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Brief Alcohol Interventions for Youth in the Emergency

Department: Exploring Proximal and Distal Outcomes

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Abstract

Brief interventions (BI) for alcohol use in the emergency department (ED) have been shown efficacious among adolescents and young adults; however, whether these interventions extend to other outcomes - proximal and distal - are less explored. This study examined outcomes of ED BIs in four completed trials showing reductions in alcohol use. Limited and inconsistent effects were found on proximal outcomes including parental monitoring, and distal outcomes including tobacco use. Identifying the mechanisms that underlie alcohol-focused BIs as well the intervention processes that may lead to generalized, positive effects on other variables is an important area of future research.

Keywords

brief interventions; alcohol; adolescents; mechanisms; ancillary outcomes

Introduction

Adolescent alcohol use and misuse is a serious health problem in the United States, where adolescents report some of the highest rates of problematic drinking relative to other ages (Substance Abuse and Mental Health Services Administration [SAMHSA], 2010; Swendsen et al., 2012). In the most recent Monitoring the Future national survey on substance use behaviors among high school students (Johnson, O'Malley, Miech, Bachman, & Schulenberg, 2017), 33.2% of 12th graders and 19.9% of 10th graders reported alcohol use in

the past month. Higher alcohol use in adolescence predicts higher use as a young adult (Jackson & Sher, 2005; Lee et al., 2012) and is associated with alcohol-related problems, such as injuries, motor vehicle crashes, and assaults (Linakis, Chun, Mello, & Baird, 2009). Thus, effective early intervention for adolescent alcohol misuse is needed.

Adolescent Alcohol Use and Emergency Care Settings

A review of studies of alcohol use screening (Sindelar, Barnett, & Spirito, 2004), found rates of alcohol use among adolescents ranged from 5% for general emergency department (ED) admissions to almost 50% for trauma admissions. As such, youth visits to emergency and trauma care settings for intoxication and alcohol-related injury create the opportunity to provide a brief intervention (BI) at a time when adolescents are most aware of the consequences of their actions. Motivational interviewing (MI)-based (Miller & Rollnick, 2002) interventions have been documented as an effective BI used with adolescents in the ED, and studies employing MI have shown reduced drinking and/or associated alcohol use problems (e.g., Monti et al, 1999; Monti et al., 2007; Spirito et al., 2004; Spirito et al., 2011). Due to the high prevalence of alcohol use among patients (including adults) treated in emergency care settings, and the apparent effectiveness of brief interventions in the ED, screening, brief intervention, and referral to treatment (SBIRT) have become a requirement for Level I trauma centers (American College of Surgeons Committee on Trauma [ACS-COT], 2006).

Since these initial ACS-COT (2006) guidelines were released, the SBIRT model has gained traction and become the most widely endorsed public health approach to improve the detection and intervention of alcohol use in acute care settings. In addition to the ACS-COT mandate, use of SBIRT among adolescents in acute care settings has been championed by many leading health organizations in the United States including National Institute of Alcohol Abuse and Alcoholism (NIAAA, 2011), National Institutes on Drug Abuse (NIDA, 2011), the American Academy of Pediatrics (AMA, 2015), and the Substance Abuse and Mental Health Services Administration (SAMHSA, 2013).

Brief Alcohol Intervention Efficacy

In a review of the literature on the efficacy of alcohol interventions for youth in primary care and urgent care settings, Yuma-Guerrera and colleagues (Yuma-Guerrera, Lawson, Velasquez, von Sternberg, Maxson, & Garcia, 2012) examined seven randomized control trials (RCTs) with youth and young adults, 24 years and younger, conducted in Level I trauma centers, to highlight the evidence in support of SBIRT. Of these seven studies, four (Monti et al, 1999; Monti et al., 2007; Spirito et al., 2004; Walton et al., 2010) reported significant intervention effects. Similarly, Newton and colleagues (2013) reviewed the effectiveness of ED-based BIs in nine RCTs with youth (ages 12 to 24 years), where six out of the nine studies overlapped with the Yuma-Guerrera et al. (2012) review. Of the three additional studies (Bernstein et al., 2010; Spirito et al., 2011; Tait, Hulse, Robertson, & Sprivulis, 2004), only two utilized BIs for adolescent alcohol use (Spirito et al., 2011; Tait et al., 2004), with one demonstrating significant intervention effects (Spirito et al., 2011). In addition, a systematic review investigating seven of the previously reviewed studies

employing BIs in the ED, Mitchell and colleagues (Mitchell, Gryczynski, O'Grady, & Schwartz, 2013) concluded that BIs may be effective with adolescents but suggest that more RCTs are needed due to gaps in the literature (e.g., inadequate statistical power and short follow-up periods). Finally, in a recently published meta-analysis, Tanner-Smith and Lipsey (2015) evaluated the effectiveness of BI for alcohol use among youth 11–18 years old and concluded that BIs yield beneficial effects on alcohol-related outcomes, citing six of the aforementioned studies and one additional study (Cunningham et al., 2012). In sum, there is considerable evidence (though not unequivocal) that BIs can be effective in reducing alcohol use and/or related problems among youth.

