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Addictive Behavior Interventions Among College Students

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Abstract

Purpose of review—Addictive behaviors among college students are a significant public health concern. This manuscript reviews the past two years of literature on prevention and treatment approaches for college students who engage in addictive behaviors.

Recent findings—In-person skills-based interventions and motivational interventions that incorporate personalized feedback are effective in the short-term but little support was found for long-term effects. Although web-based interventions reduced certain addictive behaviors (e.g., alcohol, problematic gambling), in-person interventions that include motivational interviewing components and personalized feedback appear to be more efficacious.

Summary—Research has largely focused on alcohol and little is known about the utility of interventions for students who use tobacco or illicit substances or who engage in problematic gambling. Research on interventions for these high-risk behaviors is recommended.

Keywords

Substance use; treatment; prevention; college; addictive behaviors

Introduction

Alcohol, tobacco, and illicit substance use and gambling among college students are prevalent [1–4] and are a major public health concern. College students deserve unique consideration for prevention and interventions efforts due to the prevalence of unique risk factors related to the college environment [e.g., newfound autonomy, being part of a high-risk peer group; 5]. Thus, the primary aim of this paper is to provide an update on relatively recent reviews [6–8] by reviewing the literature of the past two years of known prevention and treatment studies of addictive behaviors among college students (see Table 1), while highlighting areas that warrant further attention.

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Compliance with Ethics Guidelines

Human and Animal Rights and Informed Consent. This article does not contain any studies with human or animal subjects performed by any of the authors.

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Alcohol

College students are at greater risk for developing an alcohol use disorder (AUD) than their non-college attending peers [9]. Rates of drinking (75.6%) and binge drinking (35%; consuming over a two-hour period at least five drinks for men, four drinks for women) are high among college students [1]. It is estimated that each year collegiate alcohol consumption is associated with 599,000 student injuries, 97,000 sexual assaults or rapes, and over 1,800 deaths [10].

Brief Motivational Interventions (BMIs)

BMIs are directive, client-centered psychotherapies that utilize motivational interviewing (MI) techniques [11] to explore and resolve ambivalence to change problematic behaviors (e.g., risky substance use) in a non-confrontational manner. One popular BMI for use with college students is the *Brief Alcohol Screening and Intervention for College Students* [BASICS; 12]. The goal of BASICS is to raise awareness of risky drinking behaviors and to develop a discrepancy between current and desired alcohol use, with the goal of decreasing risky use and related problems. BMIs were developed to target heavy and problem drinking (not moderate or severe AUD). BASICS consists of discussing the following: (1) student's alcohol use compared to campus norms; (2) drinking-related problems (e.g., missing classes due to hangover); (3) risks and benefits of use; (4) alcohol outcome expectancies; and (5) strategies to reduce use (if requested). Students are typically given a personalized normative feedback (PNF) form that includes a graphic display of the student's drinking patterns and perception of campus norms relative to actual campus norms to generate discussion about the student's drinking patterns to enhance motivation to change drinking behaviors.

Individual difference factors (e.g., baseline psychopathology) are associated with poorer BASICS outcomes [13–15]. For example, the impact of baseline depression and gender on drinking outcomes was tested among heavy-drinking students who were randomly assigned to a BMI or assessment-only control [16]. Women with low baseline depression across conditions evidenced significantly greater reductions in weekly drinking (i.e., reduction of seven drinks per week) compared to those with high depression (i.e., reduction of four drinks per week). Conversely, among men with high baseline depression, the BMI condition reduced weekly drinking by eight drinks while the assessment-only control increased by one. Reductions in drinking were not significantly different between conditions among men with low baseline depression, with both groups showing moderate reductions (four to six drinks). These findings support the use of BMIs for depressed men, but suggest that BMIs may need further improvement to be effective for depressed women. This emerging body of work suggests that students with elevated depression, anxiety, and posttraumatic stress may benefit from personalized interventions that address their particular drinking behaviors as well as drinking-related expectancies.

Students mandated or otherwise referred by universities as part of sanctions after violating campus alcohol policies may present with lower intrinsic motivation and thus may not benefit from BASICS. In a RCT that examined BASICS outcomes among both mandated and equally heavy-drinking volunteer students compared to a control condition, both BASICS groups reduced weekly drinking, typical drinks per occasion, peak drinks, and

alcohol problems compared to the control condition [17]. Further, these were reduced from clinically elevated to more normative levels, and the changes persisted through the 12-month follow-up, suggesting that BASICS is useful in reducing risky drinking even among mandated students.

