Assault Related Substance Use as a Predictor of Substance Use Over Time Within a Sample of Recent Victims of Sexual Assault

Heidi S. Resnick, Ph.D.[1], **Kate Walsh, Ph.D.**[1], **Jenna L. McCauley, Ph.D.**[1], **Julie A. Schumacher, Ph.D.**[2], **Dean G. Kilpatrick, Ph.D.**[1], and **Ron E. Acierno, Ph.D.**[1]

[1]National Crime Victims Research and Treatment Center, Medical University of South Carolina, Charleston, SC

[2]Department of Psychiatry and Human Behavior, University of Mississippi Medical School

Abstract

Substance use at time of assault is reported by a significant subgroup of rape victims. This study examined: (1) prevalence of assault related marijuana or alcohol use among women seeking post-rape medical care; (2) sensitivity, specificity, positive and negative predictive power associated with reported use at time of assault in association with use in 6 weeks pre-assault, post assault use, and post-assault abuse; and (3) trajectories of use and abuse over time as a function of use in 6 weeks pre-assault/assault time frame use, exposure to brief intervention, and interaction of pre-assault/assault time frame use with intervention. Participants were 268 women seeking post sexual assault medical services completing one or more follow-up assessment at: (1) < 3 months post-assault; (2) 3 to 6 months post-assault; and (3) 6 months or longer post-assault. Use of alcohol or marijuana at time of assault were fairly sensitive or specific indicators respectively, of reported use of specific substance in the 6 weeks preceding assault and use or abuse at follow-up. Growth modeling revealed that use of alcohol or marijuana at the time of the assault or in the 6 weeks prior to assault predicted higher Time 1 follow-up alcohol and marijuana use and abuse. Although there was relatively little change in use or abuse over time, alcohol use at time of the assault or in the six weeks prior also predicted a steeper decline in alcohol use over the course of follow-up. Interestingly, women who reported using marijuana at the time of the assault or in the six weeks prior who also received a video intervention actually had lower initial marijuana use, a pattern that remained stable over time. Implications for evaluating screening, brief intervention and referral to treatment services among sexual assault victims seeking post-assault medical care are discussed.

Keywords

Sexual Assault; Drug Use; Alcohol Abuse; Screening; Intervention

1. Introduction

Data from U.S. epidemiological studies indicate lifetime prevalence of forcible, drug facilitated (resulting from victim having been administered a drug without her knowledge or consent) or incapacitated rape (resulting from self-induced intoxication by the victim to the point that she is unable to consent or resist) ranging from 16.1% to 18.3% (Kilpatrick, Resnick, Ruggiero, Conoscenti, & McCauley, 2007; Black et al., 2011).

1.1. Substance use and abuse among victims of sexual assault

Victims of sexual assault report higher prevalence of drug and alcohol use and abuse compared to non assault victims (Burnam et al., 1988; Kilpatrick et al., 2000; 2003; 2007; Polusny & Follette, 1995; Rheingold, Acierno, & Resnick, 2004). Rape victims who reported a history of voluntary substance use that led to incapacitated rape incidents also have been shown to report significantly higher recent substance abuse (McCauley, Ruggiero, Resnick, & Kilpatrick, 2010). Further, Testa and colleagues (2003) found that adult incapacitated rape experiences were significantly associated with history of adolescent substance use.

Conversely, prevalence of sexual assault is higher among those with substance abuse problems (Miller, Downs, Gondali, & Keil, 1987; Simpson & Miller, 2002). Logan, Walker, Cole, and Leukefeld (2002) reviewed findings regarding the relation between victimization and substance abuse among women and identified potential mechanisms underlying increased victimization risk including: lifestyle factors (e.g., use in high risk environments), impaired ability to recognize risk or make good decisions, perpetrator perceptions, and economic resources.

Longitudinal studies have examined potential reciprocal patterns of victimization and substance abuse over time with various populations of women. Kilpatrick and colleagues (1997) found that history of rape or physical assault reported at baseline increased risk of *both* alcohol and drug abuse in previously *non-abusing* women at two year follow-up assessment, while history of illicit drug use reported at baseline was a predictor of subsequent assault victimization. Among a representative community sample of women, Testa, VanZile-Tamsen, and Livingston (2007a) found that controlling for prior history of intimate partner victimization, baseline frequency of past year drug use was a significant predictor of intimate partner sexual victimization, whereas heavy episodic drinking predicted sexual assault by a non-intimate partner. In a separate report, significant bivariate associations were observed between sexual victimization and subsequent heavy drinking at follow-up; however, after controlling for prior heavy drinking status, sexual victimization was not predictive of heavy drinking (Testa, Livingston, & Hoffman, 2007b).

