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Underage Drinking, Brief Interventions, and Trauma Patients: Are they Really Special?

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Abstract

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Authorship: R.M.C., M.A.W., B.M.B. F.B., P.F.E., S.T.C., and K.B. designed the study. R.M.C and M.A.W. were responsible for the acquisition of the data, and the technical and material support of the study including study supervision. S.T.C. was responsible for clinical study supervision. P.F.E. was responsible for statistical analysis and data interpretation. All authors were responsible for manuscript draft and critical revisions.

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Background—While the relationship between underage drinking and injury has been well established, few studies have examined whether presenting for an acute injury moderates the efficacy of a brief intervention (BI) on alcohol misuse.

Method—Patients (aged 14-20) in the emergency department screening positive for risky drinking (AUDIT-C score) completed a baseline assessment, were randomized to conditions [a stand-alone computer-delivered BI (n=277), a therapist-delivered BI (n=278), or a control condition (n=281)], and completed a 3-month follow-up. This secondary analysis of Project U connect examined regression models (controlling for baseline values) to examine the main effects of injury, and the interaction effects of injury by BI condition, on alcohol consumption and consequences.

Results—Among 836 youth enrolled in the randomized controlled trial (mean age = 18.6, 51.6% male, 79.4% Caucasian), 303 (36.2%) had a primary complaint of intentional or unintentional injury. At baseline, injured patients were more likely to be male ($p < 0.001$) and have higher alcohol consumption ($p < 0.01$), but were less likely to misuse prescription drugs ($p = 0.02$) than those presenting for medical reasons. Regression models (controlling for baseline values) demonstrated that injury presentation predicted greater alcohol consumption prior to a BI. The computer BI was more effective at reducing alcohol consequences among those presenting with injury than those presenting for other reasons. Injury did not affect the efficacy of the computer BI on alcohol consumption, and injury did not affect the efficacy of the therapist BI on alcohol outcomes.

Conclusion—A therapist or computer BI reduced alcohol consumption and consequences among risky drinkers regardless of reason for ED presentation highlighting the opportunity to reach a broad array of youth. Although the therapist BI was not moderated by injury presentation, the computer BI was particularly effective at reducing alcohol consequences among those presenting with injury at three month follow-up.

Level of Evidence—Level 1

Type of Study—Criteria

Keywords

injury; alcohol; criteria; intervention; pediatric trauma

Introduction

Alcohol misuse among underage adolescents is an important public health issue. By age 18, 73% of all U.S. adolescents have consumed alcohol, 56% have been intoxicated, and 6.2% have been diagnosed with an alcohol use disorder (AUD).^{1, 2} Alcohol misuse among underage adolescents has been associated in prior studies with increased risk taking behavior, injuries, and long-term, adverse health consequences.^{3, 4, 5} Further, compared to those who are of legal drinking age, adolescents age 15 or younger are three times more likely to get injured when they drink, and adolescents age 16-17 are twice as likely to get injured when they drink.^{5, 6}

Emergency departments (EDs) and trauma centers are key clinical settings for detection and intervention for risky drinking, to reduce the likelihood of future injuries. These settings are ideal for screening and intervening with youth that may not be reached in school prevention programs due to their sporadic attendance⁷ or may not be reached in primary care prevention programs, as many emerging adults have not yet connected with adult primary care.⁸ Additionally, the emergency department and a trauma admission may provide a “teachable moment,” where youth are more receptive to making behavioral changes.⁹ Alcohol screening, brief intervention, and referral to treatment (SBIRT) approaches have had success with both adolescents and adults in these settings¹⁰ For example, studies with injured adults admitted to a trauma center have demonstrated that a selected intervention reduced both alcohol consumption and injury recidivism up to 45%.¹¹ Other adult SBIRT studies have shown a reduction in consequences, but not consumption.¹² In pediatric patients, alcohol brief interventions have been shown to be efficacious and feasible across many settings, including in EDs and trauma centers.^{13, 14} In response to this research, the American College of Surgeons Committee on Trauma in 2014 mandated that all Level I Trauma Centers develop and implement an SBIRT program.¹⁵

It remains unclear which subset of patients receive the most benefit from BIs delivered in such settings. Specifically, few studies have examined whether those presenting for intentional or unintentional injury, as compared to those presenting for other medical reasons, have better outcomes from a BI. From a theoretical standpoint, presentation for an injury could increase the salience of a BI, magnifying the impact of a “teachable moment,” however the hospital visit itself may be a teachable moment regardless of reason for presentation. Most prior studies have restricted their samples to those patients presenting for an injury, precluding an examination of efficacy based on chief complaint,^{12, 16-19} therefore it is not known whether presenting for an injury moderates the efficacy of BIs across delivery mechanisms.