Other BMIs also appear promising with mandated students. Kazemi and colleagues [18] examined a BMI treatment among mandated and heavy-drinking voluntary students that included treatment sessions at baseline and 2 weeks post-baseline, as well as follow-up MI sessions. The treatment sessions consisted of discussion of reasons to participate in the program, problems associated with participants' drinking, harm reduction techniques, safe drinking guidelines, and assertiveness skills. Students participated in MI sessions in person or via phone 3 and 6 months after the initial session. Both mandated and voluntary students experienced reductions from clinically elevated levels of weekly drinks consumed (mandated: 8.40; voluntary: 12.40) to significantly lower levels (mandated: 1.22; voluntary: 3.96) at 12-month follow-up. Similar reductions were seen for alcohol problems, with significantly fewer problems reported at follow-up among mandated and voluntary students. Students in the mandated group consumed less drinks and experienced less consequences at all time points compared to the voluntary students. This suggests that BMIs can be useful for both mandated and voluntary students. Further, in response to this specific BMI, mandated students may be more willing to change their drinking than those who have not been sanctioned for alcohol.

Although BASICS has been shown to reduce drinking in both mandated and voluntary students, researchers continue to seek improvement. Logan and colleagues [19] compared two BMIs to an education-based group treatment with mandated students. The two BMIs were BASICS and the Alcohol Skills Training Program [ASTP; 20], a one-session treatment that combines teaching of cognitive behavioral skills, clarification of norms, and motivational enhancement techniques. At 6-month follow-up, the two BMI groups, but not the education-based group, had significant reductions in estimated blood alcohol concentration (BAC). These findings suggest that skill building may not improve the utility of BASICS.

Research has also tested whether integrating technology into BASICS may further improve outcomes. Linowski and colleagues conducted a RCT among mandated students, comparing BASICS with and without a web-based PNF booster session 3 months after the BASICS session [21]. During this booster session, participants received similar normative feedback to that which they received during the BASICS session, updated in response to their new normative beliefs. Both conditions experienced reductions in drinking and negative consequences. However, both typical BAC and negative consequences remained clinically elevated at 12-month follow-up (typical BAC .110, consequences 6.8), and the condition with the booster session did not outperform the BASICS-only condition. A web-based booster session may not confer additional reductions in drinking and negative consequences.

Stand-Alone Computerized and Web-Based Interventions

Given that stand-alone PNF appears to be as effective in reducing college drinking as PNF delivered in multicomponent therapies [22], the utility of web-based PNF interventions with

college students has been tested. There are several benefits to web-based interventions including low cost and easy to administer, as well as convenient and unobtrusive for students as they allow students to receive the intervention without making an appointment, being seen by other students at a mental health center, or leaving their home [23].

Web-based PNFs reduce alcohol consumption in college students [24, 25]. Thus, researchers have begun to build on this success by examining different aspects of the treatment. For example, Neighbors and colleagues conducted a RCT to determine whether correcting norms about drinking is necessary to decrease alcohol consumption, or whether showing students that they drink more than other students is sufficient [26]. Heavy-drinking students were assigned to a typical PNF treatment, personalized social comparison feedback treatment (PSCF; one's own drinking rates and campus drinking rates), or an attention-control, all delivered on a computer in the lab. At 3-month follow-up, both feedback conditions (but not the control condition) showed significant reductions in drinking, although drinks per week remained higher than that of average students. The PSCF condition resulted in a statistically significant reduction in drinks per week compared to the PNF condition, although the difference was less than one drink per week and both conditions drank 7.6 drinks per week. There were no significant differences in any drinking behaviors at 6-month follow-up (with all groups drinking 7.29 to 7.68 drinks per week) or any effect of treatment on negative consequences related to alcohol. This suggests that specific correction of students' perceived norms may not be necessary in PNF.

