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Predictors of positive drinking outcomes among youth receiving an alcohol brief intervention in the emergency department

Alan K. Davis^{a,b}, Brooke J. Arterberry^b, Erin E. Bonar^{b,d}, Stephen T. Chermack^b, Frederic C. Blow^{b,c}, Rebecca M. Cunningham^{d,e}, and Maureen A. Walton^{b,c}

^aBehavioral Pharmacology Research Unit, Department of Psychiatry, Johns Hopkins School of Medicine, 5510 Nathan Shock Drive, Baltimore, MD 21224 USA

^bUniversity of Michigan Addiction Center, Department of Psychiatry, University of Michigan School of Medicine, 4250 Plymouth Road, Ann Arbor, MI 48109, USA

^cHSR&D Center for Clinical Management Research (CCMR), VA Ann Arbor Healthcare System, 2800 Plymouth Road, Building 16, Floor 2, Ann Arbor, MI 48109, USA

^dUniversity of Michigan Injury Center, University of Michigan School of Medicine, 2800 Plymouth Road, NCRC10-G080, Ann Arbor, MI, 48109, USA

^eDepartment of Emergency Medicine, University of Michigan, North Campus Research Complex, 2800 Plymouth Rd Bldg 10-G080, Ann Arbor, MI 48109-2800

Abstract

Background: Reducing underage drinking is a public health priority given increased risk for injury and other consequences. Emergency department (ED) visits offer a potential “teachable moment” to initiate interventions among youth engaged in risky drinking. Given mixed findings for alcohol brief interventions (BIs), this paper examined baseline markers of BI response in order to inform future interventions.

Method: We conducted secondary analyses of data from a randomized controlled trial of an alcohol BI delivered to youth in an ED. Among 475 participants ($M_{age}=18.6$, $SD=1.4$; 48.7% Female, 78.6% White/Caucasian) receiving a computer or therapist BI, we examined baseline characteristics (i.e., demographic, substance use, mood, risk/protective factors, and readiness to change) that predicted positive intervention response (i.e., BI responder) at 3-month follow-up using AUDIT-C scores (cut offs: < 3 for ages 14–17; < 4 for ages 18–20).

Results: Mediated logistic regression analysis (controlling for demographics) showed that greater readiness to change at baseline was positively related to BI response and baseline alcohol consumption was negatively related to BI response. Having a mentor was indirectly related to BI response via baseline alcohol consumption. Baseline readiness to change and alcohol consumption mediated the association between positive peer influences and BI response, whereas readiness to change mediated the relation between depression and BI response.

Conclusion: Findings suggest that BI response is influenced by protective social factors, such as positive peers and mentors, and depression, via alcohol severity indicators (i.e., readiness to change, consumption), thus providing clues to enhancing the content and dose of early interventions.

Keywords

risky drinking; prevention; adolescents; emerging adults

1. Introduction

Underage drinking in the United States (US) is an important public health problem (Johnston et al., 2014), and binge and high-intensity drinking (HID; 10+ drinks) are of particular concern (Patrick et al., 2016; Patrick et al., 2013). For example, not only does underage drinking increase risk for developing an alcohol use disorder (Grant et al., 2001; Merline et al., 2008), which occurs in 3% of youth (aged 12–17) and up to 23% of emerging adults (aged 18–29) (Center for Behavioral Health Statistics and Quality, 2015; Grant et al., 2017), but risk for alcohol use consequences (e.g., psychosocial problems, alcohol-related injury, mortality) associated with alcohol use and binge drinking/HID is considerable (Dawson et al., 2008; Lim et al., 2012; Patrick et al., 2016). Taken together, these data underscore the importance of early screening, identification and Brief Intervention (BI) to divert risky alcohol use trajectories.

