



A test of the efficacy of a brief, web-based personalized feedback intervention to reduce drinking among 9th grade students



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HIGHLIGHTS

- We tested the efficacy of a brief, web-based alcohol intervention.
- Two junior high schools were randomized into intervention or control schools.
- Intervention participants reported less drinking and consequences than controls.
- Results provide support for a brief, web-based alcohol intervention.

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ABSTRACT

Alcohol use increases substantially during the transition from middle school to high school. This study tested a brief, web-based personalized feedback program aimed at reducing risk factors for drinking, alcohol use, and alcohol-related consequences among 9th grade students. At a 3-month follow-up, students in the intervention group showed positive results relative to those in the control group on variables associated with reduced risk, including positive alcohol expectancies and positive beliefs about alcohol. Students in the intervention group also reported a reduction in drinking frequency and alcohol-related consequences relative to those in the control group. There were, however, no differences in normative beliefs regarding peer drinking or quantity of weekly drinking between the two groups. Results indicate that a brief, web-based personalized normative feedback program delivered in the school setting is a promising approach to reducing alcohol use and the associated consequences among 9th grade students.

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1. Introduction

Underage drinking represents a significant problem in the United States, with 70% of students reporting alcohol use by the end high school (Johnston, O'Malley, Bachman, & Schulenberg, 2012). In addition, heavy drinking in high school is associated with multiple interpersonal, academic, legal, and neurocognitive consequences (Arata, Stafford, & Tims, 2003; Brown, Tapert, Granholm & Delis, 2000; French & Maclean, 2006). Further, research indicates that youth who drink heavily during their teen years continue this pattern into college (Kenney, LaBrie, & Hummer, 2010) and early adulthood (D'Amico, Elickson, Collins, Martino, & Klein, 2005) and are at risk for developing alcohol dependence (Hingson, Heeren, & Winter, 2006).

Alcohol use increases substantially during the transition from middle school to high school. According to national survey data, lifetime prevalence rates for alcohol use among 8th, 10th and 12th grade students are 33%, 56%, and 70%, respectively (Johnston et al., 2012). Additionally, 13% of 8th grade students report alcohol use in the past 30 days compared to 27% of students in the 10th grade and 40% of students in the 12th grade (Johnston et al., 2012). More concerning is the escalation in heavy drinking during this transition, with reports of binge drinking in the past 2 weeks increasing from 6.4% in the 8th grade, to 14.7% in the 10th grade, to 21.6% in the 12th grade (Johnston et al., 2012). Data indicate that the largest increase in alcohol use and heavy drinking occurs between 8th and 10th grades, identifying a need to design prevention and intervention programs for students transitioning to high school.

One explanation for the high rates of alcohol use and heavy drinking in high school is that this period is associated with a high level of risky decision-making (Albert & Steinberg, 2011; D'Amico et al., 2005) and increased peer affiliation (Burrow-Sanchez, 2006). During this

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time, adolescents try new behaviors and may find themselves in risky situations as parental authority is tested (D'Amico & Fromme, 2000). Although adolescents have the capacity to evaluate the costs and benefits of their choices, adolescents often demonstrate poor decision making and judgment (Albert & Steinberg, 2011). Relative to adults, adolescents engage in higher rates of risky behavior, in part due to the desire to seek out novel and exciting experiences (Albert & Steinberg, 2011). Additionally, prefrontal cortex immaturity contributes to the risky decision making seen among adolescents, as the prefrontal cortex plays a key role in behavioral and emotional regulation and risk evaluation (Steinberg, 2008). Risky behavior in adolescence is also associated with an imbalance caused by different developmental trajectories of reward and regulatory brain circuitry (Van Leijenhorst et al., 2010) and may be due to the combination of relatively higher inclinations to seek rewards and still maturing capacities for self-control (Steinberg, 2010).

