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Preventing College Women's Sexual Victimization Through Parent Based Intervention: A Randomized Controlled Trial

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Abstract

A randomized controlled trial, using parent-based intervention (PBI) was designed to reduce the incidence of alcohol-involved sexual victimization among first-year college students. The PBI, adapted from Turrisi et al. (2001), was designed to increase alcohol-specific and general communication between mother and daughter. Female graduating high school seniors and their mothers were recruited from the community and randomly assigned to one of four conditions: Alcohol PBI ($n=305$), Enhanced Alcohol + Sex PBI ($n=218$), Control ($n=288$) or Unmeasured Control ($n=167$). Mothers in the intervention conditions were provided an informational handbook and encouraged to discuss its contents with their daughters prior to college matriculation. Consistent with hypotheses, PBI, either standard or enhanced, was associated with lower incidence of incapacitated rape in the first year of college relative to controls. Path analysis revealed support for a hypothesized indirect effects model, by which intervention increased mother-daughter communication, which predicted lower frequency of first semester heavy episodic drinking, resulting in lower rates of alcohol-involved sexual victimization in the first year of college.

Keywords

College drinking; Intervention; Rape; Victimization; Mediating effects

Sexual victimization is a common occurrence among college women. It is estimated that each year 5% of college women are raped (Kilpatrick et al 2007) and 15–20% experience sexual victimization defined more broadly to include attempted rape, unwanted sexual contact, and verbally coerced intercourse as well as rape (Humphrey and White 2000). At least half of these incidents occur when the victim or perpetrator has consumed alcohol (Abbey 2002) and a large proportion of rapes occur when the victim is incapacitated by alcohol and unable to resist (Mohler-Kuo et al. 2004). The goal of the current study was to test the efficacy of a novel, theoretically based, universal prevention intervention, delivered by mothers to their daughters prior to college matriculation. The parent-based intervention (PBI) was designed to prevent

alcohol-related sexual victimization in the first year of college by increasing general and alcohol-specific communication, thereby reducing heavy episodic drinking and alcohol-involved sexual victimization. The significance of these pathways in reducing sexual victimization in first-year college women was tested.

Alcohol and College Sexual Victimization

Numerous studies implicate college women's alcohol use, particularly heavy episodic drinking, as a risk factor in sexual victimization. Across numerous studies, roughly half of sexual assault episodes reported by college women occur following consumption of alcohol or other substances (Abbey 2002). Studies using daily process methodology reveal greatly increased risk of sexual victimization on days that alcohol is consumed (Neal and Fromme 2007; Parks et al. 2008). Parks et al. (2008) found that this daily relationship was specific to episodes of heavy episodic drinking (HED). Following episodes of HED (4 or more drinks, mean 7.46 drinks), the odds of experiencing sexual victimization later that day increased 19 times relative to the risk of victimization on non-drinking days. Light drinking days (3 or fewer drinks) were not associated with increased risk.

Because of the high rates of heavy episodic drinking among college students (Wechsler et al. 2002), college women are particularly vulnerable to incapacitated rape (IR), that is, non-consensual intercourse that occurs as a result of the woman drinking to the point of unconsciousness or incapacitation and being unable to resist sexual advances (Testa et al. 2003). In a national study of rape among college students, three quarters of all rapes occurred as a direct result of the victim being too intoxicated to consent to intercourse, compared to one quarter that occurred as a result of perpetrator force (Mohler-Kuo et al 2004). Past-year incidence of IR was 9 times higher in a national college sample than among a national household sample (Kilpatrick et al 2007).

Intervention to Prevent Alcohol-Related Sexual Victimization

Developing successful prevention interventions requires identification and targeting of the mechanisms that are responsible for the outcome of concern. Despite mounting evidence that heavy drinking plays a causal or facilitative role in many sexual assaults, college rape prevention programs have rarely targeted or even mentioned alcohol consumption (Bachar and Koss 2001) and, perhaps not surprisingly, have shown little efficacy in reducing sexual victimization (see Anderson and Whitson 2005; Blackwell et al. 2003; Breitenbecher 2000 for reviews). It has recently been suggested that reducing heavy episodic drinking may be an effective way of preventing college sexual assault as well (Testa and Livingston 2009). However, to date, this notion has not been tested.