Brief Alcohol Intervention in the ED

BIs have been shown to reduce alcohol consumption, be more effective than no counseling, and as effective as more extensive interventions (e.g., Bertholet, Daeppen, Wietlisbach, Fleming, & Burnand, 2005). BIs in the ED can range in their length of time, from very brief (5 minutes) to more extensive (60 minutes). The content of BIs also varies by the length of time available to complete the intervention. Brief advice, with or without psycho-education, tends to be the shortest interventions, while MI-based interventions are longer and vary in length of time, in some cases according to whether they provide individualized feedback on the patient's alcohol use.

The mechanisms that underlie behavior change vary by the type of BI delivered. For example, in a study that examined direct and indirect effects of in-person and computerized BIs in the ED (youth 14 to 20 years of age) on 3-month alcohol consumption and consequences, results indicated that “strategies” for reducing alcohol misuse were the most effective ingredients in both types of intervention (Walton et al., 2017). These strategies included refusal skills, protective behavioral strategies, and coping with negative affect. In addition, a narrative review of the literature examining mechanisms of change in face-to-face brief alcohol interventions (mostly among patients in the emergency room, non-treatment seeking young adults, and US college student populations) found that brief MI was the most frequently employed, with personalized feedback, specific MI techniques, and change plans as the identified components of change (Gaume, McCambridge, Bertholet, & Daeppen, 2014). As few studies have examined the mechanisms and processes of BI in the ED with adolescents and young adults, a crucial gap remains.

Considering Brief Interventions Effects on Other Outcomes

Problem-Behavior Theory's social-psychological framework supports the connectedness of adolescent alcohol use with other risk-taking behaviors (Donovan, 2005; Jessor & Jessor, 1977; Jessor, 1991). Specifically, there is behavioral clustering among adolescent alcohol use and drug use (Johnston, Rivara, Driesch, Dunn, & Copass, 2002; Swendsen et al., 2012), injury (Linakis et al., 2009; Sheppard, Snowden, Baker, & Jones, 2008), and violence (Walton et al., 2010).

There are numerous ways that co-occurring problems can emerge; one of the conditions may be primary and precipitate another (O'Neil, Conner, & Kendall, 2011), or the risk-

relationship between alcohol use and other problems or conditions may be driven by shared life processes and/or risk factors, such as negative family life events, peer affiliations, parental behavior, and psychopathology (Johnson, Cloninger, Roache, Bordnick, & Ruiz, 2000; Molnar, Buka, & Kessler, 2001). Regardless of the origin of such behavioral clustering, given its frequent occurrence, it is important to investigate whether interventions that are effective in reducing alcohol use in youth also result in complementary changes in other related behaviors. Indeed, panels of substance abuse treatment and research experts have been convened by the NIDA (December 2009) to identify outcome measures other than substance use that could be feasibly incorporated into substance use treatment research.

A report of this meeting by Tiffany, Friedman, Greenfield, Hasin and Jackson (2011) proposed that substance use disorder treatment evaluation should extend beyond quantity and frequency of drug use to include changes in self-efficacy, psychosocial functioning, network and social support, craving, and quality of life. Also produced from this meeting, a report by Donovan and colleagues (2011) emphasized the importance of biopsychosocial dimensions, including routine examination of psychosocial functioning, quality of life, and treatment process. Both of these reports suggest studying primary (proximal) outcomes that may change as a result of an intervention and lead to positive outcomes. They also recommend looking at secondary (distal), or ancillary outcomes, that may change as a result of a substance use focused intervention.

The purpose of the current evaluation was to explore additional outcomes – proximal and distal - of ED BIs for alcohol use among adolescents and young adults. Examining treatment interventions and how they extend to other outcomes could assist in the identification of the mechanisms of change (the active intervention ingredients). This mechanism approach is a priority of the National Institutes of Health (NIH) Science of Behavior Change (SOBC) Common Fund Program (NIH, 2010; Nielsen et al., 2018). While BIs are hypothesized to target specific underlying mechanisms, identifying such components, in lieu of a randomized controlled trial, has to be done retrospectively.

Data from four trials showing successful reductions in alcohol outcomes were analyzed to identify whether there were associated positive effects on two types of other outcomes: first, proximal outcomes, i.e. outcomes that were targeted by the intervention itself (e.g., drinking reduction strategies) but not thoroughly analyzed previously; and second, distal outcomes not targeted by the intervention itself (e.g., marijuana use) but by virtue of their association with the primary outcome of alcohol use, might also respond to an alcohol-focused intervention.

Considering BI Effects on Proximal Outcomes

Proximal outcomes were chosen according to the focus and content of the reviewed BIs, which included a focus on peer affiliations, parental monitoring, and use of protective strategies.

Peer affiliation/influence.

Youth' social networks (i.e. association with deviant and prosocial peers) influence adolescent alcohol use (Berndt, 1995). Peer and adolescent substance use are strongly correlated, whereby peer use or perceived peer use affects adolescent alcohol use behavior (Barnett et al., 2014). Given the central importance of peer influence on adolescent alcohol use, attempting to modify misperceptions of peer use should be a strategy used in brief interventions with youth.