Screening, Brief Intervention, and Referral to Treatment (SBIRT) has been recommended by leading health-related organizations in the US (National Institute on Alcohol Abuse and Alcoholism, 2015; Academic ED SBIRT Research Collaborative, 2007; U.S. Preventive Services Task Force, 2013), while noting that evidence varies by setting, sample, and age. These approaches typically include universal alcohol screening, delivery of a BI to risky drinkers, and referral to treatment for those with a probable alcohol use disorder. A visit to the Emergency Department (ED) offers an important “teachable moment” for youth and is an ideal setting for implementing SBIRT. Supporting this notion, recent meta-analyses found significant, albeit modest, reductions in alcohol use following BIs in the ED (Schmidt et al., 2016; Elzerbi et al., 2015). Specific to youth, several studies conducted in the ED demonstrated the overall efficacy of BIs for reducing alcohol consequences (Cunningham et al., 2015; Walton et al., 2015; Maio et al., 2005; Monti et al., 1999; Monti et al., 2007; Spirito et al., 2004; Bernstein et al., 2010). However, across settings the efficacy of BIs in reducing alcohol consumption is mixed, with generally modest, short-term effects (Foxcroft et al., 2014; Carey et al., 2012; Cunningham et al., 2015; US Preventive Services Task Force, 2013). For example, reviews of BIs delivered in primary care settings suggest that although data is positive for emerging adults and older individuals, findings are inconclusive among adolescents (US Preventive Services Task Force, 2013). Moreover, in a prior publication for the dataset examined in the present study, Cunningham et al. (2015) demonstrated that an alcohol BI delivered to youth in the ED was efficacious at reducing alcohol consumption and consequences in the short-term (3-months), but only consequences were reduced in the long-term (12-months).

Understanding which youth are more or less likely to respond to an alcohol BI could inform precision medicine approaches (Collins & Varmus, 2015) for risky drinkers. Theoretically, a social-ecological framework is potentially useful in identifying BI response markers because risk and protective factors at the individual, relational, and community level can be associated with the escalation and de-escalation of substance use (Connell et al., 2010; Nargiso et al., 2015). Consistent with this theory, individual factors such as greater readiness to change, cognitive and personality factors (e.g., interpersonal sensitivity, self-regulation, social comparison, future orientation), and female gender predicted better outcomes following an alcohol BI delivered to adults and college students in non-ED settings (Blankers et al., 2013; Carey et al., 2007; Riper et al., 2008). Few studies have examined within group variation in outcome among adolescents or adults following BIs delivered in an ED. For example, among adults, greater readiness to change predicted less substance use at 3-month follow-up (Myers et al., 2016), and among adolescents (aged 13–18), greater baseline alcohol use and female gender predicted a worse alcohol use trajectory during the 12 months following a BI (Becker et al., 2012). However, none of these studies examined relational or community influences such as peer influences, or community involvement, thus representing an important gap in understanding markers of BI response.

Among youth receiving a BI in the ED, studies identifying within group characteristics associated with BI response are lacking, which limits our ability to effectively allocate intervention resources and develop more intensive or adaptive interventions for those who are most likely to continue drinking at risky levels. Therefore, the current study conducted secondary data analyses of youth receiving a BI (Cunningham et al., 2015) to identify baseline patient characteristics that predicted positive BI response at 3-month follow-up. Based on theory and prior literature, baseline variables examined included, demographics, substance use, mood, protective/risk factors, readiness to change, and alcohol use. Based on prior findings (Becker et al., 2012; Myers et al., 2016), we hypothesized that less problem severity (i.e., less alcohol use and greater readiness to change) at baseline would be associated with positive BI response at 3-months. Second, as an exploratory aim, and consistent with a social-ecological perspective (Connell et al., 2010; Nargiso et al., 2015; Yap et al., 2017), we tested hypotheses that BI responders would report more baseline community involvement (i.e., community engagement, has a mentor), positive peer influences, and parental support, and would report less baseline negative peer influences, parental approval of substance use, and parental substance use compared to non-responders. Moreover, given that depression and anxiety symptoms are individual-level factors associated with substance use among adolescents (Schwinn et al., 2010), we hypothesized BI responders would report fewer anxiety and depression symptoms at baseline compared to non-responders.