Recent research supports the use of web-based PNF as a preventative measure for incoming students. The electronic Check-Up to Go [e-CHUG; 27] provides information about negative consequences of drinking (e.g., financial cost, calories consumed), provides PNF, and informs them of their estimated risk status for problematic drinking. A test of the utility of e-CHUG among college freshmen found that high-risk individuals (those who reported at least one heavy drinking episode in the past 2 weeks) who completed e-CHUG during university orientation were less likely to receive a university sanction during their first year than those who did not receive e-CHUG [28].

Recent research in Sweden tested the utility of a large-scale web-based PNF as a standard intervention for numerous national universities for students endorsing at least two recent episodes of heavy drinking [29]. Students were randomly assigned to the PNF group or an assessment-only control group. The PNF compared students' weekly alcohol consumption, frequency of heavy drinking, and highest BAC to that of a typical student in Sweden. The PNF group did not evidence a greater reduction in alcohol consumption than the control group, demonstrating that the treatment was unsuccessful in reducing drinking. This study lends limited support for web-based PNF interventions at a national level.

To help guide university decisions regarding whether to target college drinking via web-based or in-person interventions, emerging research has compared the efficacy of web-based versus in-person PNF. Rodriguez and colleagues [30] tested the efficacy of the same computer-based PNF intervention in a laboratory versus remotely, using data from three previous trials. They found that in-lab completion more effectively reduced alcohol consumption than remote completion. Thus, although online completion may be a

reasonable option for wide dissemination, something about completing the intervention in a more controlled environment seems to make the intervention more useful. One limitation of the delivery of web-based PNF is that students receiving the intervention may not be attentive to the feedback presented. Although students often completed a PNF at home (74.5%) and alone (76.7%), over half of students were engaged in one to two other activities (e.g., watching TV) while viewing feedback [31]. Despite engaging in other activities, most students reported being attentive, and attention was the best predictor of reduction of drinks per week. However, drinks per week remained higher than normative levels even among those who reported being attentive.

Emerging research of web-based interventions is also striving to treat alcohol use when it co-occurs with other problems. Geisner and colleagues conducted a RCT of a PNF intervention targeting drinking, depression, or drinking and depression among students at moderate risk for an AUD, at least one past-month heavy drinking episode, and at least mild depression [32]. At 1-month follow-up, there was no main effect of condition. However, participants low in depression or alcohol consequences who received PNF for alcohol or for both alcohol and depression showed statistically significant reductions in negative alcohol consequences compared to the control group. Those with higher levels of depression and alcohol consequences did not show statistically significant differences in reduction between conditions, with neither group showing significant reductions. These findings show that, like BASICS, web-based PNF interventions may be affected by moderating factors, such as mood disorders, suggesting that psychological conditions should be taken into account in the provision of these interventions, rather than using a one-size-fits-all approach.

Tobacco

BMI

Although tobacco use has declined among college students over the past few decades [1], its use remains prevalent, with 21% of college students reporting past-month cigarette use [2]. BMIs have been shown to effectively reduce tobacco use among college students [33], yet the treatment remains understudied. One BMI has recently been shown to increase smoking cessation at 6-month follow-up in a sample of 255 Spanish college students who reported smoking at least one cigarette per week for the last 6 months [34]. The intervention consisted of a 50-minute in-person session in which MI and self-help materials were used to address motivation, self-concept, and self-efficacy. A battery of online self-help material aimed at changing students' perceptions of tobacco and increasing their self-efficacy (e.g., information on smoking health effects and quitting) was administered. Students in the BMI received a reinforcing email 15 days before the BMI session, a group therapy session to discuss progress 2 months after the BMI, a short MI booster session 4 months after the BMI session, and six-month assessment. Over 20% of the BMI quit smoking at 6-month follow-up compared to 6.6% of the control students. Among those that continued to smoke, there was no difference in rate of smoking.