Neuroimaging studies indicate that many social brain regions continue to develop during adolescence resulting in differences in responses to peer influence and social evaluation which are associated with an increased vulnerability to risky behavior when that is the norm (Burnett, Sebastian, Kadosh, & Blakemore, 2010). Adolescent risk-taking behavior is also more likely to occur in groups than that of adults (Chassin, Pitts, & Prost, 2002). In addition, perceptions of peer drinking (Arata et al., 2003; Bekman, Cummins, & Brown, 2010; D'Amico & McCarthy, 2006) and positive expectancies regarding alcohol (Goldberg, Halpern-Felsher, & Millstein, 2002) have been identified as risk factors for drinking in adolescence. These findings suggest that adolescent risk taking behaviors are socio-emotional in nature, indicating the need for prevention and intervention efforts that provide information that is socially and emotionally relevant to adolescents, as well as targeting normative beliefs and positive alcohol beliefs and expectancies.

To date, there is limited research on interventions specifically targeting high school students (Spath, Greenberg, & Turrisi, 2008). Recent reviews of the literature indicate that brief interventions using motivational interviewing are effective in reducing adolescent substance use (Barnett, Sussman, Rohrbach, & Spruijt-Metz, 2012; Jensen et al., 2011; Tevyaw & Monti, 2004). However, a close examination of the studies reviewed indicates limited research examining interventions specific to 9th grade students. Although, the extant research on school-based programs for high school students indicates that programs using motivational enhancement and cognitive-behavioral principals are effective in reducing alcohol use (Conrod, Stewart, Comeau, & Maclean, 2006; O'Leary-Barrett, Macie, Castellanos-Ryan, Al-Khudhairy, & Conrod, 2010; Sussman, Dent, & Stacy, 2002), these types of programs are time intensive, require extensive training, and may be difficult for schools to implement. Successful school-based interventions include factors such as a sound theoretical foundation, demonstrated fidelity, and material designed to engage adolescents (Wagner, Tubman, & Gil, 2004). Thus, it is important to assess the efficacy of theory driven programs that can be easily standardized, have good program fidelity, require minimal training, and contain information that is presented in a way that will be appealing to and well-received by adolescents.

More recently, innovative approaches to implementing brief interventions have been developed. Web-based interventions may be particularly useful in the high school setting as online programming has the potential both to reach a wide audience and be an engaging medium for students who enjoy "surfing the net". Graphics used in web-based interventions may also appeal to adolescents, thus increasing their interest in reading the feedback (Tevyaw & Monti, 2004). Additionally, a web-based program is well-suited for the school setting as many of the difficulties associated with implementing traditional brief interventions can be reduced by the use of technology (Moyer & Finney, 2005). Specifically, web-based programs are inexpensive and require minimal training, thereby reducing the resources required of schools to adopt the program. Web-based interventions are also easy to disseminate to large groups of students within the existing framework of the educational

setting. Additionally, web-based interventions can be infused into the school curriculum and can improve program fidelity (Schinke, Di Noia, & Glassman, 2004).

A growing number of controlled studies indicate that web-based programs delivered to adolescents (Newton, Andrews, Teesson, & Vogl, 2009; Schwinn, Schinke, & Di Noia, 2010) or adolescents and their parents (Koning et al., 2009; Schinke, Cole, & Fang, 2009; Schinke, Fang, & Cole, 2009) are effective in reducing drinking and alcohol-related consequences in adolescents. Although research indicates that web-based interventions are promising for this age group, the majority of these studies examined online interventions with adolescent females only (Schinke, Cole, & Fang, 2009; Schinke, Fang, & Cole, 2009; Schwinn et al., 2010). The web-based interventions used in these studies were also lengthy, including 4–12 modules or sessions, with each session taking up to 40 min. Additionally, only two of these studies evaluated a school-based program (Koning et al., 2009; Newton et al., 2009). School-based interventions have several potential advantages over clinic-based interventions (Wagner et al., 2004). The school is an identifiable setting where the program can be disseminated and can reach all adolescents. Further, the school represents a unique setting for prevention and intervention because it combines personal, social, and academic forces that affect a student's life and substance use choices. Thus, further research is needed to examine the efficacy of a brief, school-based online intervention targeting both males and females.

The purpose of the present study is to test the efficacy of a brief, web-based intervention program based on social norming and motivational enhancement models on reducing risk-factors for drinking, alcohol use, and alcohol-related consequences among 9th grade students. To our knowledge, this is the first study to examine a brief, web-based personalized feedback intervention implemented through the school for 9th grade students. We hypothesized that students receiving the web-based intervention would report 1) lower levels of risk-factors for drinking (normative beliefs about peer drinking, positive expectancies, and positive beliefs about alcohol), 2) lower rates of drinking (frequency of drinking and quantity of weekly drinking), and 2) lower rates of alcohol-related consequences relative to those in the control condition.