Several different types of interventions to reduce alcohol use in college students have been developed and shown to be efficacious (see Carey et al. 2007; Larimer and Cronce 2002, 2007; Task Force of the National Advisory Council on Alcohol Abuse and Alcoholism 2002 for reviews). Most college drinking interventions are instituted after college begins, and target at-risk drinkers. However, the high rates of sexual victimization in the first year of college (Humphrey and White 2000) suggest a need for prevention interventions initiated prior to college matriculation and the increase in drinking and sexual vulnerability that accompanies this transition (Fromme et al. 2008). Moreover, although heavy high school drinkers are arguably most at risk of alcohol-related sexual victimization, even students without a history of heavy drinking may increase their consumption upon entry into college (Turrisi et al. 2006; White et al 2006). Drinking more than one's usual amount was associated with an increased risk of experiencing sexual coercion among first-year college students (Neal and Fromme 2007), suggesting that inexperienced drinkers may be less able to manage alcohol-related vulnerability. Thus, universal prevention of heavy episodic drinking, delivered prior to

the first college semester, may be an effective way of preventing alcohol-related sexual victimization.

Turrisi et al. (2001) have developed a universal prevention intervention, delivered prior to the start of college, by parents. Drawing upon research indicating that parent involvement in substance use prevention programs can reduce use of alcohol and other substances among adolescents (Rohrbach et al 1994; Spoth et al. 2004), this PBI involves providing parents of incoming freshmen with a handbook that includes information about college drinking and effective communication strategies. Drawing upon research showing that adolescent alcohol use is negatively associated with parental communication about alcohol (Turrisi et al. 2000) and parental monitoring (Ary et al 1999), handbooks are designed to encourage parent-student communication about alcohol and to foster ongoing communication and monitoring during college. Turrisi et al. (2001) found that students randomly assigned to the parent intervention condition reported lower levels of heavy episodic drinking in college and fewer negative drinking related consequences compared to controls. Similarly, Ichiyama et al. (2009) found that the same PBI decreased the likelihood of transitioning from non-drinker to drinker status and slowed growth in drinking, an effect that was stronger for women than men. Consistent with the hypothesized mediating mechanisms, the effect of PBI on college HED appears to be mediated via increased parental communication and monitoring (Turrisi 2008; Turrisi et al. 2002).

The current randomized controlled trial was designed to extend the work of Turrisi and colleagues by examining whether alcohol-focused PBI, delivered by mothers to daughters just prior to entering college, could reduce the incidence of alcohol-related sexual victimization during the first year of college. If the majority of college sexual assault is not only alcohol-related but alcohol-caused or alcohol-facilitated, then reducing HED should be sufficient to reduce rates of college sexual assault. However, because roughly half of sexual assaults occur when both victim and perpetrator are sober (Abbey 2002), mechanisms other than intoxication contribute to sexual victimization. Sexual assertiveness is one such putative mechanism, with studies showing that greater assertiveness in sexual situations predicts lower risk of subsequent sexual assault (Greene and Navarro 1998; Livingston et al. 2007). Thus, we also included an enhanced intervention condition. The mothers' handbook in this condition contained all of the alcohol-related information plus an additional chapter regarding sexual refusal assertiveness and partner selectivity. Inclusion of this enhanced intervention condition allowed us to determine whether there is an additional benefit to inclusion of sexual risk content in reducing sexual assault, beyond any benefit of reducing HED.

To examine intervention effects in more detail, we considered PBI effects on variables that are hypothesized to serve as the mechanisms of change. First, we hypothesized that PBI would result in more mother-daughter communication, both alcohol-specific communication and general communication indicative of greater mother awareness of daughter's activities. Second, we expected that increased mother-daughter communication would result in lower-frequency heavy episodic drinking during the first semester of college, which would in turn reduce sexual victimization during the first year of college. This proposed indirect effect model was tested using path analysis, allowing us to consider whether higher levels of mother-daughter communication and lower frequency of heavy episodic drinking mediate the relationship between PBI and sexual victimization.

Method

Participants

Participants consisted of 978 female college freshmen and their mothers recruited from households in Erie County, NY. This sample size provides sufficient power to detect modest

group differences in sexual victimization rates and to test the impact of moderator variables. Graduating female high school seniors were selected at random from yearbook photos from local city ($n=5$) and suburban ($n=16$) high school graduating classes of 2004, 2005, 2006, and 2007. They were located using public telephone directories. Just prior to high school graduation (T0), participants were contacted by telephone and offered the opportunity to participate in a longitudinal study of transition to college. This approach has been used successfully in several previous studies (e.g., Turrisi et al 2001). To be eligible, the graduating senior had to be planning to enter a 2- or 4-year college in the fall, live with her mother (or a mother figure, such as a grandmother), and both mother and daughter had to be fluent in English and agree to participate. We were able to locate 1,491 of 3,153 high school seniors identified through yearbook photos (47.3%) and screen 1,422 of these. Of those screened, 129 were ineligible (primarily because they were not planning to attend college in the fall) and 1,072 of 1,293 eligible mother-daughter dyads (82.9%) agreed to participate.¹ Analyses are based on dyads with complete mother and daughter data at baseline ($N=978$).