We recently completed a randomized controlled trial (RCT) entitled, “U-Connect,” comparing the efficacy of two BIs delivered by a computer or a therapist as compared to a control group among youth in the ED who screened positive for risky drinking.^{20, 21} Compared with the control condition, we found that both a therapist BI and computer BI significantly reduced alcohol consumption at 3 months and alcohol-related consequences at 3 months and 12 months.^{17,18}

This paper presents findings from a secondary data analysis from this study, examining injury as a moderator of outcomes at 3 months given the focus on injured youth in past SBIRT trials. Our hypothesis is that injury is an independent moderator if a BI success. Specifically, we hypothesized that the computer and therapist BIs would be more effective than the control among injured patients as compared to those presenting for other reasons.

Methods

Design

This paper presents findings from a secondary data analyses of the U-Connect study,^{20, 21} a randomized controlled trial (RCT) designed to examine the efficacy of emergency

department (ED)-based BIs, delivered by a computer or therapist. This paper presents outcome data from the 3-month follow-up interview. This study was approved by the University of Michigan Institutional Review Board (HUM00026141) and a Certificate of Confidentiality was obtained from the National Institutes of Health.

Procedures

The study took place between September 2010 and March 2013. A detailed description of the procedures, intervention, and measures has been published previously.^{20, 21} Briefly, youth ages 14–20, presenting to the ED for any reason were eligible for the study. Eligible patients were identified for screening by review of electronic medical records. Patients were ineligible if they could not provide informed consent, were non-English speaking, or medically unstable. Patients who were not stable to be approached in the ED were enrolled on inpatient floors within 72 hours (2.1%). Recruitment took place from 2 p.m. to 2 a.m., 7 days a week.

Participants screening positive on the Alcohol Use Disorders Identification Test–Consumption (AUDIT-C; age 14–17 years, score 3; age 18–20 years, score 4) were eligible for the RCT.^{22, 23} Once enrolled, participants self-administered a 20- to 30-minute computerized baseline survey and were randomized to one of the three study groups. Participants were stratified according to gender, age group (14–17 or 18–20 years), and meeting criteria for an alcohol use disorder (see Measures).

The computer BI and therapist BI was based on the principles of motivational interviewing to address alcohol use and its consequence.^{24–28} The computer BI was a tailored offline, Facebook-styled program, delivered using touchscreen tablets with audio (via headphones).

Follow-up assessments at 3 months were administered by participants either on a computer. Remuneration was \$35 for 3-month follow-ups.

Measures

Demographics—Demographic characteristics included: age, gender, race/ethnicity, receipt of public assistance, living situation, and school status.^{29–31}

Risk Factors—Risk factors were assessed with the 2-item Patient Health Questionnaire which assessed past 2 week depression^{32–34}, and the Young Adult Driving Questions³⁵ and Youth Risk Behavior Surveillance Survey³⁶ which assessed past 12 month driving under the influence and riding with an impaired driver.

Substance Use—Past 12-month substance use was assessed using the National Institute on Drug Abuse Alcohol, Smoking, and Substance Involvement Screening Test (ASSIST).^{37, 38} Illicit drugs included cocaine, inhalants, hallucinogens, methamphetamine, and street opioids, and the nonmedical use of prescription drugs included opioids, sedatives, and stimulants.

Visit Characteristics—Medical chart review was used to obtain data regarding chief complaint, which was coded as injury (intentional or unintentional) or other medical or

psychological reason (e.g., fever, rash) and discharge status (e.g., admitted, transferred, discharged). Additionally, participants were asked whether they used drugs or alcohol within 6 hours of their ED visit.^{39, 40}

Primary outcomes—An Alcohol Consumption Index⁴¹ was computed by multiplying the first two items of the AUDIT-C regarding past 3 month frequency (“how often have did you have a drink containing alcohol?”: never=0, monthly or less=1, 2-4 times a month = 2, 2-3 times a week = 3, 4 or more times a week=4) and quantity (How many drinks containing alcohol did you have on a typical day when you were drinking?”: 1 or 2 drinks=1, 3 or 4 = 2, 5 or 6=3, 7 to 9=4, 10 or more = 4).⁴⁸ Scores ranged from 0 to 20, with higher scores indicating greater alcohol consumption. Alcohol Consequences was assessed using the 18-item Rutgers Alcohol Problem Index[RAPI]);⁴²⁻⁴⁴ responses were scored dichotomously and summed (range 0-18).

