing goals affect the effort that people exert when evaluating a message, which in turn influence one of two processing modalities: heuristic and systematic (Griffin, Neuwirth, Giese, & Dunwoody, 2002). Heuristic processing is relatively effortless and relies on prior knowledge such as schemas, stereotypes, and expectancies. It is based on the *least effort principle* whereby people prefer less mental effort to more mental effort when performing cognitive tasks (Moskowitz, 2005; pp 203). Systematic processing, by comparison, involves a more comprehensive effort to analyze and understand information as well as reevaluate personal thoughts and prior beliefs. Whereas systematic processing involves the careful and elaborate evaluation of information, heuristic processing consists of using cognitive shortcuts that require limited cognitive effort (e.g., basing inference on their present mood or the attractiveness of the information presenter) to form a judgment. Changes in attitudes and cognitions that are based on systematic processing tend to be more permanent and are more likely to influence behavior, whereas attitudes based on heuristic processing are relatively fleeting and less likely to consistently influence subsequent behavior (Griffin et al., 2002; Petty & Briñol, 2008). One key factor that has been suggested as a determinant of systematically evaluating persuasive communications is ability to pay attention to message content.

Ability to pay attention to a persuasive communication can be influenced by distraction. Prior research has shown that any factor that hinders the efficacy of processing the information of the message (e.g., distraction) reduces the possibility of processing via the central route (Di Blasio & Milani, 2008; Petty, Wells, & Brock, 1976). The purpose of the present study was to explore what activities college students engage in when viewing web-based feedback as well as where they are and whom they are with when viewing the feedback. Furthermore, participants' self-reported attentiveness when viewing the feedback was examined as a moderator of a web-based feedback intervention.

Method

Participants and Procedures

Participants were randomly selected undergraduate students aged 18 to 25 from a large public northwestern university. Students who reported: 1) having at least 4/5 drinks on one occasion in the past month for women/men, respectively, 2) having oral, vaginal, or anal sex in the past 12 months, and 3) typically having sex with a member of the opposite sex were invited to participate in a longitudinal randomized controlled trial. Participants were randomized into one of four conditions using stratified random assignment based on typical weekly drinking (less than 10 drinks per week vs. 10 or more drinks per week) and gender. The intervention conditions included: 1) alcohol only personalized normative feedback (PNF), 2) feedback regarding alcohol-related risky sexual behavior (RSB) only PNF, 3) combined PNF and RSB, and 4) attention control. For the purpose of the present study, we examined all intervention conditions in comparison to the attention control condition. Web-based follow-up assessments were conducted at three and six months. Additional procedural details are available in Lewis et al. (in press).

Measures

Time spend viewing feedback—The amount of time spent viewing the feedback was assessed in number of seconds for each feedback screen, which were then summed for a total score representing total number of seconds viewing feedback.

Location during feedback—Participants were asked to report the location in which they viewed their personalized information. Response options included: home, school, work, in transit, non-public place, public place (non-school), and other. Location was recoded to *home* (1) and *not home* (0).

Whom with when viewing feedback—Participants were asked, “Who were you with when you viewed your personalized information?” Response options included: alone, family, friends, casual acquaintances, partner (boyfriend/girlfriend), strangers, co-workers, or other. These items were recoded to *alone* (1) and *not alone* (0).

Activities during feedback—To assess other activities when viewing the personalized feedback, participants were asked, “What other activities were you doing when viewing your personalized information?” Response options included: studying/class work, working, in class, computer use for email/messaging/web, commuting, socializing, partying, eating, on phone/text messaging, TV/movie/music, napping, housework, or other.

Attentiveness during feedback—Two items assessed the cognitive effort or attentiveness participants expended when viewing the personalized feedback (Cacioppo, Petty, Kao, Rodriguez, & 1986). Participants reported their level of attentiveness when viewing the personalized feedback with two items: “I was attentive when viewing the personalized information” and “I was preoccupied when viewing the personalized information.” (reverse coded). These two items were moderately correlated, $r = .34$; *alpha*

= .56 and averaged to create a composite. Response options ranged from 1 (*strongly disagree*) to 7 (*strongly disagree*).