At the time of recruitment students were on average 18.1 (.33) years old, and mothers were 47.6 (4.82). The majority was Caucasian (90.9% of daughters, 92.3% of mothers, compared to 82.2% for the county), suburban (78%), and comprised of two-parent households (87.1%). Median household income was \$75,000, which is comparable to the median family income of \$74,000 for college freshmen nationally (Pryor et al. 2007). In the fall semester, 80% of students attended 4-year colleges and 20% attended 2-year colleges. Although over 100 colleges were represented, a substantial proportion of the sample attended public institutions located in Western New York.

Procedures

Procedures were described by telephone to mothers and daughters and written informed consent, or assent in the case of daughters who were not yet 18, was obtained. Because some daughters were minors, we requested written informed consent from all mothers regarding daughters' participation. After receipt of written informed consent, mothers and daughters were sent, under separate cover, baseline questionnaire booklets to complete at home and return in a postage-paid envelope. To avoid bias, participants were not told of the intervention phase of the study at the time of recruitment but rather were informed that, if eligible, they might be offered the opportunity to participate in an additional paid study during the summer (in actuality, this was the intervention).

After both mother and daughter had completed and returned their baseline measures, the pair was randomized to condition based on an algorithm that was embedded in the subject database. Research assistants were blinded to condition until both baseline assessments were returned; condition was revealed when completion status was updated in the database. Mothers assigned to the alcohol only intervention ($n=305$) or enhanced intervention ($n=218^2$) were recruited by telephone to read and evaluate a handbook and talk to their daughters about its content prior to the start of college. Mothers randomly assigned to a control group ($n=288$) were not contacted or provided with an intervention handbook during the summer. To be eligible to participate in the intervention, mother and daughter had to be living together during the summer. Four daughters planned to be away from home all summer; these dyads were classified

¹Because of our reliance on public telephone directories, we were unable to recruit students without landlines and whose last names differed from their parents', resulting in a large proportion of stable, two-parent families and few single-parent or blended families. Accordingly, we located fewer of the targeted students who attended schools in the relatively impoverished city of Buffalo (30.5% located) compared to the suburbs (50.7% located), $Z=10.43, p<.01$. However, once located, students from city schools were more likely to agree to participate (90.1%) than students from suburban schools (80.7%), $Z= 3.38, p<.01$.

²At the end of each year of data collection, preliminary analyses were done to compare the two intervention conditions on key outcome and mediating variables. Consistent with the findings reported in the Results section, these revealed no differences between the two intervention conditions in the first three cohorts. Hence, we opted to drop the enhanced intervention condition in the final cohort.

as controls. Four mothers who were eligible to participate in the intervention refused to accept a handbook. To be conservative, these four dyads were classified for analysis purposes as being in the intervention group to which they were originally assigned.

In early July, mothers who were randomly assigned to the standard alcohol intervention condition were sent a handbook that was nearly identical to that used by Turrissi et al. (2001). The handbook contained information about college drinking and a chapter on effective communication strategies. It emphasized the importance of talking with their daughters about alcohol prior to the start of college and continued communication and monitoring regarding their activities in college. In the enhanced intervention condition, the handbook contained all of this information plus an additional chapter on college dating, sexual assertiveness, and partner selectivity. Mothers in both conditions were instructed to talk to their daughters about the information in the handbook prior to the start of college and to complete and return handbook evaluations at the end of August.

After initiation of the study, focus groups and comments from mothers suggested that completing baseline measures was raising mothers' concerns about college drinking and possibly leading them to talk to their daughters about alcohol. This raised the possibility that baseline measures may be serving as a brief intervention, contaminating the control group. To address this concern, in two later cohorts we added an unmeasured control group that involved no mother assessment at baseline ($n=167$). Daughters assigned to this group still completed baseline assessments. These dyads were randomized to the unmeasured control group at the time of recruitment; however, all other procedures and assessments were the same.

Follow-up questionnaires were sent to mothers in November and to daughters in December at the end of the first college semester (T1). In April, at the end of the second semester, daughters also received a second follow-up questionnaire booklet (T2). To thank participants for their participation, mothers were compensated \$20 for the baseline assessment, \$40 for intervention evaluations and \$25 for follow-up 1. Daughters were compensated \$30 for baseline and \$50 for follow-ups 1 and 2. All procedures were approved by the Social and Behavioral Sciences IRB at the University at Buffalo.

Measures

Alcohol-Specific Communication—At baseline (T0) and after the first semester (T1), daughters were asked a series of 30 items, rated on 4-point scales (*not at all to a great deal*), regarding the extent to which their mothers had discussed specific alcohol-related topics with them. Mothers were asked corresponding questions regarding their alcohol-related communication with their daughters. These topics reflected the alcohol-related content of the intervention handbook (e.g., “the ways that alcohol can impair my judgment,” “how to find fun things to do without drinking”). The mean of these 30 items was used as the measure of alcohol-specific communication. Alpha was .97 at T0 and T1 for both daughter and mother measures. Mothers' and daughters' reports of corresponding measures were correlated ($r=.27$ to $.37$, $p<.001$). However, because we believed that daughters' reports were less subject to social desirability bias, more likely to reflect the effectiveness of communication, and more likely to have an impact on daughters' behavior, we used the daughter's report as our primary measure.