2. Method

2.1. Participants

Participants were recruited from two junior high schools in the Northwest. All 9th grade students with parental consent who were present during the baseline assessment ($N = 538$) were given an opportunity to participate in the study. Of these, 513 (52% female, 48% male) students agreed to participate in the study. Participant ages ranged from 13 to 16 ($M = 14.21$, $SD = 0.47$). Participants were primarily Caucasian (74.5%), with 9.9% Hispanic, 5.5% Asian, 4.2% African-American, 3.6% American Indian/Alaskan Native, 1.5% Hawaiian/Other Pacific Islander, and 0.8% other.

2.2. Procedure

Convenience sampling was used to select the two schools. The two schools that agreed to participate were randomly assigned by coin toss to either the intervention group or control group (usual alcohol and drug education). All 9th grade students registered at the two schools were eligible to participate. All parents of 9th grade students were contacted by the school via letter by mail at their permanent addresses provided by the registrar's office. Enclosed in the letter was a project-addressed, stamped decline postcard. If a parent did not want their child to participate in the research project, they were asked to print their name and student's name and return the postcard indicating their option to decline. In addition, a phone number and email address were provided so that parents could decline their children's participation via phone or email. If the parent did not send in a decline postcard,

call, or email to the schools, students were invited to participate in the study. We selected this method of consent as passive consent is commonly used in school-based research (Smith, Boel-Studt, & Cleeland, 2009) and has several advantages over active consent including higher response rates and less sample bias relative to active consent procedures (Courser, Shamblen, Lavrakas, Collins, & Ditterline, 2009). Response rate estimates for school-based research are 90% for passive consent and 30–60% for active consent and samples recruited with active consent procedures are less diverse and have lower rates of high risk participants (Smith et al., 2009).

All students were recruited by the schools during class periods. At the start of the class, a school counselor described the research and invited students with parental consent to participate. Students with parental consent who elected to participate were assigned a unique pin number and the URL for participation. Participants logged on to the survey website and were directed to a welcome screen describing the research and were asked to enter their PIN number. Once they entered the PIN, they were presented with the informed assent statement describing the study procedures and were asked to indicate their assent by clicking “Agree”. If participants indicated their willingness to continue, they were routed to a baseline survey, which was completed immediately. This survey took approximately 15 min to complete. Students without parental consent and those who chose not to participate were given an alternative activity to complete during the class period. Students at the intervention school had an additional class meeting in which the counselor attended the class and guided the students through logging onto the online intervention. All students who participated in the baseline survey were invited to complete a 3-month survey. Procedures for administration of the 3-month survey were similar to those of the baseline survey. All study procedures were approved by the School District Research Board and the University Institutional Review Board approved secondary analysis of the database.

2.3. Measures

2.3.1. Alcohol use

Frequency of drinking was assessed using the Quantity/Frequency/Peak questionnaire (QFP; Dimeff, Baer, Kivlahan, & Marlatt, 1999; Marlatt et al., 1998). Participants were asked to indicate the frequency of drinking on an 8-point scale with options ranging from 0 (Do not drink alcohol at all) to 7 (Every day). Typical weekly drinking was assessed using the Daily Drinking Questionnaire (DDQ; Collins, Parks, & Marlatt, 1985) in which participants were asked, “Given that it is a typical week, please write the number of drinks you probably would have each day.” A response scale is provided for each day of the week (e.g., Monday __, Tuesday __, etc.). A drink was defined as “a 12-ounce can or bottle of beer, a 4-ounce glass of wine, or a shot of distilled spirits in a mixed drink.” Weekly drinking was calculated by combining the reports for the seven days of the week.

2.3.2. Alcohol-related consequences

Alcohol-related consequences were assessed using the Rutgers Alcohol Problem Index (RAPI; White & Labouvie, 1989). The RAPI is a 23-item self-administered screening tool for assessing adolescent problem drinking. Participants were asked “how many times have the following scenarios happened to you while you were consuming alcohol or as a result of your drinking in the past 30 days.” Responses were measured on a 5-point scale ranging from never to more than 10 times. A total consequence score was created by summing the 23 items ($\alpha = .96$).