2. Method

2.1 Design and setting

The current study presents secondary data analyses of those receiving a BI as part of a randomized controlled trial of an alcohol BI delivered to 14–20 year olds in an academic level 1 ED (Project U-Connect: Cunningham et al., 2015; Walton et al., 2015; Walton et al.,

2017). Youth screening positive for risky drinking on the Alcohol Use Disorders Identification Test – Consumption were randomized to a therapist-delivered BI (TBI; $n=277$), computer-delivered BI (CBI; $n=278$), or a control condition ($n=281$). In the present study, we examined characteristics of BI response among those in the intervention conditions, so we excluded the control group. In addition, because the main outcomes of the RCT (Cunningham et al., 2015) revealed that both the TBI and CBI reduced alcohol consumption and consequences at 3-months compared to the control group, we combined intervention groups; thus, the present analyses included 475 participants who received either BI and completed the 3-month follow-up ($n=475/555$; 85.5%). The Institutional Review Board at the University of Michigan approved the protocol and we obtained a Certificate of Confidentiality from the National Institutes of Health.

2.2 Procedure

Patients in the ED were approached by study staff between September, 2010 and March, 2013 (excluding holidays) and completed screening measures between the hours of ~2pm–2am, 7 days/week (Cunningham et al., 2015; Walton et al., 2015). Detailed exclusion/inclusion criteria are described elsewhere (Cunningham et al., 2015; Walton et al., 2015). Study staff used an electronic medical record to determine whom to approach, and excluded from approach any patient who presented with the following: psychosis, suicide attempt/ideation, sexual assault, or medical/psychiatric incapacitation. In addition, those aged 14–17 who did not have a parent/guardian present were not eligible for screening. Eligible patients provided consent/assent for the study (parental consent obtained for 14–17 year olds), and self-administered the computerized screening survey (15–20 minutes; \$1 gift remuneration). Those screening positive for risky drinking on the AUDIT-C were eligible for the trial. Following a second-stage consent/assent process, trial participants then self-administered a computerized baseline survey (20–30 minutes; \$20 remuneration) and were randomized to condition using a computer algorithm, stratified by gender, age group (14–17 or 18–20), and alcohol use disorder diagnosis. Following completion of their assigned condition (see details below), participants completed a post-test assessment. A computerized follow-up assessment was self-administered at 3-months (\$35 remuneration).

2.3 U-Connect Brief Intervention Content

Detailed descriptions of intervention content have been previously published (see Cunningham et al., 2015; Walton et al., 2015; Walton et al., 2017). Although there were differences in delivery mechanism, the CBI and TBI were similar in content and designed using the theory and principles of MI (e.g., exploring the reasons “why” to consider change followed by “how” to change; Miller & Rollnick, 2002; Resnicow & McMaster, 2012; Miller & Rose, 2009) to address problematic alcohol use. Both BIs included a review/discussion of personal strengths, goals/values, and normative feedback, followed by a review/discussion of potential alcohol use consequences and benefits of reducing consumption. Additionally, participants were able to explore and select tools for change (e.g., protective behavioral strategies, refusal skills, and coping with negative affect) and select alternative activities (e.g., sports). Average completion times were 45.4 minutes ($SD=19.0$) for the TBI and 34.7 minutes ($SD=19.6$) for the CBI (Walton et al., 2015).

2.4 Measures

2.4.1 Alcohol Consumption.—We used the 3-item AUDIT-C to determine eligibility for the trial and as a follow-up measure to classify participants as a BI responder or non-responder. The AUDIT-C measures alcohol consumption (frequency, quantity, and binge-drinking [defined as 5 drinks on any one occasion]) during the past three months (Bush et al., 1998; Chung et al., 2000; Knight et al., 2003). We calculated a total AUDIT-C score and potential participants were eligible if total scores were 3 for ages 14–17 and 4 for ages 18–20 (Chung et al., 2000; Knight et al., 2003). Cronbach's α was 0.58 at baseline. We classified BI responders at 3-months by AUDIT-C scores < 3 for ages 14–17 and < 4 for ages 18–20, and non-responders (i.e., maintained risky drinking levels) were classified as 3 for ages 14–17 and 4 for ages 18–20. Cronbach's α was 0.80 at follow-up.