Web-Based Interventions

Web and technology-based interventions have proven to be a promising smoking cessation treatment [35, 36], yet they are under-researched, especially among collegiate populations. Berg and colleagues tested the utility of an interactive online intervention for college smokers that used incentives and messaging to reduce smoking and increase readiness to quit. Participants were instructed to complete online modules that included smoking and drinking behavior monitoring (e.g., timeline follow-back recording number of cigarettes used during the past three to four days), graphical feedback regarding smoking, and targeted messaging (i.e., a brief paragraph and 60–90 second video regarding topics such as social stigma of being perceived as a smoker), and received incentives for healthy goods and services in exchange for completing the modules [37]. Participants in the intervention condition had lower quit attempt rates than the control condition at 6 weeks post intervention, but a higher attempt rate at 12 weeks post-intervention. Overall, quit rates were low, with the intervention group experiencing a 23% quit rate 6 weeks and a 19% rate at 12 weeks post-intervention. Participants in the intervention condition smoked fewer cigarettes per smoking day at 6 weeks post-intervention, (intervention: 3.25, control: 4.63) but only marginally fewer at 12 weeks (intervention: 3.16, control: 3.94). Given the poor abstinence rates obtained, data suggest this intervention may not be useful in encouraging smoking cessation among college students.

Mussener and colleagues examined the effect of a text message-based smoking cessation intervention among college students [38]. The intervention consisted of a 1 to 4 week motivational phase during which text messages were used to motivate students to quit smoking. After the quit date, 157 text messages were sent over a 12-week period, covering topics such as telling friends about quitting and using problem-solving tips or distraction techniques. Students received four to five text messages per day during the beginning weeks, which then gradually decreased over time. Students could also request additional texts during periods of craving. Eight-week prolonged abstinence (no more than 5 cigarettes) was achieved by 25.9% of those in the intervention condition, compared to 14.6% in the control condition. Further, 20.6% of those in the intervention group achieved past four-week total cessation, compared to 14.2% of the control group. These findings support the efficacy of the use of text messages to aid student tobacco cessation attempts, although the low abstinence rates suggest the need for additional intervention.

Campus-wide interventions

Universities have taken notice of the high rates of tobacco use found among college students [2]. Some universities are attempting to reduce student tobacco use with university policies (i.e., making campuses smoke-free). Policy efforts are supported by a recent meta-analytic review that studied the acceptability and effectiveness of smoke-free campus policies using data from 19 studies in the United States and United Kingdom [39]. Results indicated that 58.94% of students support smoke-free policies. Further, policies led to a reduction in tobacco use, with smoking rates decreasing from 16.5% to 12.8% and 9.5% to 7.0% in the two studies that assessed tobacco use rates.

Illicit Substances

Cannabis is the most commonly used illicit substance among college students [1], with 33.9% of college students reporting lifetime use [40] and nearly 25% of cannabis-using first-years meeting criteria for a cannabis use disorder [41]. Further, 4.3% to 12% of college students report using illicit substances other than cannabis during the past 30 days [3]. Among college students endorsing past-month illicit substance use, 26% and 13% reported experiencing symptoms of substance dependence and abuse, respectively [42].

Despite high rates of illicit substance use and related problems among college students, little recent research has tested the utility of interventions for college illicit substance use. In fact, we found only three studies published in the past two years testing the efficacy of interventions for illicit substance use among college students using the following search terms: *cannabis, marijuana, stimulant, cocaine, opioid, synthetic, synthetic cannabinoid, non-medical use of prescription drugs/substances, illicit drug/substance, illegal drug/substance*. One study tested the utility of a screening and brief intervention (SBI) for cannabis-using students. SBIs include a universal screening for individuals who may be having substance-related problems and a brief intervention designed to address problems related to substance use. They have been implemented online and include BMI components [e.g., personalized normative feedback about patterns of use; 43]. Although web-based SBIs may have the potential to reach more cannabis-using students than in-person administered BMIs, their effects on cannabis use outcomes have not been promising. The Marijuana eCHECKUP TO GO [43] is a commercially available online intervention that has been used in colleges across the United States and Canada. This SBI provides students with personalized feedback comparing their cannabis use to that of other college students locally and nationally. It also includes information on negative consequences of their use and alternative activities. Palfai and colleagues tested its utility [43]. eCHECKUP had an effect on perceived norms, such that participants in the eCHECKUP condition reported significantly lower estimates of peer cannabis use at the 3- and 6-month follow-up assessments compared to control (feedback on general health-related behaviors) participants [43]. However, the eCHECKUP condition did not differ from the control condition on frequency of cannabis use or self-reported cannabis problems at 3-month or 6-month follow-up [43]. This web-based SBI does not appear to be useful in reducing cannabis use or related problems in the short- or long-term.