2.3.3. Normative beliefs

Perceptions of peer drinking were assessed using a modified version of the Quantity/Frequency/Peak questionnaire (QFP; Dimeff et al., 1999; Marlatt et al., 1998). Participants were asked to indicate the frequency of drinking of a typical 9th grade student on an 8-point scale with options ranging from 1 (Every day) to 9 (Do not drink alcohol at all).

Weekly peer drinking quantity was assessed using a modified version of the Daily Drinking Questionnaire (DDQ; Collins et al., 1985). Participants were asked to estimate the number of drinks they believe a typical 9th grade student would drink. The estimate of peer weekly drinking was calculated by combining the reports for the seven days of the week.

2.3.4. Positive alcohol expectancies

Positive expectancies concerning alcohol effects were assessed using the Brief Comprehensive Effects of Alcohol questionnaire (B-CEOA; Addictive Behaviors Research Center, University of Washington, 1997). The CEOA is a 15-item version of the Comprehensive Effects of Alcohol Questionnaire (CEOA). The B-CEOA assesses 4 positive factors: sociability, tension reduction, liquid courage, and sexuality. Respondents indicate their degree of agreement that a particular effect will likely occur if they drink, using a 1–4 scale (1 = disagree, 4 = agree). The sociability ($\alpha = .88$), tension reduction ($\alpha = .85$), and liquid courage ($\alpha = .83$) scales were used in this study.

2.3.5. Beliefs about alcohol

Beliefs about alcohol were derived from findings in prior research (Turrissi, 1999; Turrissi, Wiersma, & Hughes, 2000; Turrissi et al., 2009). The items represent the constructs positive transformations, enhance social behavior, normative approval, physical risk, negative affect, and healthy lifestyle orientation. Individuals responded to each of the items on a 5-point Likert-type scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Of the 12 items, 3 items were reverse scored. The items were summed to create a composite variable ($\alpha = .84$).

2.4. Intervention

The eCHECKUP TO GO (San Diego State University Research Foundation, n.d.) is a 30 minute intervention based on social norming theory and motivation enhancement models. The program is designed to change perceptions of peer drinking norms, alcohol beliefs, and alcohol expectancies by providing personalized normative feedback regarding alcohol use, feedback regarding individual risk factors for developing alcohol-related problems, and accurate information about alcohol and myths related to alcohol use. The eCHECKUP TO GO is available through the San Diego State University Research Foundation. Although originally designed for college campuses, the program is also available for high school use. The high school program is identical to the college program with the exception of the normative data which is generated from local high schools. The program was not modified in any way for this study. The program is customized for the participating school, including providing normative data for the specific school, referrals for the local community, and designing the website using school colors and logos.

The program includes two sections: 1) online assessment and 2) personalized normative feedback. The online assessment consists of basic demographic information (e.g. sex, age, weight, living situation, class standing) and information on alcohol consumption, drinking behavior, and alcohol-related consequences. Immediately following the assessment, individualized graphed feedback is provided in the following domains: summary of quantity and frequency of drinking including graphical feedback such as the number of cheeseburgers that are equivalent to alcohol calories consumed, graphical comparison of one's own drinking to U.S. norms, estimated risk-status for negative consequences associated with drinking and risk-status for problematic drinking based on the participant's Alcohol Use Disorder Identification Test (AUDIT) score, genetic risk, tolerance, approximate financial cost of drinking in the past year, normative feedback comparing one's perception of peer drinking to actual school drinking normative data, accurate information about alcohol, and referral information for local agencies (see the Appendix for examples of the feedback). During the feedback portion of the program, students are asked to respond whether or not they would be willing to engage in potential strategies to reduce drinking.

Students are then given a list of strategies (e.g. avoid drinking games, space my drinks out over time, alternate alcoholic and non-alcoholic drinks) they have endorsed that can use as steps to change their drinking. Students are also given a unique identification number which they can use to go back into the eCHECKUP TO GO program to review their feedback or re-take the assessment and compare their results across time.