Parental monitoring.

The Center for Disease Control and Prevention (2012) characterizes parental monitoring as a combination of three components: 1) parental expectations and rules for their teen's behavior; 2) parental knowledge of the teen's activities and their peers; and 3) parental reaction when their teens break the rules. Lower levels of parental monitoring, structure, appropriate discipline, warmth and support have all been associated with increases in adolescent alcohol use and problem behavior (Barnes, 1992). In addition, parental monitoring has been shown to deter adolescent drinking and to influence youth to make healthier decisions around alcohol use (Dishion & McMahon, 1998). With younger youth, improvements in parental monitoring have been found to mediate the effects of BIs employed in the community on alcohol use (Dishion, & McMahon, 1998). As a result, parental monitoring is often a target of brief interventions with youth and their families.

Protective strategies.

Protective behavioral strategies (PBS; e.g., limiting the number of drinks) are inversely associated with negative drinking outcomes (Martens, Pederson, Labrie, Ferrier, & Cimini, 2007; Pearson, 2012). For adolescent populations, the literature on PBS is limited; although it seems to follow the same inverse relationship as seen in college samples (Branstrom, Sjostrom, & Andreasson, 2008). Importantly, when PBS information is included in brief interventions, it mediates the intervention effect on alcohol use (Barnett, Murphy, Colby, & Monti, 2007; Carey, Lust, Reid, Kalichman, & Carey, 2016; Kenney, Napper, LaBrie, & Martens, 2014; LaBrie et al., 2013) and therefore is a primary proximal target for BI.

Considering BI Effects on Distal Ancillary Outcomes

Other substance use, including tobacco, marijuana and other drug use is the most frequently investigated ancillary outcomes of BIs for alcohol use.

Tobacco use.

Tobacco and alcohol commonly co-occur in youth (Centers for Disease Control and Prevention, 2012), and studies have shown a strong association of initiation and progression trajectories for both substances (Hoffman, Welte, & Barnes, 2001; Weitzman & Chen, 2005). In a recent study, it was found that by age 14, cigarette smoking and alcohol use were already strongly and positively correlated and the rate of change in both behaviors over time was also positively correlated, suggesting that these behaviors 'moved together' over time (Hagger-Johnson et al., 2013). Given their associations, tobacco use should be an ancillary outcome of brief alcohol interventions with youth.

Marijuana use.

Alcohol and marijuana are the two most commonly used psychoactive substances in adolescence. More than 90% of youth who used marijuana and alcohol at the same time also engaged in binge drinking (Hingson, Heeren, & Winter, 2006). Conjoint use is associated with problem behaviors, including impaired driving (Soderstrom, Dischinger, Kerns, & Trifillis, 1995) and injury (Woolard, Baird, Mello, Nirenberg, & Longabaugh, 2009), more so than either substance alone. Given their frequent co-occurrence, marijuana use may decline as a function of BIs targeting alcohol use and, thus, considered an ancillary outcome. Magill and colleagues (2009) considered data from Monti et al. (2007) in which MI with personalized feedback for alcohol use reduction was compared to personalized feedback only among young adults in the ED. Even though the intervention did not target other drug use, Magill et al. (2009) found the MI participants reduced their marijuana use more than the comparison group during follow-up.

Substance use other than marijuana.

By late adolescence, 81.4% of teens had the opportunity to use illicit drugs other than marijuana, 42.5% reported using drugs, and 16.4% met criteria for a substance abuse diagnosis (Swendsen et al., 2012). These rates are of concern given research demonstrating that early onset alcohol and other drug use increases risk for the development of abuse and dependence (Swadi, 1999). Given the relationship with alcohol use, illicit drug use warrants consideration as an ancillary outcome of BIs with youth.

The Current Study

The purpose of the current study was to analyze proximal and distal outcomes from studies of BIs conducted in EDs for alcohol use among youth. Data from four trials (Monti et al., 1999; Monti et al., 2007; Spirito et al., 2004; Spirito et al., 2011) were reviewed. The original studies aims, designs (including participants and procedures), and outcomes are presented in Table 1.

METHODS

Participants

All participants were identified while in the ED of a Level I trauma center in the Northeastern US. They met study criteria either because they were being treated for an alcohol-related injury or intoxication or because they screened positive for a history of hazardous alcohol use. All had to pass a mini-mental status exam and complete informed consent/assent procedures, including parent consent for minors.

Procedures

Participants in the four studies ranged in age from 13 to 24 years of age. In all studies, intervention counselors were Master's-level research staff who received formal training in Motivational Interviewing (MI; Rollnick & Miller, 1995), a non-directive, client-centered counseling style for eliciting behavior change by helping clients to explore and resolve ambivalence. Control conditions varied across studies. All studies included 3- and 6-month

follow-up assessments. Each study's procedures were approved by the University's and the Hospital's Institutional Review Boards. See Table 1 for additional study information.