2.4.2 Demographic Characteristics.—Participants provided data on their gender, race, age, current living situation, education level, and whether they received public assistance (as a proxy for family socioeconomic status) using items from prior research (Bearman et al., 1997; Handelsman et al., 2005; Smith et al., 1996).

2.4.3 Substance Use.—We used selected items from the National Institute on Drug Abuse (NIDA) Alcohol, Smoking, and Substance Involvement Screening Test (ASSIST; WHO ASSIST Working Group, 2002) to measure illicit substance use (excluding marijuana), non-medical use of three prescription drugs (i.e., sedatives, stimulants, opioids), and tobacco use. Participants rated the frequency of use during the past 12 months on a scale from “0 = Never” to “6 = Daily or Almost Daily.” We combined the illicit substances, prescription drugs, and tobacco use into two separate categories for analyses (any past 12-month use: yes/no). We also included items from the Substance Abuse Outcomes Module (SAOM) to assess the total number of days in the past month that participants used marijuana, used alcohol, and engaged in binge drinking (consuming 5+ drinks on a single occasion; Smith et al., 1996).

2.4.4 Mood.—The Brief Symptom Inventory (BSI; Derogatis & Spencer, 1982; Derogatis & Melisaratos, 1983) was used to assess anxiety symptoms (6 items) and depression symptoms (7 items) during the week prior to baseline. For all items, participants responded by rating how much discomfort each symptom has caused them on a scale from 0 = “Not at all” to 4 = “Extremely.” Scores were dichotomized (not at all vs. all other responses) and summed to create a score of total number of depression and anxiety symptoms. Cronbach's α was 0.89 for the depression subscale and 0.89 for the anxiety subscale.

2.4.5 Risk and Protective Factors.—At baseline, we included measures of positive and negative peer influences adapted from prior work (Bryant & Zimmerman, 2002; Doljanac & Zimmerman, 1998; Dielman et al., 1991). Nine items assess negative peer influences (e.g., alcohol problem, use marijuana weekly, get into fights) and 4 items assess positive peer influences (e.g., go to college, get As and Bs, in clubs/athletics) rated on a 5-point scale from 1 = “None of my friends” to 5 = “All of my friends.” Cronbach's α for negative peer influences was 0.80 and 0.65 for positive peer influences. We also included 6 items measuring parental support (Doljanac & Zimmerman, 1998) rated on a 5-point scale

from 1 = “Not true” to 5 = “Very true.” Cronbach’s α was 0.89. We included 8 items measuring parents’ substance use (Dielman et al., 1991), rated on a 5-point scale from 1 = “Never” to 5 = “Very often.” Cronbach’s α was 0.70. We included 3 items measuring parents’ approval of substance use (Arthur et al., 2002), rated on a 4-point scale from 1 = “Not wrong at all” to 4 = “Very wrong.” Cronbach’s α was 0.65. For all parent and peer variables we calculated summary scores. We also included 1 item measuring community involvement (Zimmerman, 2000), rated on a 5-point scale from 0 = “Not at all” to 5 = “More than once a week.” Scores greater than 0 were coded as engaged in community activities (yes/no). Mentoring was also assessed using one item asking whether (yes/no) participants had a non-family member mentor (Zimmerman et al., 2002).