Research suggests that prevention programs using brief motivational enhancement approaches with individualized feedback are effective in reducing adolescent drinking (Barnett et al., 2012; Jensen et al., 2011; Tevyaw & Monti, 2004). Although no efficacy trials have been conducted with the eCHECKUP TO GO with high school students, several studies have demonstrated the efficacy of the eCHECKUP TO GO among college students, including first year students (Dumas & Anderson, 2009; Dumas, Kane, Navarro, & Roman, 2011; Dumas, Nelson, DeYoung, & Conrad, in press; Hustad, Barnett, Borsari, & Jackson, 2010; Walters, Vader, & Harris, 2007), student athletes (Dumas, Haustveit, & Coll, 2010), and students sanctioned for campus alcohol policy violations (Alfonso, Hall, & Dunn, 2012; Dumas, Workman, Navarro, & Smith, 2011; Dumas, Workman, Smith, & Navarro, 2011). Research also indicates that the eCHECKUP TO GO program is as effective as other computer interventions that are more expensive and time intensive (Hustad et al., 2010) (Figs. 1–4).

2.5. Control school alcohol and drug education

The control school received their usual alcohol and drug education. This education is delivered by a school counselor as a classroom presentation on the health risks of tobacco, alcohol, and other drugs, why people might choose to use substances, and peer refusal skills.

2.6. Statistical analyses

Baseline measures between intervention and control conditions were compared with *t* tests for continuous variables and chi-square tests for categorical variables. Outcome variables were examined with general linear model repeated measures analyses. Outcome variables were the within-subjects factor, study condition was the between-

subjects factor, and ethnic background was a covariate. Effect size was calculated by eta squared (η^2). All analyses were conducted at $p < .05$.

3. Results

3.1. Preliminary analyses

All outcome variables were examined for skew and kurtosis at baseline and follow-up assessments. The distribution for weekly drinking and alcohol-related consequences at baseline and follow-up assessments substantially deviated from the normal distribution (>3 skew and >9 kurtosis) so a logarithmic transformation was used to normalize the distributions (Tabachnick & Fidell, 2007). Raw descriptive statistics for the outcome variables at baseline and follow-up assessments are presented in Table 1.

We examined differences on demographic variables and outcome variables between the two study conditions at baseline. There was a significantly higher percentage of Caucasian students in the intervention condition and a significantly higher percentage of Hispanic students in the control condition, $\chi^2(6) = 21.76, p < .001$. The intervention condition also had a higher mean score on positive alcohol expectancies than the control condition, $t(510) = -4.74, p < .05$. There were no other differences on demographic variables or outcome variables at baseline. Overall, 79% ($N = 410$) of the 518 participants completed the 3-month follow-up assessment. There were no differences on any demographic or outcome variables between those who completed the 3-month follow-up assessment and those who did not.

3.2. Outcome analyses

3.2.1. Risk-factors for drinking

Results for risk factors for drinking outcomes are reported in Table 1. Relative to the control condition, students in the intervention condition reported lower levels of positive alcohol expectancies at follow-up ($p < .01$) and a greater reduction in positive alcohol expectancies over time ($p < .001$). Results also indicated that students in the control condition reported a significantly greater increase in positive alcohol beliefs over time, relative to students in the intervention condition ($p < .01$).

Physical Costs

How many **cheeseburgers** did you **drink** last month?



Each standard drink also contains approximately 100 to 140 calories. Given the number and types of drinks you reported drinking, in ONE month you drank about **6020 calories**, or the equivalent of **17 cheeseburgers**.



If you ran at a pace of 6 miles per hour (a 10-minute mile) you would have to run for **11 hours and 4 minutes** to burn off all of the calories you accumulated from drinking alcohol.

Fig. 1. Example of eCHECKUP TO GO feedback: physical costs.