Study 1.—(Monti et al., 1999; $N = 94$) included youth 18 to 19 years of age ($M_{\text{age}} = 18.4$, $SD = 0.05$; 63% male), and evaluated a single session MI versus treatment as usual (TAU) to reduce alcohol-related use and consequences.

Study 2.—(Spirito et al., 2004; $N = 152$) included youth 13 to 17 years of age ($M_{\text{age}} = 15.6$, $SD = 1.20$; 64% male), and investigated the efficacy of MI versus TAU in reducing alcohol use and alcohol-related problems at follow-up.

Study 3.—(Monti et al., 2007; $N = 198$) included young adults 18 to 24 years of age ($M_{\text{age}} = 20.6$, $SD = 1.90$; 68% male) and examined MI with personalized feedback versus personalized feedback only (PNF).

Study 4.—(Spirito et al., 2011; $N = 125$) included youth 13 to 17 years of age ($M_{\text{age}} = 15.5$, $SD = 1.20$; 46% male) and their parents, and examined individual MI versus MI plus the Family Check-Up (FCU; a MI based-parent feedback), for reducing alcohol use.

Measures

For the purposes of the current study, we focused on the 3- and 6-month findings because group differences within each original study's examination of primary outcomes occurred at these follow-up time points. We therefore expected that differences across conditions on proximal and distal outcomes would be more likely to emerge in these earlier follow-up assessments. We specify below the measures for each construct within each study. In some cases the measures were not administered at both follow-ups; see details in Table 2.

Intervention Proximal Outcomes

Peer affiliation/influence.—One or more items measuring peer influence were administered in all four studies. Perception of peer drinking was measured in Studies 1 and 2 using one item from the *Health Behavior Questionnaire* (HBQ; Jessor, Donovan, & Costa, 1989): "How many of your friends' drink alcohol fairly regularly?" For Study 3, a single item was used: "How many drinks do you think the average person your same age and sex drinks per occasion?" Study 4 used the *Peer Substance Use and Tolerance of Substance Use Scale* (Chassin, Rogosch, & Barrera, 1991) to assess how many of the adolescent's friends used alcohol, marijuana, and other drugs occasionally and regularly. Perception of peer approval/disapproval of drinking was measured in Studies 1 and 2 with one HBQ item: "How do most of your friends feel about someone your age drinking alcohol?" from 0 = *strongly disapprove* to 4 = *strongly approve*. Study 4 used an item from the *Peer Substance Use and Tolerance of Substance Use Scale* (Chassin et al., 1991), which asked the adolescent to indicate how their close friends would feel about their use of marijuana, alcohol, and other drugs occasionally and regularly.

Peer pressure to drink was measured in Studies 1 and 2 with one HBQ item: "Do your friends ever pressure you to drink more than you do now?" from 0 = *never* to 3 = *all the*

time. In Study 4, two subscales from the *Child: Peer/Social Scale* (Dishion & Kavanagh, 2003) assessed peer deviance and peer pro-social behaviors. Peer deviance was measured with four items: “What percentage of your friends were well behaved in school?”, “misbehaved or broke rules?”, “experimented with smoking or other substances?”, and “dressed or acted like a gang member?” with responses on a 5-point scale from 1 = *very few* to 5 = *almost all* (some items were reverse-scored such that a lower number defined more deviant behaviors). Exposure to pro-social peers was assessed with two items, where a higher score indicates more pro-social behaviors: “How often did you spend time with kids who took school seriously and completed their homework?” and “How often did you spend time with kids who were involved in positive school or community activities?” on a scale from 1 = *never* to 5 = *always*, where a higher number reflects more pro-social behaviors.

Parental monitoring.—Parental monitoring was assessed in Studies 2 and 4. Study 2 used four items from the HBQ to evaluate adolescent perceptions of their parents’ rules for drinking: “Which statement best describes the rules for teenage drinking in your house?” on a scale from 1 = *you are not allowed to drink under any circumstance* to 4 = *drink at home whenever you want to*. Parent monitoring in Study 2 was measured with three items: “When you went out with your friends, how often did your parent(s) ask where you were going?”, “When you went out with your friends, how often did your parent(s) check where you were going?”, and “When you went out with your friends, how often did you tell your parent(s) where you were really going?” In Study 4, parental monitoring was measured using the total score from the 6-item *Transdisciplinary Tobacco Use Research Center: Teen Monitoring Scale* (Cohen, Richardson, & LaBree, 1994). For example, “When you go out with your friends, do your parents ask where you’re going?”, “How often do your parents really know where you are?”, and “Do you ever go places your parents don’t want you to go?” with responses provided on a scale from 1 = *never* to 4 = *very often*.