Data Analysis

Data were analyzed using SAS Version 9.4. To begin, descriptive characteristics of the sample based on chief complaint are presented (injury vs other). Next, regression analyses (i.e., based on distribution: negative binomial or Poisson) were conducted to examine whether injury or medical visit was predictive of alcohol use outcomes at 3-months (i.e., alcohol consumption index, alcohol consequences). Specifically, to examine whether injury or medical visit predicted alcohol-related outcomes, models included main effects of intervention conditions (as compared to the control) and injury (yes/no). Then, to determine whether injury moderated the efficacy of the BIs, regression models were conducted including interaction effects for injury by ED condition (therapist BI vs control; computer BI vs control). Note that regression models included baseline levels of the alcohol variable examined, as well as sex and age group (14-17; 18-20), since these were randomization strata. Baseline levels refers to the values reported at the assessment in the ED prior to receipt of the intervention/control condition.

Results

Demographics

Among 4,389 patients screened, 24.0% (n=1,054) reported risky drinking and 836 (79.3% participation) were enrolled in the RCT (mean age=18.6, 51.6% male, 79.4% Caucasian), of which 303 (36.2%) had a primary complaint of injury (intentional or unintentional). Of those randomized, 94.4% completed the initial intervention, and 3 month follow-up rates were 83.6%. Figure 1 shows eligibility, screening, and randomization scheme for the study, and the number of participants presenting for injury at the index visit in each intervention condition and how many completed their 3-month follow-up. Approximately one third of patients presented with injury and participants were equally distributed between groups.

Baseline and Randomization

Table 1 shows the baseline characteristics of the injured and non-injured patients. As compared to those presenting for other reasons, injured participants were more likely to be male, report greater past 12-month tobacco use, report alcohol use prior to the ED visit, and

have higher AUDIT-C scores. Participants presenting for an injury were also less likely to report past 2 month depressive symptoms, and were less likely to be admitted to the hospital. No differences were observed by age and race, or for marijuana or other drug use, and history of drinking and driving/riding with an intoxicated driver based on ED presentation.

Injury as a predictor of alcohol-related outcomes

Regression analyses, which including ED presentation reason, showed that injury significantly predicted alcohol consumption at 3 month follow-up, but did not predict alcohol consequences. Additionally, injured patients had more alcohol consumption at 3 months than patients presenting for other reasons (Table 2).

Injury as a moderator of alcohol-related outcomes following a computer or therapist BI

Regression models including interaction effects between the intervention conditions (computer BI and therapist BI vs. control), and chief complaint (injury, other) were not significant for alcohol consumption, indicating the interventions were equally effective on reducing consumption for those presenting with injury and medical conditions (Table 3). When examining alcohol consequences, the therapist BI \times injury interaction term was not significant; however, the computer BI \times injury interaction term was significant. Thus, ED presentation did not affect the efficacy of the therapist BI on alcohol consequences, but ED presentation did affect the efficacy of the computer BI. As can be seen in Figure 2, participants in the computer BI condition who presented with an injury had the greatest percent change in mean alcohol consequences at 3-months relative to participants in the computer BI who presented for other reasons and to the participants in the control condition.

Discussion

Injury remains the leading cause of morbidity and mortality in adolescents and young adults.⁴⁵ Alcohol misuse is a significant correlate of risk taking and injury within this age group.⁴⁶ Due to the impact that alcohol misuse has on injury, and the effectiveness of SBIRT for alcohol misuse, the American College of Surgeons (ACS) has mandated that all verified Level I trauma centers must have an active SBIRT program to address alcohol risks and prevention.¹⁵ Despite being accepted as an important part of the care of injured patients, several questions remain about how to optimally use these programs within clinical settings.³⁹ This includes questions regarding what factors enhance the success of the intervention. This study addressed the role that reason for visit presentation may have on the BI given that the majority of the literature focuses only on injured patients.

This paper provides additional data regarding a recently published study showing that a therapist and computer BI reduced alcohol consumption and alcohol-related consequences among youth who are risky drinkers.^{20, 21} In this study, we examined ED presentation, either for injury or for a non-injury-related medical reason, in relation to baseline characteristics of risky drinkers, as a predictor of alcohol outcomes, and as a moderator of the efficacy of computer and therapist BIs.