General Communication—At baseline (T0), daughters responded to five items assessing mother-daughter communication that were based on a commonly used measure of parental monitoring (e.g., “how often do you tell your mother where you're going after school?”, Barnes et al. 2006). Because the majority of daughters were no longer living with parents during the first semester, T1 items were modified to assess daughter's willingness to tell her mother about school, social activities, personal issues, romantic relationships, and personal problems.

Mothers were asked corresponding questions regarding how often their daughters talked to them about these topics. All items were rated on 7-point scales ranging from 1 (*not at all*) to 7 (*frequently*). Cronbach α for the scale was .75 at T0 and .89 at T1 for daughters and .73 at T0 and .89 at T1 for mothers. Mothers' and daughters' reports were correlated ($r=.45$ and $.44$ at T0 and T1, respectively, $p<.001$); however, we used daughters' reports as the primary measure.³

Sexual Assertiveness—At T0 and T1, daughters completed a six-item measure of sexual refusal assertiveness that was based on the Sexual Refusal subscale of the Sexual Assertiveness Scale (Morokoff et al. 1997). Items included “I would not have sex if I didn't want to, even if my date or boyfriend threatened to end our relationship” and “If I didn't want to have sex, I would communicate this clearly to my date/boyfriend.” They were rated on 5-point scales ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Cronbach alpha was .84 at T0 and .79 at T1.

Alcohol Use—At baseline and at both follow-ups, daughters completed several items regarding their alcohol use in the past 90 days. To create an index of frequency of heavy episodic drinking (HED), our primary alcohol measure, we averaged responses to two items: “How frequently have you consumed 4 or more drinks on an occasion?” and “How frequently have you consumed enough alcohol to feel drunk or intoxicated?” Both were rated on 6-point scales ranging from *never* to *5 or more days per week*. Women who reported no drinking were assigned a value of 0 for both variables. The two items were correlated .85 at T0 and .89 at T1. We also asked participants to report how many drinks they typically consumed each day of the week and summed the number of drinks typically consumed on Friday and Saturday as a measure of weekend drinking. Weekend drinking was correlated .82 with frequency of HED at T0 and .83 at T1.

Sexual Victimization—At baseline (T0), daughters completed a 20-item measure of sexual victimization since age 14. The measure was based upon the Sexual Experiences Scale (SES, Koss et al. 1987), which was subsequently revised by Testa et al. (2004) to include incapacitated rape. The version used in the current study expanded on earlier measures by crossing four perpetrator tactics (verbal coercion, force, threats, incapacitation) with five outcomes (contact, attempted intercourse, completed vaginal intercourse, oral sex, and anal sex). The same measure was used at T1 and T2 to assess victimization experiences over the past semester.

Women were classified as experiencing adolescent incapacitated rape (IR) if at T0 they reported experiencing at least one of four items following the stem “When you were incapacitated by alcohol or drugs and unable to object or consent...”. These items were: “tried to have sexual intercourse with you (but it did not happen)”, “made you have sexual intercourse?”, “made you do oral sex or have it done to you?”, “made you have anal sex or penetrated you with a finger or objects?” They were classified as experiencing IR in the first year of college if they responded positively to any of the four items at either T1 or T2. We also summed the total number of SES items reported at T0 ($\alpha=.83$), T1 ($\alpha=.73$), and T1 and T2 combined ($\alpha=.81$) as a continuous measure of extent of sexual victimization.

³We presume that daughters' willingness to communicate with their mothers reflects the mothers' ability to facilitate communication and elicit information from daughters. In a separate but comparable sample of first-year college students ($n=235$), we assessed not only daughters' willingness to communicate with their mothers about school, social activities, personal issues, romantic relationships, and personal problems, but also corresponding questions about how often their mothers asked them about these topics during the first semester of college. These measures were correlated significantly ($r=.60$), suggesting congruence between daughters' willingness to communicate with their mothers and mothers' strategies for facilitating communication.

Demographics—At baseline, mothers and daughters completed demographic questions regarding ethnicity, age, and family income. College information, such as living arrangements, was assessed at T1.