Drinking behavior—The Daily Drinking Questionnaire (DDQ; Collins, Parks, & Marlatt, 1985) was used to assess number of typical drinks per week. Participants were asked to “Consider a typical week in the past 3 months. How much alcohol, on average (measured in number of drinks), do you drink on each day of a typical week?” Weekly drinking was computed by summing the standard number of drinks for each day of the week.

Frequency of drinking prior to sex—Items assessing sexual behaviors and related items for normative misperceptions were adapted from those used by Lewis et al. (2007). Frequency of alcohol use in conjunction with oral, vaginal, or anal sex was measured by the question, “You said you had sex ___ time(s) in the past 3 months. Of the ___ time(s), how many times did you consume alcohol before or during the sexual encounter?” Response options ranged from 0 = *none* to 25 = *25+ times*.

Results

Descriptive Information—As reported in Lewis et al. (in press), most participants (97.5%) reported viewing their personalized feedback one or more times. Of those who viewed their feedback, participants did so from one to five times ($M = 2.18, SD = .97$). For the first feedback viewing, time spent viewing the feedback ranged from five seconds to fifteen minutes ($M = 1.27, SD = 2.10$). A small minority of those who viewed their feedback reported printing it (3.4%).

The majority (74.5%) of participants reported viewing the feedback at home. Similarly, most (76.7%) participants viewed the feedback alone. There were no significant differences between those who received PNF versus those in the attention control condition in where feedback was viewed, $\chi^2(2, N = 451) = 2.17, p = .14$, or if they were alone when viewing feedback, $\chi^2(2, N = 451) = 0.02, p = .89$.

Participants in the three PNF conditions spent more time viewing the feedback ($M = 89.68$ seconds, $SD = 134.36$) than those in the attention control condition ($M = 36.71$ seconds, $SD = 85.52$), $t(464) = -3.99, p < .001$. Because one feedback condition (combined feedback) was double in length (i.e., eight screens instead of four screens), we further examined differences among all four groups. Results indicated differences in time spent among the four groups, $F(3, 465) = 6.33, p < .001$. Post-hoc analyses revealed that the RSB and the combined RSB+PNF participants spend more time viewing feedback than the attention control participants, $ps < .01$. There was no significant difference between PNF and attention control or among any of the three intervention conditions, $ps > .05$.

Most (62.3%) participants engaged in at least one activity when viewing their feedback and 30.1% engaged in two or more activities. Table 1 presents frequencies for activities that participants engaged in when viewing feedback. For the Other category, participants self-reported the following: babysitting, cooking, going to bed, playing with pet bird, working out, and smoking weed. Participants in the three intervention conditions engaged in significantly fewer activities when viewing the feedback ($M = 1.05, SD = 1.12$) than those in

the attention control condition ($M = 1.32$, $SD = 1.33$), $t(451) = 2.08$, $p < .05$. Despite the finding that most participants engaged in at least one activity when viewing the feedback, participants reported being attentive when viewing the feedback ($M = 5.39$, $SD = 1.21$). Participants' self-reports of attentiveness did not vary between those in the three feedback conditions ($M = 5.42$, $SD = 1.24$) and those in the attention control condition ($M = 5.32$, $SD = 1.10$), $t(448) = -.772$, $p = .44$.

Correlations among study variables are presented in Table 2. Spearman's rho correlations indicated that, overall, location of viewing feedback and whether one was alone or not when viewing feedback did not relate to time viewing feedback, number of activities involved in when viewing feedback, self-reported attentiveness, baseline risk behaviors, or follow-up risk behaviors. The one exception was that if one reported being alone when viewing feedback they reported engaging in significantly fewer activities. Pearson's correlations demonstrated that spending a longer time viewing the feedback was positively associated with self-reported attentiveness. Further, reporting more activities when viewing the feedback was associated with riskier health behaviors at baseline and at three-month follow-up.