In regard to decreasing alcohol consumption this study notes that there was no difference in the positive BI effect for youth seeking care for medical reasons or injury reasons. At

baseline, those who presented with injury were more likely to be male, report alcohol use prior to the ED visit, have higher AUDIT-C scores, and were less likely to be admitted to the hospital. In this study, injured patients also had more alcohol consumption at 3 months than medical patients across all study conditions. Given that youth presenting with injuries have greater consumption to begin with, it may be that they have greater consumption at the 3 month follow-up and this may contribute to the lack of differential effects of the BI based on presentation. Conversely it may be that the relevance of alcohol prevention and potential for future harm is great enough in both the medical and injured groups that ED presentation is not the defining factor for potentiating BI effects.

Our prior work shows that both the computer BI and therapist BI reduced alcohol consequences and consumption as compared to controls.²⁰ An observation from this study, however, is that the computer BI was particularly effective in reducing alcohol consequences among those presenting with injury, whereas injured patients in the control group had more consequences than those presenting for other medical reasons; note that the CBI was still found to be effective among the non-injured group. Parallel findings were not found for the therapist BI indicating that the therapist BI was as effective for patients with a medical presentation as those with an injury presentation. It may be that these findings reflect subtle differences in delivery of the BIs. For example, the computer BI included content directly connecting risky drinking to injury-related consequences specifically. The injured group also was more likely to be in school and to not have failing grades and may have been more receptive to the computerized format. In contrast, the therapist innately has greater ability to tailor benefits of change to a variety of health issues in real time; thus, being equally efficacious among youth presenting with injury as those with other medical complaints. Prior papers from this study showed that greater identification of benefits of change was associated with better post-test outcomes²¹ and for the non-injured youth, the benefits of change relating to reasons other than injury may have been able to be explored better by the therapist than the computer, and thus as salient for changing behavior as injury.

The results from this study continue to support providing SBIRT to youth who seek care both for injury and medical presentations. Indeed given the broad population that can be reached seeking care for medical causes and the findings that injury presentation was not a factor in reduction of alcohol consumption in either the therapist or computer BI, or for alcohol consequences for the therapist BI; health systems should continue to explore ways to reduce barriers in SBIRT delivery across settings for maximal public health reach. This study also supports the ACS mandate for SBIRT for pediatric trauma centers and injured patients in general, particularly for computerized SBIRT approaches.¹⁵ The findings from this study suggest that a well-crafted computer intervention can be particularly effective among injured patients if a therapist is not available. This finding may also help in operationalizing the ACS requirement for an SBIRT program, since most pediatric trauma occurs on weekends where the availability of a therapist may be limited.

The results of this study must be considered in the context of several limitations. Findings from this study were limited to the 3-month follow-up. The primary study was not powered to look at the difference between those who presented with injury compared to other ED presentations; thus, we did not have meaningful numbers of injured patients to look at the

efficacy of the 3-month booster (described in previous work) on outcomes at 12 months. Also, we could not examine injury severity (e.g., admission status) or intentional versus unintentional injury. Replication with larger and more diverse samples of youth is needed.

Conclusion

Youth seeking care for a medical visit and an injury visit were equally likely to reduce their alcohol consumption 3 months after a therapist and computer delivered BI, indicating the need for a broad based public health SBIRT approach. In regard to reduction of alcohol consequences, the therapist delivered BI found similar effects also among an injured and non-injured population. The computer BI was effective among those seeking care for medical complaints, however it was particularly effective at reducing alcohol consequences among those presenting with injury. This finding may help in operationalizing the American College of Surgeons' requirement for an SBIRT program, given ease of future implementation. In summary, these findings underscore the importance of BIs for youth seeking care with both medical and injury complaints and highlight the potential for a computer BI being particularly promising for operationalizing the ACS SBIRT platform.