2.4.6 Readiness to Change.—We included 4 items measuring baseline motivational constructs (e.g., importance, readiness) related to behavior change (Hesse, 2006; Harris et al., 2008; Monti et al., 2007; Neal et al., 2006; Daeppen et al., 2007). Items were measured using a 10-point visual analog scale (i.e., “rulers”) ranging from 1 = “not at all” to 10 = “very.” Because these four items demonstrated good internal consistency (Cronbach’s α = 0.81), we used an overall mean of these four items and included this single item mean as a measure of readiness to change.

2.4.7 Alcohol Consequences.—We used the shortened 18-item version of the Rutgers Alcohol Problem Index (RAPI; White & Labouvie, 1989; Neal, Corbin, & Fromme, 2006) to evaluate participants’ experience of alcohol-related consequences during the 3 months prior to baseline. The S-RAPI assesses the number of alcohol consequences one has experienced on a scale from 0 = “Never” to 4 = “More than 10 times.” For the present study, scores were dichotomized (never vs. all other responses) and summed to create a score of total number of alcohol-related consequences (Cunningham, et al., 2015). Cronbach’s α was 0.89 in the present sample.

2.5 Data Analysis

Because we excluded from analyses those who did not complete the baseline and 3-month follow-up, we first examined whether baseline characteristics differed between those 475 participants who completed the 3-month follow-up and those 80 who did not complete the follow-up. Second, we calculated descriptive statistics (i.e., demographics, mood, risk/protective factors, substance use, readiness to change) for the overall study sample ($n=475$), and then within each of two groups: BI responders ($n=122$) and non-responders ($n=353$). We used an intent-to-treat approach, where all participants assigned to a condition were included in all follow-up assessments and in these analyses (8–9% of participants did not receive the BI, but participated in follow-up). Third, we used a series of Chi-square and t-tests to examine differences in baseline characteristics by responder group. Finally, we conducted a mediated logistic regression analysis (see Muthén, 2011) including variables that were significant in the bivariate analyses. Thus, the mediated logistic regression examined background factors, including positive peer influence, having a mentor, and baseline depression as predictors of being classified as a BI responder, with baseline alcohol consumption and the readiness to change ruler as multiple mediators, controlling for background characteristics (i.e., age, race/ethnicity, living with parents, and public

assistance). Education was excluded in the model as it was highly correlated with age ($r = 0.66$, $p < .001$). All analyses were conducted using maximum likelihood with robust standard errors in MPlus version 8.0 (Muthén & Muthén, 1998–2017).

3. Results

3.1 Participant Characteristics

Among 4,389 patients approached, 1,053 (24%) screened positive for risky drinking, and 836 (80%) were enrolled in the study; 277 (33%) were randomized to the CBI condition and 278 (33%) were randomized to the TBI condition. Of the 555 active intervention participants, 475 (85.5%) completed baseline and 3-month follow-up and were included in the current analysis (see Table 1). Participants were young ($M_{\text{age}} = 18.6$; $SD = 1.4$), approximately one-half (48.7%) were female, and most were White/Caucasian (78.6%; 10% African American, and 11% Other). Overall, 122 participants (25.6%) were classified as a BI responder and 353 (74.3%) were classified as a non-responder at 3-month follow-up. There were no significant bivariate differences in baseline demographics, substance use, mood, readiness to change, or risk/protective variables between those who completed ($n = 475$) and those that did not complete ($n = 80$) the baseline and 3-month follow-up, except that non-completers had significantly lower scores on a measure of negative peer influences ($M = 18.7$; $SD = 4.5$) compared to completers ($M = 20.8$; $SD = 5.4$), $t(553) = -3.30$, $p = 0.001$.

3.2 Bivariate baseline comparisons of BI responders and non-responders

There were no baseline differences in gender, past 30-day marijuana use, illicit substance use, tobacco use, misuse of prescription substances, alcohol consequences, anxiety, parent influences, negative peer influences, community involvement, BI condition, or reason for ED visit, between BI responders and non-responders (see Table 1). However, compared to non-responders, BI responders were younger, fewer were White/Caucasian, and more received public assistance, lived with their parents, and had a mentor. Additionally, BI responders reported significantly less alcohol consumption and positive peer influences, and reported more depression symptoms and higher levels of readiness to change compared to non-responders¹.