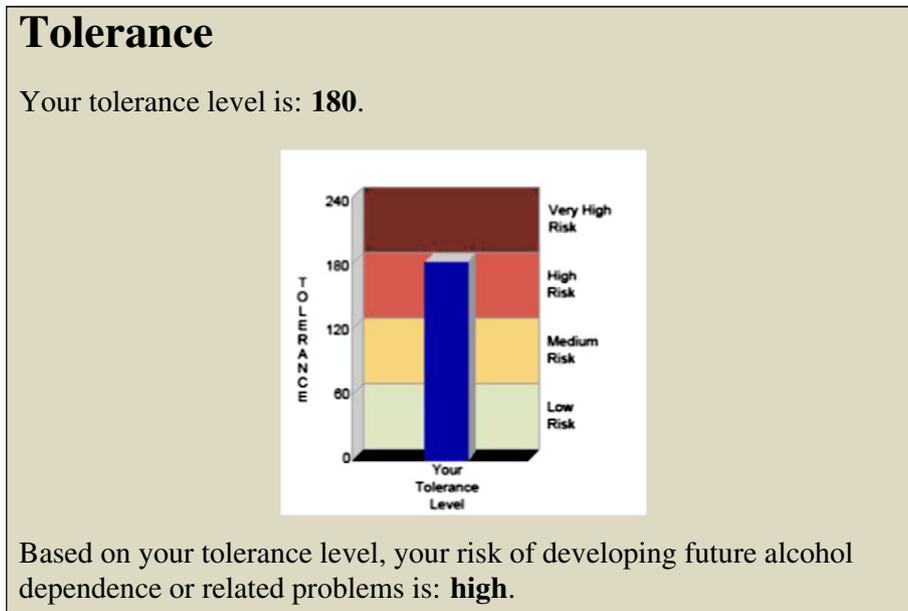


Fig. 2. Example of eCHECKUP TO GO feedback: tolerance.

There were no significant effects for normative beliefs regarding peer weekly drinking quantity or drinking frequency.

3.2.2. Alcohol use and alcohol-related consequences

Results for alcohol use and alcohol-related consequences are reported in Table 1. Results indicated that student in the control condition reported a significantly greater increase in frequency of drinking over time relative to those in the intervention condition ($p < .05$). Results also indicated that students in the intervention condition reported a significantly greater reduction in alcohol-related consequences relative to

students in the control condition ($p < .05$). There were no significant effects for weekly drinking quantity.

4. Discussion

This is the first controlled study to evaluate the effectiveness of a brief, web-based personalized feedback intervention implemented as a school-based alcohol intervention program for 9th grade students. Findings from the current study indicate that this type of intervention can positively impact risk-factors and alcohol use and alcohol-related consequences among 9th grade students. Results showed findings favorable to students receiving the eCHECKUP TO GO intervention relative to those in the control condition on positive alcohol expectancies, positive beliefs about alcohol, frequency of alcohol use, and alcohol-related consequences.

The intervention used in this study is designed to directly address risk-factors for alcohol use, including normative beliefs regarding peer drinking, positive alcohol expectancies, and positive beliefs about alcohol. Results of this study provide partial support for the program's effectiveness in impacting these risk-factors. Specifically, students in the intervention condition reported a reduction in positive alcohol

How Does Your Drinking Compare? Were Your Estimates Accurate?

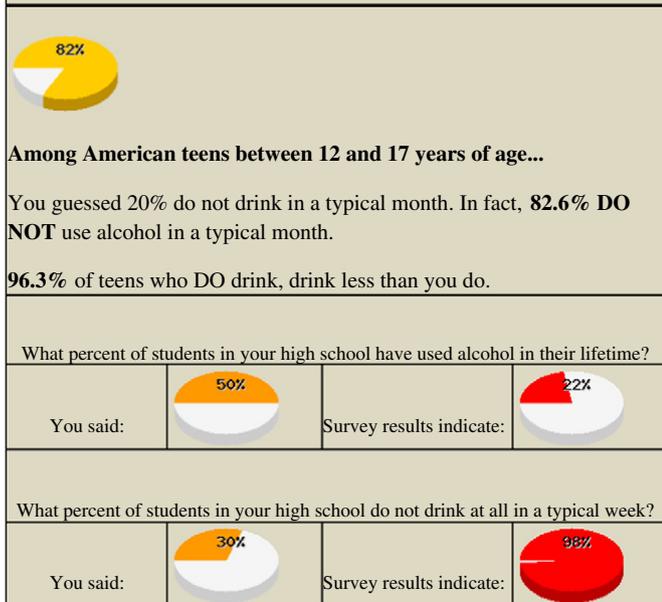


Fig. 3. Example of eCHECKUP TO GO feedback: normative data.