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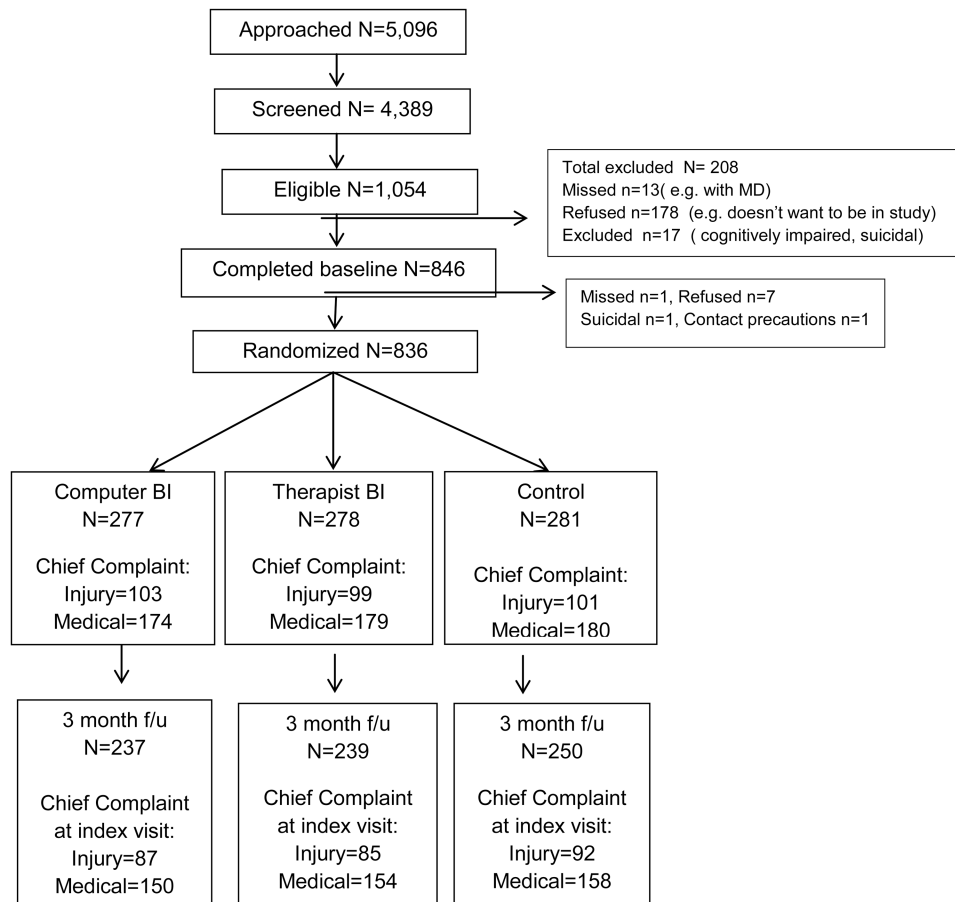


Figure 1.
Study Design Flowchart.

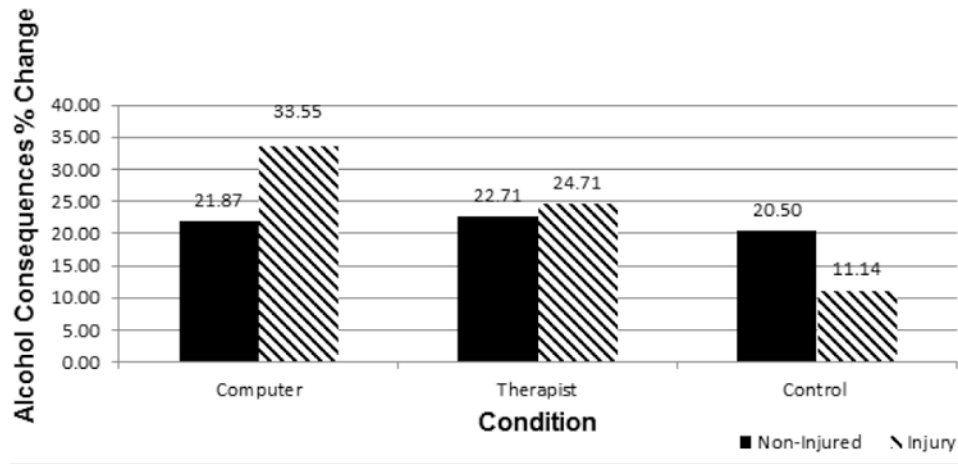


Figure 2. Percent Change in Mean Alcohol Consequences (from Baseline to 3-Month Follow-up) by Condition and ED Presentation (Injury, Non-Injured)

Table 1

Descriptive characteristics of those presenting for injury, other reasons, and total.