Self-reported Attentiveness as a Moderator of PNF Efficacy

Path analysis in AMOS 20 was used to examine participants' self-reported attentiveness as a moderator of intervention effects on drinks per week and frequency of drinking prior to sex at the three-month follow-up. This strategy was chosen because it provides an index of model fit and allowed for utilization of bootstrapping to estimate standard errors as a means of addressing non-normally distributed outcomes. Two models were examined, one with drinks per week at follow-up as the outcome and one with frequency of drinking prior to sex at follow-up as the outcome. Baseline outcomes were included as covariates in both models. Parameter estimates for both models with bootstrapped standard errors are presented in Table 3.

In the first model, drinks per week at the three-month follow-up was examined as a function of baseline drinks per week, feedback, attentiveness, and the product of feedback with attentiveness. Baseline drinks per week and attentiveness were mean centered. Consistent with the random assignment to condition, correlations between baseline drinks per week and feedback and between attentiveness and feedback were set to zero. This provided 2 degrees of freedom for testing model fit. Results indicated good model fit, $\chi^2(2) = .85$, $p = .66$, NFI = .999, CFI=1.000, RMSEA=.000. Results further indicated that controlling for baseline drinks per week, feedback was significantly associated with lower drinks per week at follow-up. A significant interaction between feedback and attentiveness suggested that feedback effects on drinks per week at three-month follow-up were stronger among those who processed the information more carefully. Figure 1 presents predicted values based on parameter estimates where higher and lower values of attentiveness were specified as one standard deviation above and below the mean, respectively. Tests of simple slopes indicated a significant feedback effect was only evident among those who were higher in attentiveness.

The second model mirrored the first model with the exception that frequency of drinking prior to sex at three-month follow-up was examined as a function of baseline frequency of drinking prior to sex, feedback, attentiveness, and the product of feedback with attentiveness. Baseline frequency of drinking prior to sex and attentiveness were again mean centered and correlations between baseline frequency of drinking prior to sex and feedback and between attentiveness and feedback were set to zero. Results again indicated good model fit, $\chi^2(2) = .35, p = .84, NFI = .1.000, CFI=1.000, RMSEA=.000$. Tests of parameter estimates indicated only a main effect of feedback on frequency of drinking prior to sex. There was no main effect of attentiveness. Nor did attentiveness moderate the effect of feedback on frequency of drinking prior to sex.

Discussion

The present study extends the literature on web-based interventions as it offers a glimpse as to what college students are doing, who they are with, and where they are when viewing web-based personalized feedback. Examining college students' attention during web-based interventions can inform web-based intervention efforts in hopes to increase the efficacy of this very important mode of intervention delivery. The results indicate that most students are engaged in other activities, are alone, and at home when viewing the feedback. The finding that most students are engaged in one other activity (32.2%) or two or more activities (30.1%) when viewing the feedback offers a potential explanation for why in-person interventions are somewhat more efficacious at reducing college student drinking than computer-delivered interventions (Carey et al., 2007) as well as ways in which web-based intervention efficacy could be increased with future research. In-person interventions are led by a facilitator, which prevents participants from being distracted by other various activities, such as watching TV or socializing. Computer-delivered interventions in a laboratory setting also have a more controlled environment in that participants are often asked to put away their belongings during the study, thus eliminating potential distractions such as texting or phone calls. All of these distractions are more likely during web-delivered interventions in which no facilitator or communication restrictions are present. This, in part, may help to explain why in-person interventions are more efficacious than computer-delivered interventions, especially those interventions that are web-delivered. Furthermore, while most students were at home or alone, many students reported viewing the feedback when not at home (25.5%) or with others (23.3%), which are likely associated with additional distractors that would not be present when receiving an in-person facilitator led intervention. Moreover, students who reported not being alone when receiving feedback engaged in more activities than those who reported being alone.

It is noteworthy that most students viewed their feedback at home or alone. This finding is encouraging in that most students probably had privacy when viewing their feedback. A potential concern when delivering an intervention via the web is that if people are not alone or in a public setting they may spend less time viewing the feedback as a result of not wanting others to see it on their computer screen. However, findings indicated that time spent viewing the feedback did not differ among those at home or not at home or among those alone or with others. Thus, it is important to note that privacy concerns leading to restricted exposure does not appear to be a concern, or at least not in this study.