Protective strategies.—Protective strategies were assessed in Studies 1, 2, and 3. Studies 1 and 2 administered *The Safe Strategies Questionnaire* (Farrow, 1989), which asks the adolescent to indicate which of eleven strategies he/she used to avoid driving or riding after drinking in the past 3 months. Dichotomous answers were summed into a total score. Study 3 administered the *Self-Control Questionnaire* (SCQ; Werch & Gorman, 1986). The SCQ contains 28 items reflecting behavioral strategies for limiting drinking, such as “set the number of drinks you will have ahead of time” and “drink nonalcoholic beverages between alcoholic drinks,” on a scale from 1 = *never* to 5 = *always* resulting in a summed score. For these analyses, strategies that were used “*sometimes*” (score of 3) or more frequently were counted to provide an indicator of the number of different strategies used at least sometimes.

Intervention Distal Ancillary Outcomes

Tobacco use.—All four studies assessed tobacco use. Study 1 and 2 dichotomized an item from a shortened version of the *Fagerström Test for Nicotine Dependence* (FTND; Heatherton, Kozlowski, Frecker, & Fagerstrom, 1991): “How many cigarettes per day do you smoke currently?” (1 = *use* and 0 = *no use*). Studies 3 and 4 asked: “Have you used cigarettes over the last 3 months?” (0 = *no*, 1 = *yes*).

Marijuana use.—Marijuana use was assessed in Studies 1, 2, and 4. Studies 1 and 2 used one item from the HBQ: “In the past three months, how often have you used marijuana?” This question was converted to a dichotomous item of any marijuana use. Study 4 used a single dichotomous item: “Have you used marijuana in the past 3 months?”

Substance use other than marijuana.—Illicit drug use was assessed in all four studies. Studies 1 and 2 collapsed seven items on the HBQ that measured the number of times the following drugs were used in the past 3 months: pills, crack, cocaine, LSD, PCP, inhalants (e.g., paint and glue), or heroin. Any use of these drugs was counted as drug use. In Studies 3 and 4, four items asked about specific drug use (cocaine, prescription drugs, designer drugs, and other drugs) in the prior 30 days, which were dichotomized as in Studies 1 and 2.

Data Analysis

Due to differences in measures, the four study datasets were analyzed separately. Continuous variables were summarized using means and standard deviations, and categorical variables were described with frequencies and percentages. Continuous and dichotomous scores were used in regression models (multiple or logistic), with baseline values and treatment condition entered on separate steps. Given the exploratory nature of these analyses (i.e., none of these analyses were based on the original study’s primary outcomes), no adjustments to the significance value of $p < .05$ were made, and effect sizes and odds ratios (OR) were reported for all analyses that approach significance with a $p < .10$.

RESULTS

Results for all analyses are presented in Table 2, and significant findings are presented below.

Intervention Proximal Outcomes

Peer affiliation/influence.—At 3 months, Study 1 had two variables with significant findings and small effect sizes; participants in the MI group perceived *more* peer drinking ($\beta = 0.23$, $p = 0.01$) and *greater* pressure to drink from peers ($\beta = 0.18$, $p = 0.03$) than participants in the TAU condition. In Study 3, at 6 months, a small effect was demonstrated, whereby participants in the MI group perceived *more* peer drinking than participants in the PNF group ($\beta = 0.13$, $p = 0.08$).

Parent monitoring.—In Study 4, at 3 months, there was a small effect size ($\beta = 0.16$, $p = 0.07$), whereby youth (but not parents) in the combined adolescent/parent BI MI+ FCU condition reported *lower* parental monitoring than the adolescent only MI condition, after controlling for baseline values of the given outcome.

Protective strategies.—Studies 1 and 2 showed no significant group differences on protective behavioral strategies at 3 or 6 months, nor did Study 3 at 6 months.

Intervention Distal Ancillary Outcomes

Marijuana and other substance use.—No significant group differences were found in any of the four studies on marijuana use, or on substance use other than marijuana.

Tobacco use.—For study 2, at 6 months, participants in the MI group reported using less tobacco than participants in the TAU group ($OR = 3.39, p = 0.07$).

DISCUSSION

This is an exploratory study that examined proximal and distal outcomes of BIs in four completed randomized controlled trials targeting alcohol use in adolescents and young adults (ages 13 to 24) recruited while in the ED of a Level 1 trauma center. Across these studies, we identified several constructs that were directly targeted by the intervention (proximal outcomes) and were measured in more than one of the four studies as well as those that we expected might change because they commonly co-occur with alcohol use (distal ancillary outcomes). Overall, very few significant group differences were found for either set of outcomes.

The domain that demonstrated the strongest group difference was peer affiliation/influence, but in the direction opposite to what would be expected. A MI is typically designed to correct the commonly found overestimates of peer drinking, which should therefore lead to lower estimates of peer drinking at follow-up (Miller & Rollnick, 1991). However, in Study 1, perception of peer drinking was *higher* in the MI group at 3-month follow up, as was the perception of peer pressure, compared to TAU. It is possible that the MI group was primed to attend to peer behaviors of peer alcohol use and peer pressure, which could have resulted in higher estimates. In Study 3, adolescents in the MI condition also perceived *higher* peer drinking (a finding that approached statistical significance) than the comparison condition (PNF). In Study 3, the personalized feedback in the PNF condition included the correct peer norms (the written feedback was identical to what was used in the MI), and though we would have expected the discussion about peer behavior that occurred in the MI to have made the correction more salient and resulted in lower perceived norms, the written feedback may have been more effective than the same feedback presented in the MI condition. To our knowledge, the finding that the peer normative information had an effect opposite to what was expected has not been previously reported in studies using normative feedback so requires replication. It is possible that these findings are specific to the population or setting studied in these investigations.