3.3 Mediated logistic regression analysis examining the odds of being classified a BI responder at 3-months

As Figure 1 reveals, having a mentor, depression symptoms, and positive peer influences at baseline had no significant direct effects on being a BI responder at 3-months. Greater baseline readiness to change predicted being a responder and greater baseline alcohol consumption predicted being a non-responder. These baseline alcohol severity factors were also mediators in the relation between baseline depression, positive peer influences, having a mentor and BI response (see Tables 2 and 3 for indirect effects). Specifically, having a mentor had an indirect association with being a responder via less baseline alcohol

¹When those participants who were lost to follow-up were included in this analysis and classified as non-responders, findings were similar, except that non-responders reported more parental support ($M = 23.8$; $SD = 5.8$) compared to BI responders ($M = 22.6$; $SD = 6.2$), $t(553) = 2.06$, $p = 0.04$.

consumption. Greater positive peer influences had an indirect relation with being a responder via less baseline alcohol consumption and less readiness to change. Finally, greater depression was indirectly associated with being a responder via greater readiness to change.²

4. Discussion

Critical to creation of scalable public health approaches to reduce underage drinking is understanding heterogeneity in BI response, which could inform parsimonious delivery of intervention components based on patient characteristics. Although prior papers from this study demonstrated that the computer and therapist-delivered BIs reduced alcohol consumption at 3-months relative to control (Cunningham et al., 2015), only one-in-four (~26%) participants who received an alcohol BI reduced alcohol use below cut-offs for risky drinking. This paper provides novel information regarding variation in response among youth receiving a BI in the ED based on baseline individual and social characteristics assessed before intervention delivery, which could inform future intervention development. The present study also extends past findings by including a larger sample of adolescents and emerging adults (14–20), who presented to the ED for alcohol *and* non-alcohol related events, demonstrating that presenting complaint was unrelated to BI response. In terms of demographic factors, there were no significant sex differences in BI response; however, college students, and other characteristics associated with being in college (i.e., older age, not living with parents, not on public assistance, Caucasian), were markers of lower likelihood of BI response.

Key findings from this study are that variation in BI response appears to be based on severity factors, such as baseline readiness to change and alcohol use severity, which mediate the relationship between individual (i.e., depression) and social (i.e., positive peer influences, having a mentor) factors and BI response at 3-months. These findings are interesting because motivational interviewing based BIs have been shown to increase readiness to change (Walton et al., 2017); further, findings may help explain inconsistencies in the literature regarding the efficacy of alcohol BIs on consumption among youth (Maio et al., 2005; Monti et al., 1999; Monti et al., 2007; Spirito et al., 2004; Bernstein et al., 2010). Importantly, having a mentor indirectly predicted BI response as mediated by alcohol consumption, which suggests that it may be important to link youth with supportive adults in their communities to maximize BI effects. Baseline readiness to change also mediated the relationship between depression and BI response. It may be that youth with depression drink to cope with negative affect, and in turn may be more ready, and likely, to respond to a BI that addresses alternative strategies to manage challenging emotions. Although prior research has consistently demonstrated the effects of negative peer influences on risky drinking (Patrick et al., 2016), fewer studies have shown protective effects for positive peer influences, which, in our study, were related to less baseline alcohol consumption. However, positive peer influences were also related to less readiness to change. It may be that positive peers exert social influence to limit alcohol consumption, resulting in lower readiness to

²Findings were similar when those participants who were lost to follow-up were included in this analysis and classified as a non-responder.

reduce further (e.g., complete abstinence), given social norms in this age group. Finally, the lack of significant findings for negative peer influences in our study may reflect the commonality of such behaviors among youth, with means for negative peer influences exceeding that of positive peer influences. Regardless, youth with depression and greater alcohol problem severity, and those with fewer positive social influences (e.g., peers, mentors) may benefit from more intensive interventions.