BMIs have also been utilized to address the rates and related problems of other illicit substance use among college students. One study evaluated the efficacy of two interventions for reducing illicit substance (i.e., cannabis, cocaine, stimulants, inhalants, sedatives, hallucinogens, opioids) use and related problems compared to a screening only control: an in-person version of the Alcohol, Smoking, and Substance Involvement Screening Test (ASSIST)/Motivational Brief Intervention (MBI; ASSIST/MBIi) and a web-based version of ASSIST/MBI [ASSIST/MBIc; 44]. The ASSIST/MBIi and ASSIST/MBIc conditions included the screening test and one session (either in-person or web-based) of a 5–20 minute BMI. The sample included 330 substance using Brazilian college students who volunteered to participate in the study and who demonstrated moderate to high risk for experiencing substance-related problems. No differences were found in reported illicit drug use or related

problems from baseline to 3-month follow-up between all three conditions, suggesting that the intervention was not useful.

Yurasek and colleagues [45] examined the effect of adding a behavioral economic substance-free activity session (SFAS) to BMI for alcohol and illicit substance (i.e., cannabis, cocaine, stimulants, opioids) use for college students. All participants attended a 20–30 minute BMI session, which consisted of discussion of their alcohol and drug use, including tolerance, PNF (for students of the same gender and ethnicity), and goal setting. Participants were then randomized to attend an additional 25–30 minute session consisting of either SFAS or education (ED) about alcohol and substance use. The SFAS component consisted of a discussion of (1) college and career goals and how alcohol and substance use might impact participants' goals and (2) goal setting. BMI + SFAS was compared to BMI + ED. At 6-month follow-up, no differences were found between groups in terms of number of drinks consumed per week or alcohol-related problems. Participants in the BMI + SFAS condition used cannabis on significantly fewer days during the past month than those in the BMI + ED condition, although all participants' cannabis use significantly decreased and those in the SFAS condition remained frequent users (>5 times per month). Although the interventions focused on alcohol and drug use broadly (i.e., not just cannabis), outcomes related to other substance use behaviors were not tested given low base rates of other substance use found in the sample. Taken together, these results suggest that BMIs that address the use of multiple illicit substances (e.g., stimulants, cannabis) and/or alcohol are not useful for reducing illicit substance use (or alcohol). It is unknown whether more targeted BMIs focusing on one specific illicit substance would be more effective.

Gambling

BMIs

Although 7.89% to 10.23% of college students endorse problematic gambling [4, 46], there has been little empirical attention paid to testing the utility of interventions for college student gambling. Given that personalized feedback interventions have been successful for heavy drinking college students, several studies have evaluated both PNF and feedback only interventions. One such study examined college students deemed to be at-risk gamblers (i.e., having gambled at least once in the past 60 days and scoring 3+ on the South Oaks Gambling Screen [SOGS], indicating “problem” gambling). Students were randomized to an in-person PNF, education-only (EO), or assessment-only (AO) intervention [47]. Students in the PNF intervention received a paper printout of feedback and reviewed it for 10+ minutes in a lab. Feedback consisted of the student's own gambling frequency compared with actual rates of gambling at the same university, student's gambling status (i.e., “problem” or “pathological”), and self-reported gambling behaviors, gambling problems, and high-risk gambling situations. At 3-month follow-up, students in the AO condition reported spending more dollars gambling and endorsed more gambling problems (e.g., guilt about gambling) than students in the PNF condition. There were no significant differences between the PNF and EO conditions on number of gambling days, dollars gambled, or gambling-related problems but participants in the PNF condition reported the greatest reduction in gambling behaviors at 3-month follow-up. Participants who received PNF spent less money at 3-month

follow-up as well as endorsed fewer gambling-related problems, although all three groups were deemed to have moderate levels of problematic gambling at baseline and low levels of problematic gambling at 3-month follow-up, suggesting that all participants had reductions in gambling-related problems over the 3-month follow-up period.

Web-Based Interventions

Neighbors and colleagues [23] tested the utility of a web-based PNF intervention among at-risk college gamblers (i.e., those scoring 2+ on the SOGS), comparing PNF to an attention control condition. Students in the PNF condition received feedback related to their own gambling behaviors, perceived norms of other students gambling, other students' actual gambling, and a percentile rank of participants' gambling compared to same-university peers. At 3-month follow-up, PNF significantly reduced perceived norms as well as quantity of money lost and gambling problems. The effect of the intervention on quantity of money lost remained at 6-month follow-up but gambling problems no longer significantly differed between conditions at that time. However, gambling problems remained relatively unchanged from 3-month (score of 3.56) to 6-month follow-up (score of 3.61) among participants in the PNF condition, suggesting that the intervention produced long-term changes in gambling problems as well as quantity of money lost.