For parental monitoring there was a statistical trend in Study 4; younger adolescents who received an MI perceived greater parental monitoring at follow-up than did adolescents who received the MI+FCU condition in which the parent component of the intervention had a focus on increased monitoring. Because both conditions in Study 4 were active BI interventions and analyses were conducted on measures of adolescent perception only, the protective benefits of an MI are still evident in the findings. One possible explanation for this finding is that the MI+FCU condition emphasized both monitoring and parent-adolescent communication and that the monitoring, when applied in the context of improving communication, might not be as obvious or evident to the teen in the MI+FCU

condition. The extant literature discusses the importance of communication in the parent-adolescent relationship (e.g., Chen, Grube, Nygaard, & Miller, 2008), and it is possible that measuring parent-child communication patterns following the FCU would help explain this unexpected finding on parental monitoring. It is also possible that the MI+FCU did not result in an actual change in monitoring, i.e., some parents might have been wary about using parental monitoring because of the potential for greater parent-teen conflict. However, this finding only approached significance, and, in the absence of supporting literature, we interpret this finding with caution until it is replicated.

The lack of significant group differences on protective behavioral strategies in Studies 1 and 2 suggest that the interventions did not focus to a large enough extent on the adoption of specific harm reduction behavioral strategies with the adolescent samples (e.g., setting the number of drinks an adolescent would have before going to a party and drinking nonalcoholic beverages between alcoholic drinks). Given that interventions incorporating protective behavioral strategies have been efficacious in reducing alcohol risk with college students (e.g., Neighbors et al., 2007), they should be evaluated as to their efficacy in BIs for adolescents of all ages (Johnson et al., 2017; Martens et al., 2005).

While tobacco was not used by all participants and was not a target of the intervention, Study 2 findings indicated that there was a statistical trend for the MI group to report using somewhat *less* tobacco than the TAU group at follow-up. These findings are consistent with the literature indicating that adolescent tobacco use often mirrors adolescent alcohol use and vice versa (Schulenberg & Maggs, 2002). Given this reciprocal relationship between tobacco and alcohol use, interventions targeting alcohol use perhaps should also, in tandem, target tobacco use for youth who use both.

Marijuana use showed no group differences across the four studies except, as mentioned previously, one analysis already published using data from Study 1 (Magill et al., 2009). Magill and colleagues (2009) found that youth who received an MI to reduce alcohol use experienced a greater reduction than the comparison group from 6- to 12-month follow-up. They also showed a lower number of days on which both marijuana and alcohol were used; this finding appeared to be a function of the fewer number of days using alcohol in the MI condition, suggesting a longer-term generalization of BI for alcohol use extends to marijuana use.

No distal outcome effects were found on other drug use. Given that studies have documented the increased use of prescription drugs and illicit drug use among youth (Monnat & Rigg, 2016), and the greater alcohol-related harms associated with stimulant intoxication and excessive alcohol use (McKetin, Chalmers, Sunderland, & Bright, 2014), these findings suggest that interventions for youth may need to specifically target other drug use to see an effect.

Future Directions

Two principles that have emerged in the last decade are 1) the need to treat comorbid conditions concurrently (National Institute on Drug Abuse, 2010) and 2) the priority to examine mechanisms of change that underlie an intervention to identify where BI change is

taking place (NIH SOBC, 2010). While a randomized controlled trial (RCT) to examine hypothesized mechanisms of change is a just goal, understanding retrospectively the components of BIs in the ED that produce change is also worthwhile. Identifying the underlying mechanisms (active ingredients) and processes (the components that extend the treatment) of BIs would help guide treatment and further investigation.

The limited findings in these studies suggest that proximal and distal outcomes may need to be targets of the intervention. That is, they would not necessarily be expected to change with a BI that focuses on alcohol only. The majority of ED trials of BI with adolescents have targeted alcohol use only, with a few exceptions: Walton and colleagues (Walton et al., 2010) explicitly targeted both violence and alcohol use among youth and were successful in reducing both outcomes using an in-person brief intervention versus a computer intervention or brochure.

Limitations

This study is not without its limitations. First, there was no correction for multiple comparisons, and in the interest of exploration, we used a p-value higher than the conventional 0.05. In addition, effect sizes were small and so even the few effects and significant findings we detected should be considered preliminary. To add, where study control conditions differed, the comparison of effect sizes should be interpreted with caution. Other methods of comparison (e.g., meta-analysis, integrated data analysis) might be appropriate for such investigations, but were not employed, primarily because most of the outcomes were measured in only one or two studies. Moreover, proximal and distal outcomes may not have been measured optimally given that they were not original study outcomes. Additionally, age range differences amongst original studies influence comparisons of mechanisms due to different stages of cognitive development and should be an area of future study. Finally, there are other proximal and distal variables to be explored, but the ones examined in this study were restricted to what was assessed in the original four studies.