Taken together, results suggest that extending interventions beyond a single session for those with more severe alcohol use may be particularly important, especially given the rise in high-intensity drinking among youth (Patrick et al., 2017); however, given the lack of efficacy found for therapist-delivered boosters following BIs (Cunningham et al., 2015), employing innovative delivery of tailored intervention content related to social influences and depression may be beneficial. In this regard, using technology to deliver adaptive interventions that adjust the dosage or type of intervention offered based on response, and identify optimal intervention components proximal to the occurrence of risk behaviors, is an exciting future direction (Lei et al., 2012). These adaptive interventions could also be tested using innovative designs such as micro-randomized trials (Klasnja et al., 2015; Nahum-Shani et al., 2016) or sequential, multiple assignment randomized trials (SMART; Lei et al., 2012), providing insights into the “black box” of interventions and enhancing efficacy among those with greater severity.

4.1 Limitations

This study is limited by a sample comprised primarily of White/Caucasian suburban youth and findings should be replicated among patients from more diverse racial, ethnic, and economic backgrounds. The study is also limited by potential self-report biases, even though evidence supports the reliability and validity of computerized and confidential measures of substance use and related behaviors (Brenner et al., 2003). Although our follow-up rate was high (~86%), those with negative peer influences were less likely to complete follow-ups; thus, replication of findings for this variable is warranted. Finally, within intervention group analyses focused on 3-month outcomes, as participants received an additional booster intervention following the 3-month interview, therefore, future studies examining longer-term outcomes are needed.

4.2 Conclusions

Findings from this study suggest that one in four youth receiving a BI in the ED will reduce alcohol consumption below risky drinking guidelines (Chung et al., 2000; Knight et al., 2003). Given similarity in findings for the CBI and TBI conditions, reducing alcohol use (at 3 months) and consequences (at 3 and 12-months) (Cunningham et al., 2015), the feasibility of integrating a computer-based BI in an ED seems especially promising in terms of scalability. Although a single session may be sufficient among youth engaged in lower levels of risky drinking, for those engaged in greater levels of use, and those with lower readiness to change, more intensive interventions are likely necessary. Such interventions may benefit from addressing depressive symptoms, as well enhancing positive social influences, such as connections with positive peers and mentors.

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Figure 1:
Mediation diagram of risk and promotive factors on brief intervention response through baseline alcohol consumption and readiness to change ruler (* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Control variables included age, public assistance, race, and living with parents)

Table 1.

Bivariate Comparisons of Demographic Characteristics, Substance Use, Mental Health, Protective and Risk Factors, and Readiness to Change, by Treatment Outcome Group