Conclusions

There are several conclusions that arise from this review of prevention and intervention research for college student addictive behaviors published in the past three years. Regarding alcohol, BMI reduces risky drinking and related problems among mandated and voluntary students. PNF interventions reduce risky drinking among incoming college freshman but do not appear to be useful for students who drink heavily or have co-occurring problems (e.g., depression) and seem to be less efficacious than BMIs administered by clinicians. Regarding cannabis, SBIs, such as the eCHECKUP TO GO, do not appear to reduce cannabis use or related problems among college students. Further, BMIs do not appear to reduce illicit drug use. Regarding smoking, BMIs and web-based interventions reduce rates of smoking among students who use tobacco at least monthly, although rates remained relatively high. Regarding gambling, BMI and PNF reduce money spent gambling and gambling-related problems among students at-risk for problematic gambling.

This review highlights the need for additional research on interventions for addictive behaviors among college students. For example, current interventions do not appear to be efficacious at reducing risky use of cannabis or other illicit drugs. Thus, additional work is necessary to identify intervention strategies to help these students. Second, emerging data suggest that students with elevated mental health problems (e.g., anxiety, depression, posttraumatic stress) may not benefit from current BMIs for risky drinking [13, 14, 16] and future work is necessary to develop and test the utility of personalized interventions for these especially vulnerable students. Third, we know of no studies identifying individual difference variables that predict outcomes for interventions for illicit drugs or for gambling and this will be an important avenue of future research. Fourth, although researchers have identified some treatment mechanisms (e.g., change in perceived norms; [48]), identification

of other mediators and moderators of treatment outcomes will inform efforts to improve these interventions.

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Table 1
Overview of Articles Included in the Review Organized by Type of Addictive Behavior

Study	Sample	Conditions	Main finding(s)
Bendisen et al. (2015)	<i>N</i> = 1605 heavy-drinking college students	Web-based PNF Assessment-only control	<ul style="list-style-type: none"> No significant difference in reduction rates in drinking between the two groups.
Doumas et al. (2014)	<i>N</i> = 350 heavy-drinking college students	e-CHUG Assessment-only control	<ul style="list-style-type: none"> Students who completed e-CHUG during freshman orientation received significantly less university infractions during their first year.
Geisner et al. (2015)	<i>N</i> = 311 heavy-drinking students who scored 8+ on the AUDIT and 14+ on the BDI-II	Alcohol-only PNF Depression-only PNF Integrated PNF Assessment-only control	<ul style="list-style-type: none"> Participants with low baseline levels of depression and alcohol consequences in the alcohol-only and integrated PNF conditions had significant reductions in negative consequences compared to the control group. Those with high levels of depression and alcohol consequences did not show significant reductions in any condition.
Kazemi et al. (2014)	<i>N</i> = 190 mandated and 710 heavy-drinking voluntary students	BMI Assessment-only control	<ul style="list-style-type: none"> Alcohol consumption and alcohol problems significantly decreased among both mandated and voluntary students. Overall, mandated students consumed fewer drinks and experienced fewer alcohol problems than voluntary students.
Linowski et al. (2016)	<i>N</i> = 346 mandated college students	BASICS + booster session BASICS-only	<ul style="list-style-type: none"> Students in both condition evidenced significant reductions in drinking and alcohol problems. The BASICS + booster condition did not outperform the BASICS-only condition.
Logan et al. (2015)	<i>N</i> = 61 mandated college students	BASICS ASTP Education-only	<ul style="list-style-type: none"> Significant reductions in BAC were found among participants in the BASICS and ASTP conditions, but not the education condition.
Merrill et al. (2014)	<i>N</i> = 330 heavy-drinking college students	BMI Assessment-only control	<ul style="list-style-type: none"> Regardless of condition, women with low baseline depression evidenced significantly greater reductions in drinking than those with high baseline depression. Among men with high baseline depression, the BMI condition significantly reduced drinking compared to the control condition. Among men with low baseline depression, reductions in drinking did not differ significantly by condition.
Neighbors et al. (2016)	<i>N</i> = 623 heavy-drinking college students	PNF PSCF Attention-control	<ul style="list-style-type: none"> At 3-month follow-up, participants in both PNF and PSCF showed significant reductions in weekly drinks compared to the control. There were no significant differences found between conditions at 6-month follow-up.
Rodriguez et al. (2015)	<i>N</i> = 2046 heavy-drinking college students from three previous trials	PNF in lab PNF remotely	<ul style="list-style-type: none"> PNF completed in lab reduced alcohol use more than PNF completed remotely.