Alcohol & Physical Performance

Alcohol takes effect more quickly when mixed with carbonated/caffeinated beverages or mixers.

You said: **False** Answer: **True**

Drinking alcohol in combination with carbonated beverages can increase the speed at which your body absorbs alcohol. Carbonated drinks tend to irritate the lining of the stomach and *increase the rate* of alcohol absorption. Mixing caffeine and alcohol *does not reduce the effects* of alcohol intoxication.

Mixing caffeine with alcohol also increases the risk of *heart rhythm problems*. High levels of caffeine can increase your heart rate and blood pressure and cause heart palpitations. Also, like alcohol, caffeine is a diuretic, and mixing the two increases the *risk of dehydration*.

Fig. 4. Example of eCHECKUP TO GO feedback: alcohol and physical performance.

Table 1
Means and standard deviations for outcome variables at baseline and 3-month follow-up.

Outcomes	Baseline		Follow-up		Time (T)		Intervention (I)		Interaction (T × I)	
	Intervention mean (SD)	Control mean (SD)	Intervention mean (SD)	Control mean (SD)	F	η^2	F	η^2	F	η^2
	Positive alcohol expectancies	13.96 (4.89)	11.74 (5.08)	13.05 (5.38)	12.77 (5.42)	0.78	.00	6.47**	.02	14.41***
Positive alcohol beliefs	24.83 (8.82)	23.67 (8.42)	25.30 (9.03)	25.90 (8.76)	0.93	.00	0.10	.00	6.23*	.02
Perceptions of peer drinking frequency	3.51 (1.67)	3.24 (1.91)	3.40 (1.67)	3.34 (1.91)	0.71	.00	1.30	.00	0.16	.00
Perceptions of peer drinking quantity	5.25 (5.93)	5.71 (7.75)	4.02 (4.66)	4.78 (6.27)	0.03	.00	0.98	.00	1.17	.00
Frequency of drinking	1.00 (1.46)	0.78 (1.30)	0.99 (1.40)	1.03 (1.53)	0.34	.00	0.38	.00	3.96*	.01
Weekly drinking quantity	0.60 (2.00)	0.54 (1.95)	0.90 (3.47)	0.85 (3.06)	0.17	.00	0.09	.00	0.25	.00
Alcohol-related consequences	2.25 (5.46)	2.82 (7.01)	1.73 (5.90)	2.52 (6.29)	2.35	.01	1.44	.00	5.44*	.02

Note. $df = 1393$.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

expectancies, whereas students in the control condition reported an increase in positive alcohol expectancies. Relative to students in the intervention condition, students in the control condition reported a significantly greater increase in positive beliefs about alcohol. These findings support the effectiveness of the programmatic components designed to change positive expectancies and beliefs among this age group.

In contrast, there were no significant effects for normative beliefs regarding peer drinking quantity or frequency. This is surprising as the intervention is designed to change perceptions of peer drinking by providing normative feedback about perceptions of peer drinking specific to the student's school, as well as providing personalized normative feedback regarding the student's drinking relative to peer drinking norms. Additionally, research with college students indicates that students receiving the e-CHECKUP TO GO intervention report reduction in perceptions of peer drinking relative to students in control conditions, and that changes in these normative beliefs mediate intervention effects (Doumas, McKinley, & Book, 2009; Doumas, Workman, Smith, & Navarro, 2011; Doumas et al., 2010). One explanation for this discrepancy is that drinking rates for 9th grade students are lower than that of college students. Thus, providing accurate data regarding peer drinking may not result in a downward adjustment of normative beliefs. Alternatively, students in this age group may not have found the accurate normative data to be believable, and, therefore, may have discounted this information. The lack of group differences in normative beliefs about peer drinking may indicate that the type of normative data provided or the way the normative data is presented may need to be modified to be more appropriate for this age group. Future research is needed to address how eCHECKUP TO GO may be modified for this age group.