While most students were participating in one or more other activities when viewing feedback, most still considered themselves to be attentive when viewing the feedback. This subjective measure of attention was the only variable that was significantly and positively associated with time spent viewing feedback, as more objective measures of attention (i.e., home, alone, number of activities) were not associated with time spent viewing the feedback. The results revealed a main effect of attentiveness on reduced drinks per week, which suggests that paying more attention to information presented in the feedback was associated with *more* drinking at the three-month follow-up. This may be due to differences in content between heavier and lighter drinkers, where heavier drinkers are necessarily presented with larger discrepancies between drinking norms and their own drinking. The main effect of attentiveness, which was only evident for drinks per week, is less consequential given the significant interaction between attentiveness and the intervention. More specifically, findings indicated that there was a significant feedback effect on drinks per week but only among those higher in attentiveness. Attentiveness did not moderate the intervention when examining frequency of drinking prior to sex as the outcome. In sum, it appears that it is not how many other things participants were doing or how long they viewed feedback, but rather the quality of their attention when viewing the feedback that moderated intervention effects on drinks per week.

Because web-based interventions have unique merits that in-person interventions do not have (i.e., less expensive, less difficult to implement, greater reach, better opportunities for inclusion of low-incidence populations, lower participant burden, greater opportunities for multiple viewings of feedback), it is important to determine ways in which web-based intervention efficacy can be increased. As suggested by the ELM (ELM; Petty & Cacioppo, 1981, 1986) and the HSM (Chaiken, Liberman, & Eagly, 1989), these results indicate that efficacy of web-based interventions could be improved if participants' attentiveness could be increased when viewing the feedback. One possible way to do so is to make web-based interventions more interactive rather than static. For example, many web-based interventions present information on the screen for participants to read. Attentiveness could be increased by requiring participants to click on certain parts of graphs or icons in order to view all feedback. In addition, research has shown that longer personalized feedback interventions are not always more efficacious than briefer personalized feedback interventions (Kulesza et al., 2010). This may be due to students' abilities to better pay attention to all of a briefer intervention in comparison to a longer intervention. It is also possible that longer interventions include some material that does not contribute to intervention efficacy and may dilute other more efficacious content. Future research might consider attention levels during interventions and monitor intervention content where recipients' attention appears to wane. Finally, personal fatigue may play a role in student's ability to remain attentive when viewing web-based feedback. Students may be completing the survey and viewing the feedback during very late hours of the night or very early hours of the morning. Additional research should evaluate fatigue or time of day feedback is viewed as moderators of intervention efficacy.

Limitations of the present study include the college student sample. It is unclear what possibly distracting activities populations other than four-year college students may engage

in or how attentive they may be when viewing web-based interventions. For example, community college students may be more likely to be parenting and have additional distractions related to a parenting role. Related, it is unclear how attentiveness could vary among heavier drinking populations as alcohol impairs both acute and longer-term cognitive functions (Oscar-Berman, 1980; Peterson, Rothfleisch, Zelazo, & Pihl, 1990; Tharp, Rundell, Lester, & Williams, 1974). Traditional college students may also be less interested in considering changes to their drinking relative to other. In addition, the activity and attentiveness measures in the current study were all self-report, additional research should examine an experimental manipulation of distractions or attentiveness on intervention efficacy.

The present study is the first to examine what college students are doing, who they are with, and where they are at when viewing a web-based intervention. The current findings offer some indications, in part, as to why in-person interventions are more efficacious than those delivered by computer or web as well as future directions in order to increase web-based intervention efficacy. Additional research is needed to help determine ways to increase attention during computer- or web-delivered interventions as they have many unique benefits over in-person interventions.

Acknowledgments

Data collection and manuscript preparation were supported by National Institute on Alcohol Abuse and Alcoholism Grant K01AA016966.