Intervention Evaluation and Fidelity Measures—Using an approach similar to that of Turrissi et al. (2001, 2009), we included evaluation questionnaires in mothers' handbooks at the end of each chapter, as well as at the end of the entire book, as means of encouraging mothers to read the handbook. Four 7-point Likert scales assessed the extent to which they viewed each chapter as interesting, clear, well-written, and helpful. At the end of the handbook, mothers rated the extent to which they thought the handbook would facilitate communication, using a 1 (*not at all*) to 7 (*very much so*) scale. Handbook evaluations were returned at the end of the summer intervention period. Fidelity was assessed as part of the T1 questionnaire for mothers in the intervention conditions. Mothers were asked: 1) whether they discussed the handbook with their daughter (Y/N), 2) whether they planned to discuss the handbook in the future (Y/N), 3) how many conversations they had had regarding the handbook, 4) how well these conversations went (1 = *not well at all* to 7 = *very well*) and 5) how open their daughter was to these conversations (1 = *not at all open* to 7 = *very open*).

Results

Preliminary Analyses

At baseline, the prevalence of any sexual victimization since age 14 was 47%, and the prevalence of incapacitated attempted or completed rape (IR) since age 14 was 15%. During the first year of college, the prevalence of any sexual victimization was 36%, and the prevalence of IR was 9.6%. At baseline, 53% reported engaging in heavy episodic drinking (HED) at least once in the past 90 days; this increased to 67% at T1 and 68% at T2.

To ensure baseline equivalence across conditions and cohorts, 4 (condition)×4 (cohort) ANOVAs were performed on baseline measures of number of sexual victimization experiences, frequency of HED, weekend drinking, communication about alcohol, and general communication. There were no main effects or interactions, suggesting that random assignment to condition was successful and that cohorts were equivalent and could be collapsed.

Overall, attrition was low. Of 978 dyads at baseline, 944 (96.5%) daughters completed T1, 911 (93.1%) completed T2, and 904 (92.4%) completed both T1 and T2. There were modest differences in completion rates across the four conditions, with the non-completion rates being 10.5% in the standard (alcohol only) intervention, 3.2% in the enhanced intervention, 8.3% in the control group, and 6.6% in the unmeasured control group ($\chi^2=10.12$, $df=3$, $p=.02$). Daughters with complete data at both T1 and T2 were compared to non-completers on several key baseline variables. The two groups did not differ significantly on ethnicity, weekend drinking, proportion engaging in HED, frequency of HED, general or alcohol-specific communication or total number of SES items.

Effects of Measurement on Mother-Daughter Communication

The inclusion of a control group with no mother baseline measures allowed us to examine whether measurement alone had an impact on mothers' behavior and hence on daughters' outcome variables. The two control groups were compared on general and alcohol-specific communication using mothers' and daughters' T1 (first semester) measures. Daughters' reports of T1 drinking as a function of control group type also were compared. There were no differences in mothers' ratings of general or alcohol-specific communication as a function of whether they completed baseline measures. Moreover, there were no differences in daughters' reports of first semester drinking or general communication. However, daughters in the

measured control group reported somewhat more discussion about alcohol ($M=1.82$, $SD=0.78$) compared to the group whose mothers did not complete baseline assessments ($M=1.67$, $SD=0.67$, $p=.04$, $t(373)=2.02$, $d=0.19$). Because this was the only measure that differed and the magnitude was small, we decided to combine the two control groups for analyses. This results in a slightly more conservative test of intervention effects.

Intervention Evaluation and Fidelity

Completed handbook evaluation forms, included with the handbook, were returned by 481 of 523 (91.9%) of mothers assigned to one of the intervention conditions. The handbooks as a whole were rated as helpful in facilitating conversations by mothers in both intervention conditions ($M=5.66/7$, $SD=1.27$) with no differences between the two conditions. At T1, the vast majority of mothers (95.6%) reported discussing the handbook with their daughters and 95.8% planned to discuss it in the future. On average, mothers reported having 5.77 ($SD=9.86$) conversations with their daughters based on the handbook. Mothers rated these discussions as going well, $M=5.52/7$ ($SD=1.29$), and perceived their daughters as being open to them, $M=5.34/7$ ($SD=1.29$). There were no differences between the two intervention conditions on these fidelity measures.

Standard Vs. Enhanced Intervention

Inclusion of the enhanced intervention condition allowed us to test the hypothesis that an intervention with sexual assertiveness content would be superior to one with only alcohol content in reducing college sexual victimization. However, the two intervention conditions did not differ at either T1 or T2 on number of sexual victimization items reported or on occurrence of IR. Moreover, T1 sexual assertiveness for daughters in the enhanced intervention group did not differ from that of either the standard intervention group or the control group. Both the standard and enhanced intervention conditions were expected to result in increased mother-daughter communication and decreased college HED. As expected, comparison of the two intervention conditions on general and alcohol specific communication and on HED and weekend drinking at T0, T1 and T2 revealed no differences between them. Because the primary focus of this paper was on the mediated effects of PBI on sexual victimization via HED, we combined the two intervention conditions for subsequent model testing.