Reason for Visit	Injured (N=303, 36.2%)	Non-Injured (N=533, 63.8%)	Total (N=836)	p-value
Demographics				
Age	18.6 (1.4)	18.6 (1.4)	18.6 (1.4)	0.7515
Female	91 (30.0%)	314 (58.9%)	405 (48.4%)	<0.0001
Caucasian	248 (81.9%)	416 (78.1%)	664 (79.4%)	0.1914
Public Assistance (Parent/Self)	50 (16.5%)	118 (22.1%)	168 (20.1%)	0.0506
Currently in School	266 (87.8%)	436 (81.8%)	702 (84.0%)	0.0233
Grades (D or below)	15 (5.0%)	50 (9.4%)	65 (7.8%)	0.0215
Risk Factors				
Depressive Symptoms (past 2-wks)	29 (9.6%)	109 (20.5%)	138 (16.5%)	<0.0001
Drinking & Driving (past 12-months)	59 (19.5%)	113 (21.2%)	172 (20.6%)	0.5522
Driving with Intoxicated Driver (past 12 months)	105 (34.7%)	219 (41.1%)	324 (38.8%)	0.0664
Past 12 Month Substance Use				
AUDIT-C Score	6.4 (2.1)	5.8 (2.1)	6.0 (2.1)	<0.0001
Marijuana Use	212 (70.0%)	390 (73.2%)	602 (72.0%)	0.3213
Tobacco Use	200 (66.0%)	312 (58.5%)	512 (61.2%)	0.0331
Any Prescription Drug Misuse	62 (20.5%)	141 (26.5%)	203 (24.3%)	0.0521
Illicit Drug Use	194 (64.0%)	370 (69.4%)	564 (67.5%)	0.1097
ED Visit Characteristics				
Drank alcohol within 6hrs of ED visit	37 (12.2%)	12 (2.3%)	49 (5.9%)	<.0001
Used drugs within 6hrs of ED visit	15 (5.0%)	26 (4.9%)	41 (4.9%)	0.9675
Admitted	17 (5.6%)	73 (13.7%)	90 (10.8%)	0.00003

Table 2

Injury as a predictor of alcohol-related outcomes at 3 months.

Variable	3-month	
	IRR 95% CI	P-Value
Alcohol Consumption		
Older Age Group	1.30 (1.12-1.49)	0.0004
Male Gender	1.04 (0.94, 1.15)	0.4692
Baseline Consumption	0.09 (1.07, 1.11)	<0.0001
Computer BI	0.88 (0.79, 1.00)	0.0454
Therapist BI	0.87 (0.77, 0.98)	0.0200
Injury	1.15 (1.03, 1.28)	0.0094
Alcohol Consequences		
Older Age Group	0.97 (0.86, 1.1)	0.6749
Male Gender	0.85 (0.78, 0.94)	0.0008
Baseline Consequences	1.13 (1.12, 1.14)	<0.0001
Computer BI	0.85 (0.76, 0.95)	0.0037
Therapist BI	0.87 (0.78, 0.97)	0.0131
Injury	1.02 (0.92, 1.12)	0.6952

Note: Reference group is female gender, younger age group (14-17), and presentation for a medical condition. Alcohol consumption was measured with a quantity-frequency index, with higher scores indicating greater alcohol consumption. Alcohol consequences were measured with the Rutgers Alcohol Problem Index (RAPI).

Table 3

Injury as a moderator of alcohol-related outcomes at 3 months following a computer or therapist BI.

Variable	3-month	
	IRR 95% CI	P-Value
Alcohol Consumption		
Older Age Group	1.30 (1.13, 1.51)	0.0004
Male Gender	1.04 (0.94, 1.16)	0.4654
Baseline Consumption	1.09 (1.07, 1.11)	<0.0001
Computer BI	0.92 (0.79, 1.07)	0.2652
Therapist BI	0.86 (0.74, 1.01)	0.0644
Injury	1.18 (1.00, 1.4)	0.0572
Computer BI * Injury	0.91 (0.72, 1.17)	0.4716
Therapist BI * Injury	1.01 (0.79, 1.29)	0.9370
Alcohol Consequences		
Older Age Group	1.03 (0.92, 1.16)	0.5986
Male Gender	0.85 (0.78, 0.93)	0.0007
Baseline Consequences	1.13 (1.12, 1.14)	<0.0001
Computer BI	0.95 (0.83, 1.09)	0.4531
Therapist BI	0.92 (0.8, 1.05)	0.2073
Injury	1.17 (1.01, 1.37)	0.0418
Computer BI * Injury	0.72 (0.57, 0.91)	0.0062
Therapist BI * Injury	0.87 (0.7, 1.09)	0.2253

Note: Reference group is female gender, younger age group (14-17), and presentation for a medical condition. Alcohol consumption was measured with a quantity-frequency index, with higher scores indicating greater alcohol consumption. Alcohol consequences were measured with the Rutgers Alcohol Problem Index (RAPI).