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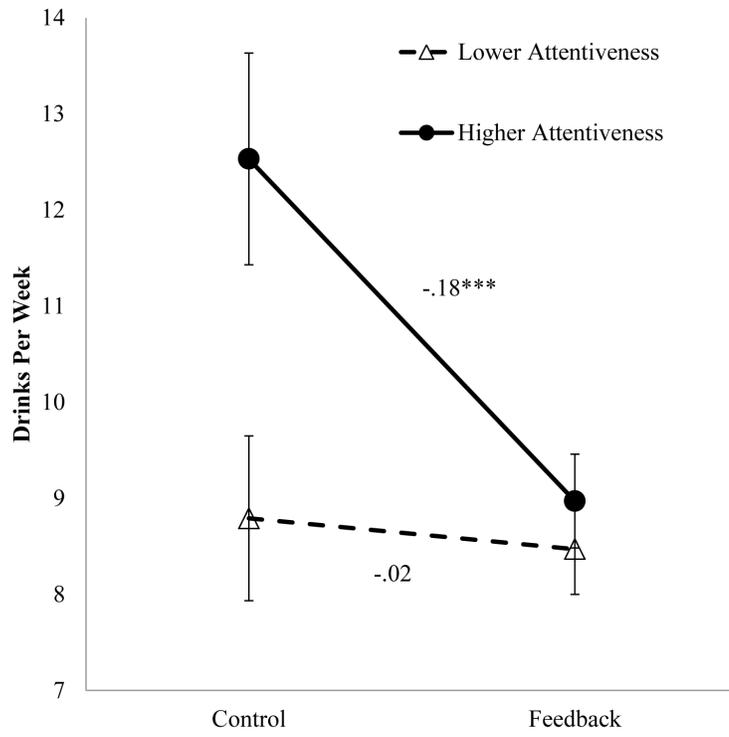


Figure 1. Attentiveness as a moderator of PNF efficacy on drinks per week.

Table 1

Percent of Students Reporting Engaging is Activities when Viewing the Feedback

Activity	Percent
TV/movie/music	26.9%
Computer use for email/messaging/web	23.6%
Studying/class work	23.2%
On phone/text messaging	15.0%
Eating	13.2%
Socializing	9.7%
Working	3.8%
In class	2.2%
Other	1.8%
Commuting	0.9%
Housework	0.9%
Partying	0.2%
Napping	0.2%

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Table 2

Correlations

Variable	1	2	3	4	5	6	7	8
1. Home	-							
2. Alone	.03	-						
3. Time viewing feedback	.08	-.01	-					
4. Number of activities	.04	-.14**	.01	-				
5. Attentiveness	.06	.05	.12**	-.08	-			
6. Baseline drinks per week	.06	-.06	-.01	.20***	-.04	-		
7. Baseline frequency of drinking prior to sex	.02	-.07	.09	.11*	.02	.36***	-	
8. 3-month drinks per week	.01	.01	-.03	.16**	.04	.70***	.30***	-
9. 3-month frequency of drinking prior to sex	.01	-.08	.09	.08	.01	.25***	.59***	.31***

Note. Home was coded as *home* (1) versus not *home* (0) and alone was coded as *alone* (1) versus not *alone* (0).

Table 3

Self-reported Attentiveness as a Moderator of PNF Intervention Efficacy

Drinks per Week					
	B	SE	Z	p	Beta
Baseline drinks per week	0.604	0.040	15.10	<.000	0.697
Feedback	-1.940	0.776	-2.50	0.012	-0.096
Attentiveness	1.555	0.589	2.64	0.008	0.215
Feedback × Attentiveness	-1.346	0.664	-2.03	0.042	-0.166
Frequency of Drinking Prior to Sex					
Baseline frequency of drinking prior to sex	0.614	0.064	9.59	<.000	0.584
Feedback	-1.031	0.495	-2.08	0.037	-0.102
Attentiveness	-0.192	0.363	-0.53	0.596	-0.054
Feedback × Attentiveness	0.274	0.388	0.71	0.478	0.069