Direct Effects of Intervention

We hypothesized that the intervention would result in lower rates of incapacitated rape (IR) and overall sexual victimization during the first year of college, as well as increased communication and decreased heavy episodic drinking. The intervention and control groups were compared on daughters' reports of first year sexual victimization, first semester college drinking and communication, and on mothers' reports of first semester communication (see Table 1). Means of continuous variables were compared using t tests, and the prevalence of IR in the first year of college was compared using chi square. Consistent with hypotheses, daughters in the intervention group were significantly less likely to report IR in the first year of college (8.0%) compared to the control group (12.1%, $\chi^2(1)=4.26$, $p=.04$). Total number of sexual victimization experiences reported was somewhat but not significantly lower in the intervention group compared to control. Consistent with the hypothesis that the intervention would result in increased mother-daughter communication, mothers and daughters in the intervention group reported more general communication during the first semester. Mothers (but not daughters) reported more alcohol-specific communication compared to controls. However, there were no group differences in frequency of heavy episodic drinking (HED) nor in typical number of weekend drinks.

Testing the Indirect Effects of PBI Intervention

We hypothesized that PBI would result in increased mother-daughter communication, leading to lower college HED, which would result in lower incidence of incapacitated rape and other college sexual victimization. To test this model of the direct and indirect effects of the combined intervention on college sexual victimization, we conducted path analyses. For the first model, we used as the outcome the occurrence of incapacitated rape (IR) in the first year of college. Regression was used to test the paths predicting the mediators, and logistic regression was used to test the paths predicting the dichotomous outcome of IR in the first year in college. Intervention was entered as a dummy variable coded 0 for the combined control groups, and 1 for the combined intervention groups. Daughters' reports of general mother-daughter communication and alcohol-specific communication were used as mediating variables. We also controlled for baseline HED and IR by including direct paths from these variables to T1 HED and T1/T2 IR, respectively. Because of the small amount of missing data, listwise deletion of cases with missing data was used, resulting in a small reduction in sample size ($N=896$). The means, standard deviations, and correlations of the variables included in the model are presented in Table 2. To test for mediation, the joint significance test of the indirect paths from the independent variable (intervention) to the mediator, and from the mediator to the outcome was used. It has been shown to have the most power and the most conservative Type I error rate compared with other methods to test indirect effects (MacKinnon et al. 2002) and has been used in other recent mediational studies (Turrissi et al. 2008). If both of the component direct paths in the mediational sequence jointly show significance at the .05 level, then there is evidence for a significant indirect or mediating effect through that mediator at the .05 level, and the product of the two component path estimates provides a point estimate of the mediated effect. Although originally proposed for the single-mediator or “two-path” situation, this same test has also recently been extended to the situation involving two mediators in sequence, i.e., a “three-path” mediated effect (Taylor et al. 2008). Thus, this joint significance test was used to assess the significance of the three-path mediated effects of intervention on IR via general communication and frequency of HED, and also via mother-daughter alcohol-specific communication and frequency of HED.

First, the direct effect of the intervention on the occurrence of IR in the first year of college, without the hypothesized mediators in the model, was tested. The direct effect of the independent variable on the dependent variable without controlling for the mediators is called the total effect (Shrout and Bolger 2002). A logistic regression predicting IR in the first year of college (coded 1 = yes, 0 = no), with the intervention dummy variable as the key independent variable, and controlling for baseline IR (age 14 to high school graduation), showed that intervention significantly reduced the odds of IR in college compared to controls, with an odds ratio (OR) of .63, $p<.05$, and 95% confidence interval (CI) (.40, .99).

The results of the path analysis including the putative mediators are presented in Fig. 1. Although standardized paths (denoted by β) are commonly used to present the results of path analyses, indirect effects are frequently expressed in terms of unstandardized coefficients (denoted b). Therefore, unstandardized coefficients are presented in Fig. 1. The intervention had a significant direct effect on reducing the probability of IR in the first year of college, even after controlling for the mediators ($b=-.550$, $p<.05$). This corresponds to an odds ratio of .58, with a 95% CI of (.35, .94). Intervention predicted increased general communication ($b=.198$, $p<.05$), which in turn predicted reduced HED ($b=-.076$, $p<.01$). Therefore, by the joint significance test, the indirect effect of intervention on fall HED via general communication was significant at $p<.05$. In turn, frequency of HED in the fall semester was highly significant in predicting IR in the first year of college ($b=.920$, $p<.001$, OR=2.51, 95% CI=2.00, 3.15). Therefore, by the joint significance test again, the “three-path” specific indirect effect of intervention on IR through communication and HED was significant at $p<.05$. The direct path

from general communication to IR was not significant ($b=-.150, p=.09, OR=.86, 95\% CI=.73, 1.02$). The indirect paths from intervention to both HED and IR through alcohol-specific communication were not significant, since intervention did not predict communication about alcohol ($b=.079, p=.10$), and communication about alcohol did not predict HED ($b=.046, p=.31$).