Variable	Overall Sample (n=475) n(%) or M(SD)	BI Responders (n=122, 26%) n(%) or M(SD)	BI Non-responders (n=353, 74%) n(%) or M(SD)
Demographics			
Age *	18.6 (1.4)	18.3 (1.6)	18.7 (1.3)
Female sex	232 (48.7%)	68 (55.7%)	164 (46.5%)
White/Caucasian *	374 (78.6%)	86 (70.5%)	288 (81.6%)
Receiving public assistance *	97 (20.4%)	34 (27.9%)	63 (17.8%)
Currently lives with parents *	211 (44.4%)	65 (53.7%)	146 (41.4%)
Education Status			
Not in School	68 (14.4%)	28 (23.0%)	40 (11.3%)
High School/GED or below ***	86 (18.2%)	34 (27.9%)	52 (14.7%)
Technical School or College ***	319 (67.4%)	60 (49.2%)	259 (73.4%)
Substance use			
Past 30-day marijuana use	6.8 (9.7)	6.5 (9.9)	6.9 (9.6)
Illicit drug use	79 (16.6%)	22 (18.0%)	57 (16.1%)
Nonmedical prescription drug use	112 (23.5%)	31 (25.4%)	81 (22.9%)
Past 30-day alcohol use ***	6.5 (5.2)	4.7 (4.4)	7.1 (5.3)
AUDIT-C total score at baseline ***	5.9 (1.9)	5.2 (1.7)	6.1 (2.0)
Frequency of past 30-day binge-drinking ***	3.3 (4.0)	2.2 (3.6)	3.6 (4.0)
Total number of alcohol consequences	3.4 (3.7)	3.5 (4.4)	3.4 (3.4)
Past 12-month tobacco use	293 (61.6%)	73 (59.8%)	220 (62.3%)
Mental health			
Total number of depression symptoms *	5.2 (5.3)	6.2 (6.0)	4.8 (5.0)
Total number of anxiety symptoms	4.0 (4.6)	4.4 (5.0)	3.8 (4.5)
Protective and risk factors			
Parental support	23.4 (5.9)	22.6 (6.2)	23.7(5.8)
Parental approval of substance use	9.0 (2.3)	9.2 (2.5)	9.0 (2.3)
Parent substance use	12.2 (3.5)	12.2 (3.5)	12.2 (3.5)
Positive peer influences *	12.1 (2.7)	11.7 (2.9)	12.2 (2.6)
Negative peer influences	20.8 (5.4)	20.1 (5.9)	20.1 (5.2)
Community involvement	221 (46.4%)	61 (50.0%)	160 (45.3%)
Has a mentor *	385 (80.9%)	108 (88.5%)	277 (78.5%)
Brief intervention condition			
Computerized BI	237 (49.8%)	64 (52.5%)	173 (49.0%)
Therapist BI	239 (50.2%)	58 (47.5%)	181 (51.3%)
Motivation to change			
Readiness to change ruler ***	3.8 (2.5)	4.9 (2.9)	3.3 (2.2)

Variable	Overall Sample (n=475) n(%) or M(SD)	BI Responders (n=122, 26%) n(%) or M(SD)	BI Non-responders (n=353, 74%) n(%) or M(SD)
Reason for baseline visit to emergency department			
Alcohol-related visit	70 (14.7%)	18 (14.8%)	52 (14.7%)

Note: Participants were classified as being a BI responder if AUDIT-C score at 3-month follow-up was < 3 for those under 18 and < 4 for those age 18-20; BI Non-responders were classified as ≥ 3 for those under age 18 and ≥ 4 for those ages 18-20 at 3-month follow-up.

*
p<0.05,

**
p<0.01,

p<0.001.

Indirect effects of protective and risk factors on response to an alcohol brief intervention at 3-months through baseline readiness to change ruler.

Table 2.

Variable	Standardized Regression Coefficient (SE)	95% CI	Adjusted Odds Ratio (95% CI)
Positive peer influence *	−0.03 (0.01)	(−0.05, −0.01)	0.97 (0.95, 0.99)
Depression symptoms **	0.04 (0.01)	(0.01, 0.06)	1.04 (1.01, 1.06)
Has a mentor	0.02 (0.03)	(−0.03, 0.07)	1.02 (0.97, 1.07)

*
p<0.05,

**
p<0.01

Note. SE = standard error; CI=confidence interval; control variables included age, public assistance, race/ethnicity, and living with parents

Indirect effects of protective and risk factors on response to an alcohol brief intervention at 3-months through baseline alcohol consumption.

Table 3.

Variable	Standardized Regression Coefficient (SE)	95% CI	Adjusted Odds Ratio (95% CI)
Positive peer influence *	0.03 (0.01)	(0.01, 0.05)	1.03 (1.01, 1.05)
Depression symptoms	-0.003 (0.01)	(-0.02, 0.02)	0.997 (0.98, 1.02)
Has a mentor *	0.08 (0.01)	(0.02, 0.14)	1.08 (1.02, 1.15)

*
p<0.05,

**
p<0.01

Note. SE = standard error; CI=confidence interval; control variables included age, public assistance, race/ethnicity, and living with parents