Conclusion

Demonstrating improvement in domains other than the primary domain targeted by the intervention would make BIs more credible and appealing to stakeholders (e.g., Tiffany et al., 2011). Specifically, identifying mechanisms of change among interventions that affect proximal and distal (or ancillary) outcomes may already exist, and their evaluation is needed. Even if additional targets are not needed for all adolescents, effects could be protective and preventative.

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Table 1:

Original Study Designs and Outcomes

Authors (year)	Participants	Intervention Conditions	Inclusion Criteria	Follow-up	Published Outcomes
Study 1 (Monti et al., 1999)	N = 94; Ages 18 – 19; 80% White 13% Black 5% Asian/East Indian 2% Hispanic	1. MI = 35–40 min with personalized feedback & handout 2. TAU = ~5 min with handout	Positive BAC or report of drinking alcohol prior to event treated for in the ED	3 and 6 months	Both conditions reduced alcohol use; MI reduced incidents of drinking and driving, traffic violations, alcohol-related injuries, and alcohol-related problems
Study 2 (Spirito et al., 2004)	N = 152; Ages 13 – 17; 72% White 7% Black 3% Asian/East Indian 17% Hispanic 1% Native American	1. MI = same as Study 1 but with parent involvement 2. TAU = same as Study 1	Positive BAC, breath, or saliva levels or self-report of drinking alcohol 6 hours before the injury that precipitated treatment	3, 6, and 12 months	Those who screened positive for alcohol-related problems at baseline had fewer average # of drinking days/month and high-volume drinking days if they received MI. Both conditions reduced quantity of drinking at 12 months
Study 3 (Monti et al., 2007)	N = 198; Ages 18 – 24; 72% White 7% Black 3% Asian/East Indian 17% Hispanic 1% Native American	1. MI = 30 – 45 min with personalized feedback and 2 telephone booster sessions 2. PNF = 10–15 min with personal feedback and 1 telephone booster session	Positive BAC, reported drinking alcohol within 6 hours of the event causing the ED visit, or score of 8 on the AUDIT at the time of treatment in the ED	3, 6, and 12 months	6-month follow-up revealed MI group had fewer self-reported drinking days, fewer heavy drinking days, and drinks per week in past month than SC. The MI group reduced volume of alcohol consumption from baseline to 12 months
Study 4 (Spirito et al., 2011)	N = 125; Ages 13 – 17; 66% White 2% Black 2% Asian/East Indian 27% Hispanic 2% Native American	1. MI = 45–60 min with personalized feedback with 5 booster brochures 2. MI+FCU = same MI plus 60 min family MI with parent personalized feedback	Positive BAC, breath, or saliva levels or self-report of drinking alcohol 6 hours before the ED visit	3, 6, and 12 months	Results showed a reduction in all drinking outcomes at all follow-up assessment time points, with the strongest effects at 3 and 6 months. MI/FCU reduced high-volume drinking days at 3-month follow-up better than MI only

Note. MI = Motivational Interview; TAU = Treatment as Usual; BAC = Blood Alcohol Concentration; PNF = Personalized Normative Feedback; FCU = Family Check-Up

Table 2:

Project Outcomes at 3- and 6-months: Percentages and Means (SD)