We repeated the above path analysis using total number of items on the SES endorsed during the first year of college as the sexual victimization outcome measure. Since this is a continuous dependent variable, the path analysis was conducted using Amos 7.0 Graphics software (Arbuckle 2006), using maximum likelihood estimation. The model fit well [$\chi^2(9, N=894) = 9.62, p=.38, CFI=0.99, TLI=0.99, RMSEA=.01$]. The path estimates were similar to those for the model using IR as the outcome measure with two exceptions. The direct path from intervention to total SES was not significant; however, there was a significant path from general communication to total SES. Specifically, more mother-daughter communication was associated with fewer sexual victimization experiences in the first year of college. Moreover, as in the previous path analysis using IR as the outcome, the indirect paths from intervention to SES via general communication and HED were significant at $p<.05$. In sum, consistent with the previous model, general but not alcohol-specific communication emerged as a mediator of the intervention effect.

To assess the robustness of the model, we repeated the above path analyses using weekend drinking in place of frequency of HED as the measure of drinking in the fall semester. Results were essentially the same. We also repeated the path models substituting mothers' measures of general and alcohol-specific communication in place of daughters' measures. The findings were identical with one exception. In the model predicting IR, the association between intervention and mothers' reports of alcohol-specific communication was significant and positive; however, alcohol-specific communication was not associated with HED or IR.

Discussion

The study provides evidence that parent-based intervention (PBI) prior to college matriculation can reduce the incidence of alcohol-related sexual victimization among female college freshmen. Given the lack of efficacious programs for reducing rape among college students (see Anderson and Whitson 2005; Blackwell et al. 2003; Breitenbecher 2000), the finding that a low-cost universal prevention intervention can reduce alcohol-involved sexual assault is an important contribution. Moreover, we found support for our hypothesized indirect effects model. Specifically, PBI increased mother-daughter general communication in the first semester of college which in turn predicted less frequent first semester HED, resulting in lower rates of incapacitated rape and fewer sexual victimization experiences in the first year of college.

Findings suggest that increased mother-daughter general communication during the first semester of college is the active ingredient of the PBI. Our measure of mother-daughter communication, which focused on daughter's willingness to disclose to her mother, was intended to be conceptually similar to measures of parental monitoring used with younger adolescents, but developmentally appropriate for young adults. Despite differences in measures, our findings are consistent with those of previous survey studies that demonstrate the importance of parental monitoring as a protective factor for adolescent and emerging adult substance use (Barnes et al. 2006; Capaldi et al. 2002; White et al 2006; Wood et al. 2004). By way of contrast, alcohol-specific communication did not mediate the intervention's effects, despite the fact that parent handbooks provided much factual information on alcohol use and mothers were encouraged to discuss this information with their daughters. Mothers assigned to intervention conditions reported more communication about alcohol topics with their

daughters and also believed that these conversations had gone well and that daughters were receptive. However, there was no corresponding intervention effect on daughters' reports of alcohol-specific communication, suggesting that mothers' efforts may not have been recognized as such by the recipients. It is also possible that mothers overestimated the extent to which they talked to their daughters about drinking, reflecting a motivation to act upon the intervention demands and to portray themselves as responsible parents. However, even when college students perceive more alcohol-related communication from their parents, it may not be associated with reduced college HED (Turrisi et al 2008). Alcohol-related communication reflects a one-way communication from mother to daughter, similar to traditional educationally focused approaches, which have generally proved ineffective (e.g., Larimer and Crouce 2002). In contrast, our measure of daughters' willingness to talk to their mothers is presumably reflective of an active, two-way communication process that permits the mother to monitor the daughter's activities and to offer input.

Despite overall support for the indirect effects model that was tested, intervention effects were relatively modest and we did not observe a direct effect of intervention on college HED. Likewise, the enhanced intervention did not increase daughters' sexual assertiveness or reduce sexual victimization relative to the alcohol-only intervention. PBI, by its very nature, necessitates an indirect effects model, whereby the intervention must be delivered by one person and then received, processed, and acted upon by another. Weaknesses in any step of the model will preclude the desired outcome; thus, the impact of PBI is likely to be more modest relative to more intensive or investigator-delivered interventions. With PBI, the researcher has little control over the strength or fidelity with which the intervention is delivered. That is, although mothers reported having multiple conversations with their daughters regarding the handbook, the content and effectiveness of these conversations varied widely, since parents cannot be trained to achieve fidelity as therapists are. Future efforts may be addressed toward strengthening PBI, for example, through booster or training sessions for parents. Alternatively, combining PBI with peer-based intervention appears to increase effectiveness in reducing HED relative to either method alone (Turrisi et al. 2009; Wood et al. 2008). On the other hand, PBI can be disseminated at very low cost to a large population. Thus, even a modest change in behavior can be considered cost effective and result in a meaningful reduction in negative consequences at a population level (Weitzman and Nelson 2004).