Study findings also support the effectiveness of the eCHECKUP TO GO intervention in reducing alcohol use and alcohol-related consequences among 9th grade students. Students in the intervention condition maintained levels of drinking frequency, whereas students in the control condition increased drinking frequency from baseline to follow-up assessments. Additionally, students in the intervention condition reported a significantly greater reduction in alcohol-related consequences relative to students in the control group. These findings are consistent with the growing body of research indicating that web-based interventions are effective in reducing drinking and alcohol-related consequences in adolescents (Koning et al., 2009; Newton et al., 2009; Schinke, Cole, & Fang, 2009; Schinke, Fang, & Cole, 2009; Schwinn et al., 2010).

In contrast, there were no significant effects for weekly drinking quantity. This finding was also surprising as frequency of drinking and alcohol-related consequences was positively impacted in the intervention condition. It is possible that the absence of change in weekly drinking quantity was due to low rates of weekly drinking quantity (<1 drink per week) among this age group. Alternatively, in general, the intervention effect sizes for significant drinking outcomes were small. Other intervention strategies may be necessary to augment brief, web-based intervention programs for this age group. As the family is more

salient during this developmental period relative to older adolescence (Cleveland, Feinberg, Bontempo, & Greenberg, 2008), intervention efficacy for this age group may be enhanced by the addition of parent-based interventions.

Although this study adds to the literature by providing support for the effectiveness of a brief, web-based alcohol intervention for reducing risk-factors for alcohol use, alcohol use, and alcohol-related consequences, there are limitations. These include reliance on self-report, a relatively short follow-up period, and limited generalizability due to a primarily Caucasian sample from the Northwest region. Future research with objective measures of drinking and alcohol-related consequences (e.g. cheek swab, school alcohol policy violation reports), longer follow-up periods, and more diverse samples is warranted. Additionally, differential ethnicity rates between the intervention and control conditions potentially confounded findings. Although this concern was reduced by including ethnicity as a covariate in all analyses, the difference between the control and intervention groups, however, may be indicative of other differences between the school samples, such as socio-economic status and the results should be interpreted in light of this consideration. Finally, because students completed an assessment prior to the intervention, the issue of repeated assessment and possible reactivity should be considered. Although it is possible that the efficacy of the intervention is in some way related to reactivity to the initial assessment, we are less concerned about reactivity as it was controlled for across the study conditions.

Results of this study have important implications for developing prevention and intervention programs for students as they transition into high school. First, this study provides support for the use of a brief, web-based personalized feedback intervention among 9th grade students. As the transition to high school is marked by an increase in alcohol use, providing evidence-based programming through the schools for this age group is imperative. Web-based programs are well-suited for school-based implementation as they are inexpensive, require minimal training, can be implemented with high a high degree of fidelity, and are easy to disseminate to large groups of students within course curricula relative to in-person, multi-session programs. Second, results indicate that providing normative feedback to this age group may not be an effective strategy for changing perceptions of peer drinking. Because normative beliefs are predictive of alcohol use in adolescents, new ways to impact this risk-factor via web-based programs may be needed for this age group. Finally, although this study provides some support for the use of a brief, web-based personalized feedback intervention, effect sizes were small. Because familial influences may exert an equal or stronger effect than peer influences during this developmental period, incorporating individual web-based programs into a comprehensive strategy which includes parent-based interventions may be important to increase intervention effects. Research examining the combination of web-based individual and parent intervention programs for female adolescents provide promising support for this type of approach (Schinke, Cole, & Fang,

2009; Schinke, Fang, & Cole, 2009). Further research is needed to test the effects of a brief web-based student and parent combined intervention for both male and female students.

5. Conclusion

A brief, web-based intervention program may be an effective way to reduce alcohol use and alcohol-related consequences among 9th grade students. This type of approach may be preferable to other programs as it is brief, cost-effective, requires little training, can achieve high levels of standardization and fidelity, and is easily disseminated to large groups of students.

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Contributors

Doumas, Esp and Turrissi designed the study and wrote the protocol. Hausheer and Cuffee conducted literature searches and provided summaries of previous research studies. Doumas conducted the statistical analysis. Doumas wrote the first draft of the manuscript and all authors contributed to and have approved the final manuscript.

Conflict of interest

All authors declare that they have no conflicts of interest.

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