Measures	Study 1 (18-19; N = 94) Monti et al., 1999				Study 2 (13-17; N = 152) Spirito et al., 2004				Study 3 (18-24; N = 198) Monti et al., 2007				Study 4 (13-17; N = 125) Spirito et al., 2011			
	3 month	6 month	3 month	6 month	3 month	6 month	3 month	6 month	3 month	6 month	3 month	6 month	3 month	6 month	3 month	6 month
	MI	TAU	MI	TAU	MI	TAU	MI	TAU	MI	PNF	MI	FCU	MI	FCU	MI	FCU
Proximal Outcomes:																
<i>Peer affiliation/influence,^a Means (SD)</i>																
Perception of peer drinking	1.9(0.8) <i>p</i> = 0.01	1.6(0.8) <i>p</i> = 0.58	1.9(0.8) <i>p</i> = 0.97	1.6(0.9) <i>p</i> = 0.97	1.6(0.8) <i>p</i> = 0.11	1.9(0.8) <i>p</i> = 0.11	--	--	5.8(3.0) <i>p</i> = 0.08	5.1(2.1)	1.3(1.0) <i>p</i> = 0.87	1.4(1.0)	--	--	--	--
Perception of peer approval	2.7(0.7) <i>p</i> = 0.60	2.9(0.8) <i>p</i> = 0.14	2.7(0.7) <i>p</i> = 0.74	2.6(0.8) <i>p</i> = 0.74	2.6(0.7) <i>p</i> = 0.16	2.4(0.7) <i>p</i> = 0.16	--	--	--	--	2.3(1.0) <i>p</i> = 0.25	2.2(1.0)	--	--	--	--
Peer pressure	0.4(0.7) <i>p</i> = 0.03	0.3(0.6) <i>p</i> = 0.94	0.2(0.4) <i>p</i> = 0.91	0.2(0.4) <i>p</i> = 0.91	0.1(0.4) <i>p</i> = 0.30	0.3(0.7) <i>p</i> = 0.30	--	--	--	--	--	--	--	--	--	--
Deviant peers	--	--	--	--	--	--	--	--	--	--	2.2(0.8) <i>p</i> = 0.16	2.5(0.8)	2.2(0.8) <i>p</i> = 0.91	2.5(0.9)	--	--
Pro-social peers	--	--	--	--	--	--	--	--	--	--	3.5(0.8) <i>p</i> = 0.28	3.1(0.9)	3.4(0.8) <i>p</i> = 0.79	3.1(0.9)	--	--
<i>Parent monitoring,^a Means (SD)</i>																
TTURC ^b (parental monitoring)	--	--	--	--	--	--	--	--	--	--	3.8(0.5) <i>p</i> = 0.17	3.7(0.6)	3.7(0.5) <i>p</i> = 0.56	3.6(0.6)	--	--
House rules	--	--	--	1.5(0.7) <i>p</i> = 0.40	1.3(0.5) <i>p</i> = 0.76	1.4(0.5) <i>p</i> = 0.76	--	--	--	--	--	--	--	--	--	--
Parents ask where going	--	--	--	4.1(1.1) <i>p</i> = 0.80	4.1(1.4) <i>p</i> = 0.58	4.1(1.1) <i>p</i> = 0.58	--	--	--	--	3.5(0.6) <i>p</i> = 0.07	3.3(0.8)	3.4(0.6) <i>p</i> = 0.42	3.3(0.7)	--	--
Parents check where going	--	--	--	2.1(1.3) <i>p</i> = 0.20	2.4(1.5) <i>p</i> = 0.70	2.3(1.4) <i>p</i> = 0.70	--	--	--	--	--	--	--	--	--	--
Teen tells parent where really going	--	--	--	3.6(1.3) <i>p</i> = 0.99	3.7(1.3) <i>p</i> = 0.97	3.7(1.2) <i>p</i> = 0.97	--	--	--	--	--	--	--	--	--	--
<i>Protective strategies, Means (SD)</i>																
Safe strategies used (1 or more)	96% <i>p</i> = 1.00	100%	89% <i>p</i> = 0.84 ^c	91% <i>p</i> = 0.16	89% <i>p</i> = 0.80 ^c	86% <i>p</i> = 0.80 ^c	--	--	--	--	--	--	--	--	--	--
Strategies for limiting drinking (count)	--	--	--	--	--	--	--	--	13.1(6.2) <i>p</i> = 0.17 ^c	12.2(5.2)	--	--	--	--	--	--
Distal Outcomes:																

Measures	Study 1 (18–19; N = 94) Monti et al., 1999				Study 2 (13–17; N = 152) Spirito et al., 2004				Study 3 (18–24; N = 198) Monti et al., 2007				Study 4 (13–17; N = 125) Spirito et al., 2011			
	3 month		6 month		3 month		6 month		3 month		6 month		3 month		6 month	
	MI	TAU	MI	TAU	MI	TAU	MI	TAU	MI	PNF	MI	PNF	MI	MI + FCU	MI	MI + FCU
Tobacco use (past 3 months), %	--		59% 54% <i>p</i> = 0.50		--		52% 74% <i>p</i> = 0.07		--		55% 52% <i>p</i> = 0.71 ^d		39% 40% <i>p</i> = 0.92		40% 35% <i>p</i> = 0.54	
Marijuana use (past 3 months), %	60% 59% <i>p</i> = 0.92		63% 60% <i>p</i> = 0.93		63% 70% <i>p</i> = 0.48		76% 65% <i>p</i> = 0.45		--		49% 47% <i>p</i> = 0.60 ^e		31% 22% <i>p</i> = 0.10		32% 28% <i>p</i> = 0.61	
Substance use other than marijuana (past 3 months), %	17% 17% <i>p</i> = 0.91		25% 17% <i>p</i> = 0.29		17% 22% <i>p</i> = 0.27		18% 18% <i>p</i> = 0.78		--		12% 7% <i>p</i> = 0.46 ^e		0% 7% <i>p</i> = 1.00		8% 3% <i>p</i> = 0.35	

Note. MI = Motivational Interview; TAU = Treatment as Usual; PNF = Personalized Normative Feedback; FCU = Family Check-Up; "--" = data not collected; Bold p-values are significant at $< .05$ & $< .10$. Statistical test outcome data available from the first author by request.

^aParticipant report (not parent)

^bTransdisciplinary Tobacco Use Research Center: Teen Monitoring Scale

^cStudy 3 uses different count measures than Studies 1 and 2

^dPast 30 days

^eNumber of days of marijuana use in the past 30 days was not significant; however, MI < PNF at six months for number of days marijuana used with alcohol (Magill et al., 2009), $p < .01$