The longitudinal design, low attrition, and large community sample of mothers and daughters are strengths of the study. The sample, although not representative, is more heterogeneous than many other college samples, in that it included students attending 2- and 4-year colleges, living at home and in dorms. Although we relied on self-report, the availability of corresponding communication and monitoring measures from both mothers and daughters allowed for corroboration. Moreover, the model was largely equivalent regardless of whether mother or daughter reports of these mediators were used.

The study has important implications for prevention of college sexual victimization. First, parent-based intervention prior to college matriculation can reduce the high rates of sexual victimization that continue to be reported by college women. Given the strong link between college HED and alcohol-related victimization observed in this and other studies, interventions that have a significant direct effect on college HED may result in even larger reductions in college sexual victimization. Thus, addressing college sexual victimization by addressing college drinking, through any number of efficacious interventions that have been developed for this purpose (see Larimer and Crouce 2002, 2007 for reviews) appears to be a viable if underused approach (see Testa and Livingston 2009). Because the heaviest drinkers are at greatest risk of incapacitated rape (Mohler-Kuo et al 2004), interventions that can reduce HED among these women may be particularly effective in reducing sexual victimization. Second, as prevention researchers have emphasized, understanding how an intervention works and

identifying its active ingredients are key to developing and improving interventions (Longabaugh 2007; Michie and Abraham 2004). Our indirect effects model provides additional support for the importance of ongoing parental communication and monitoring as a means of reducing HED and its negative consequences (Turrissi 2008; Turrissi et al 2002). Although mothers of college students cannot monitor their daughters' activities in the same ways that they did in high school, they can foster open communication so that daughters are willing to discuss their college activities with them. By doing so, they can reduce their daughters' vulnerability to college heavy episodic drinking and alcohol-related sexual victimization.

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Note: Path coefficient estimates are unstandardized.
 $p < .05$. ** $p < .01$. *** $p < .001$.

Fig. 1.

Path model predicting incapacitated rape (IR) with all direct and indirect paths illustrated

Comparison of combined control group and combined intervention group on fall semester college measures of drinking and communication and on first-year college sexual victimization

Table 1

Measure	Group						<i>t</i> or χ^2	<i>d</i>
	Combined control group		Combined intervention group					
	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>		
Incapacitated rape, T1 or T2 (%)	12.1%	–	421	8.0%	–	487	4.26*	–
Total SES items endorsed, T1 + T2	1.13	2.15	442	0.95	2.08	509	–1.30	–0.08
Frequency of HED since started college (T1)	1.26	1.17	439	1.28	1.20	505	0.29	0.02
Weekend drinks (T1)	4.69	5.19	438	4.85	5.32	505	0.48	0.03
General communication—D (T1)	4.60	1.47	437	4.82	1.43	505	2.29*	0.15
Alcohol-specific communication—D (T1)	1.76	0.74	439	1.85	0.70	505	1.89	0.12
General communication—M (T1)	5.03	1.39	433	5.32	1.30	481	3.29**	0.22
Alcohol-specific communication—M (T1)	2.17	0.80	436	2.45	0.71	482	5.51***	0.37

SES Sexual Experiences Scale, HED heavy episodic drinking, D daughter, M mother, T1 end of first semester of college, T2 end of second semester of college

* $p < .05$,
** $p < .01$,
*** $p < .001$

Table 2Correlations, means, and standard deviations of variables in the path model ($N=894$)

Variable	1	2	3	4	5	6	7	8
1. HED (T0)	—							
2. Total SES items (T0)	.26***	—						
3. Incapacitated rape (T0) ^a	.32***	.63***	—					
4. General communication (T1)	-.00	-.03	.01	—				
5. Alcohol-specific communication (T1)	.08*	.04	.05	.31***	—			
6. HED (T1)	.63***	.18***	.21***	-.09*	.04	—		
7. Total SES items (T1 + T2)	.25***	.34***	.21***	-.12***	.01	.37***	—	
8. Incapacitated rape (T1 or T2) ^a	.25***	.23***	.22***	-.08*	.07	.33***	.65***	—
<i>M</i>	0.95	1.64	0.15	4.72	1.81	1.28	1.06	0.10
<i>SD</i>	1.10	2.52	0.36	1.45	0.72	1.18	2.14	0.30

All variables are daughter report. *HED* heavy episodic drinking, *SES* Sexual Experiences Scale, *T0* end of senior year in high school, *T1* end of first semester of college, *T2* end of second semester of college*
 $p < .05$,**
 $p < .01$,***
 $p < .001$ ^aDummy variable coded 1 for yes, 0 for no