In sum, studies examining risk of subsequent drug or alcohol abuse as a function of victimization have yielded mixed results. Despite mixed findings, research establishes a notable association between substance abuse and sexual victimization, with different patterns observed in some studies related to specific substances and victimization risk; and prior substance use/abuse evinces strong associations with future substance use. Further, findings indicate different patterns of substance abuse associated with rapes that involve incapacitation due to use of drugs or alcohol on the part of the victim (e.g., McCauley et al., 2010; Testa et al., 2003).

1.2. Substance use among recent sexual assault victims seeking immediate post-rape medical care

Findings from the National Women's Study (Resnick et al., 2000) indicated that approximately one-fourth (26.2%) of women reporting a history of rape at age 18 or older

sought post assault medical care and are more likely to comprise those who report the incident to police and those more likely to indicate concerns related to sexually transmitted diseases. Medical care typically occurs within 72 hours after assault (Logan, Cole, & Capillo, 2007) and includes assessment of evidence as well as medical services (Ledray, 1999). The post-rape medical exam may present a unique opportunity to screen for substance abuse (and acute situational substance use) and provide feedback, brief intervention strategies, and/or referral for more in depth treatment.

Slaughter (2000) examined drug and alcohol use in the immediate time frame preceding (or as part of) a sexual assault incident. Urinalysis data based on samples from 2,003 cases throughout the U.S. and Puerto Rico in which use was reported or suspected at time of exam indicated that the most frequently detected substances were alcohol and marijuana, identified in 63% and 30% of samples tested, respectively. As the author noted, these findings indicate that greater focus should be placed on these drugs that may increase vulnerability to assault more so than rarely reported drugs such as Rohypnol. Consistent with this suggestion, epidemiological data indicate that alcohol and marijuana are the substances most frequently involved in drug facilitated or incapacitated rape (Kilpatrick et al, 2007).

Previously we have reported primary findings related to post assault time frame use and abuse of alcohol, marijuana, and other illicit drugs among a sample of recent rape victims who were assessed following the post rape medical exam and longitudinally over the course of 6-month follow-up as part of a randomized controlled trial examining the efficacy of a video-based intervention shown to women prior to the medical exam (Resnick et al., 2007). Participants who watched the brief video designed to reduce distress and promote adaptive coping post assault reported significantly lower frequency of recent marijuana use at all follow-up assessments controlling for reported use in the 6 weeks preceding assault. To our knowledge no prior study of recent sexual assault victims has included assessments of alcohol or marijuana use: (1) at the time of sexual assault (as reported at the post-assault medical exam), (2) retrospectively reported use in the weeks preceding the assault, and (3) longitudinal examination of trajectories of use and abuse up to 6 months post assault. If use at time of assault, as reported at the post rape medical exam, is a good indicator of existing substance abuse problems and/or a good predictor of post-assault problems, this limited information may be helpful in suggesting targeted screening strategies to facilitate appropriate brief intervention and/or referral to treatment. Routine screening for existing problem use is not currently done at the time of the post assault medical exam (Cole & Logan, 2008; Ledray, 2008) while use at time of assault *is* typically assessed as part of the assault description.

1.3. Aims of the current study

Goals of the present study were to examine reported use of alcohol or marijuana *at the time of or just prior to assault as reported at the post-rape medical exam* as well as whether it predicts the trajectory of use and abuse over time in the sample of women who participated in the above-noted randomized controlled trial of a video-based intervention. We hypothesized that: (1) based on prior research, use of alcohol and marijuana at time of or just prior to assault would be prevalent; (2) Based on previous findings related to greater prevalence of alcohol use at time of assault (e.g., Slaughter, 2000) and alcohol abuse as a more prevalent outcome relative to marijuana use or abuse (Resnick et al., 2007), alcohol use at time of assault will be a relatively sensitive predictor of reported heavy alcohol use in the 6 weeks prior to assault whereas marijuana use at time of assault will be a relatively more specific indicator related to prior use; (3) alcohol and marijuana use at time of assault respectively would be relatively more sensitive and specific indicators of use and abuse occurring at one or more follow-up assessments and moderation of this pattern based on

video condition was expected such that marijuana use at any follow-up would be lower among those in the video condition, controlling for marijuana use *at time of assault*; (4) substance use at time of assault would predict higher prevalence of abuse as well as greater frequency of recent use at each *specific* follow-up time point; and (5) trajectories of use over time would differ as a function of use *either* in the 6-weeks pre-assault *or* at the time of assault.