Study	Sample	Conditions	Main finding(s)
Terlecki et al. (2015)	N = 114 heavy-drinking mandated college students and 111 heavy-drinking voluntary students	BASICS Assessment-only control	<ul style="list-style-type: none"> In the BASICS condition, all students showed significant reductions in weekly drinking, drinks per occasion, peak drinks and alcohol problems when compared to the control group at 1-month follow-up. These reductions were sustained through the 12-month follow-up.
Berg et al. (2014)	N = 122 college student smokers	Interactive online intervention Assessment-only control	<ul style="list-style-type: none"> At 6-week follow-up, quit attempt rates were lower in the intervention condition than the control condition. At 12-week follow-up, quit attempt rates were higher in the intervention condition compared to the control condition.
Mussener et al. (2016)	N = 1590 college student smokers	Text-message based intervention Assessment-only control	<ul style="list-style-type: none"> Participants in the intervention group demonstrated higher prolonged abstinence and cessation rates than the control group.
Pardiavila-Beljo et al. (2015)	N = 255 college student smokers	BMI Assessment-only control	<ul style="list-style-type: none"> Students in the BMI condition evidenced significantly higher rates of smoking cessation compared to those in the control condition.
De Oliveira Christoff et al. (2015)	N = 330 substance-using college students	In-person ASSIST Web-based ASSIST Screening-only control	<ul style="list-style-type: none"> No significant differences in substance use or related problems were found between conditions at 3-month follow-up.
Palfai et al. (2014)	N = 1080 cannabis-using college students	eCHECKUP Assessment-only control	<ul style="list-style-type: none"> Participants in the eCHECKUP condition reported significantly lower estimates of peer cannabis use at 3- and 6-month follow-ups. Frequency of cannabis use and related problems did not differ by condition at either follow-up.
Yurasek et al. (2015)	N = 97 substance-using college students	BMI + SFAS BMI + Education	<ul style="list-style-type: none"> At follow-up, no differences in alcohol consumption or related problems were found between conditions. Participants in the BMI + SFAS condition used cannabis on significantly fewer days during the than those in the BMI + Education condition.
Martens et al. (2015)	N = 333 college student gamblers who scored 3+ on the SOGS and endorsed gambling at least once during the past 60 days	PNF Education-only Assessment-only control	<ul style="list-style-type: none"> At 3-month follow-up, students in the assessment-only condition reported spending more dollars gambling and experiencing more gambling problems than those in the PNF condition. At 3-month follow-up, there were no differences in number of gambling days, dollars gambled, or gambling problems between the PNF and education-only conditions.
Neighbors et al. (2015)	N = 252 college student gamblers who scored 2+ on the SOGS	PNF Attention control	<ul style="list-style-type: none"> At 3-month follow-up, students in the PNF condition evidenced significantly reduced perceived norms, quantity of money lost, and gambling problems. The effect of the intervention on quantity of money lost remained at the 6-month follow-up. At 6-month follow-up, conditions no longer differed on gambling problems.

Note. PNF = personalized normative feedback; e-CHUG = electronic Check-Up to Go; AUDIT = Alcohol Use Disorders Identification Test; BDI-II = Beck Depression Inventory-II; BMI = brief motivational intervention; BASICS = Brief Alcohol Screening and Intervention for College Students; ASTP = Alcohol Skills Training Program; PSCF = personalized social comparison feedback; ASSIST = Alcohol, Smoking, and Substance Involvement Screening Test; eCHECKUP = Marijuana eCHECKUP TO GO; SFAS = substance-free activity session; SOGS = South Oaks Gambling Screen.