2. Method

2.1. Participants

Eligible participants were 268 adolescent girls and women age 15 years or older who were victims of sexual assault seen at a Southeastern academic medical center. Women presented for a post-sexual assault forensic medical exam and consented to participate in a randomized controlled trial of a brief video intervention designed to reduce distress and promote adaptive post-assault coping. Given the longitudinal nature of the current study, only women who completed one or more follow-up interview assessments conducted over the course of a 6-month follow-up period (Resnick et al., 2007) were included in these analyses. A specially trained project assistant obtained informed consent at the time of the initial medical examination and again at the first study follow-up interview. Individuals who could not provide informed consent to participate in the study (e.g., those with mental retardation, serious injury or interfering health condition, intoxication, or extreme distress that would interfere with the ability to attend to information about the study as assessed by the medical staff and project assistant on site) were considered ineligible. Procedures were approved by the medical center Institutional Review Board. More detailed description of the sample and study procedures is provided in a previous report (Resnick et al., 2007).

Of an initial group of 406 recruited at the time of the medical exam and participating in the brief intervention study (including watching the video if assigned to intervention condition), 66% (N=268) completed one or more follow-up assessments. In terms of specific follow-up time frames: 216 participants completed Time 1, which occurred within 3 months post-sexual assault (M = 48.94 days, SD = 11.14); 133 participants completed Time 2 assessment between 3 and 6 months post-sexual assault (M = 104.83 days, SD = 19.55); and 219 participants completed Time 3 assessment at 6 months or more post-sexual assault (M = 196.37 days, SD = 79.27)[1]. There were no differences among follow-up completers and non-completers in terms of race, age, or marital status.[2]

2.3. Measures

Information gathered at the time of medical exam services included demographics and self reported use of drugs or alcohol at time of or just prior to assault. Follow-up assessments were conducted using a structured clinical interview (*Sexual Assault Interview)* developed for this study to collect data regarding lifetime victimization, lifetime and recent substance use, and lifetime and recent substance abuse (based on DSM-IV criteria). The Sexual Assault Interview incorporated substance abuse and assault history sections that were developed and evaluated in prior epidemiological studies (Kilpatrick et al., 1997; 2000). Variables examined in the current study are described below.

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[1]A smaller number of participants completed the Time 2 assessment because that assessment was added into the study, after an intervention dismantling phase comparing major intervention components began in 2000 (See Resnick et al., 2007 for detailed description). This dismantling study phase included the addition of a 3 month follow-up assessment. The Time 1 and Time 2 assessments were conducted throughout the entire course of the study.

[2]For the purpose of analyses in the current report, race/ethnicity was based on information from the time of the medical exam, or if missing, based on report at first follow-up assessment. Of the 268 completing one or more follow-up assessments, 38.4% were classified as minority race/ethnicity and 61.6% were classified as non-minority. Of those classified as minority race/ethnicity, 98% reported that they were Black.

6 week Pre-assault High-Risk Alcohol Use was defined as consuming four or more drinks (defined as one can of beer, 4 ounce glass of wine, or one shot of liquor such as whiskey, vodka, or mixed drinks) in a day in the 6 weeks before the index sexual assault. *Pre-Assault Marijuana Use* was defined as *any* use of marijuana in the 6 weeks before the index sexual assault. Frequency of current alcohol or marijuana use was defined as number of days in which the specific substance was consumed based on self-report of use during the previous 2 weeks via the Time-Line Follow-back (TLFB) method (Sobell & Sobell, 1978) which has good reliability and validity for substance use frequency (Fals-Stewart, O'Farrell, Freitas, McFarlin, & Rutigliano, 2000). Alcohol and Marijuana Abuse were defined according to DSM-IV (American Psychiatric Association, 1994) criteria and diagnosed via structured clinical interview. The same methods were used for assessment of use at each follow-up; however, the time frame for assessment of post-assault abuse was based on the period since the assault at initial assessment and since the previous interview at subsequent assessments.

Any Prior Use—Separate indicator variables were constructed for pre-assault alcohol and marijuana use based on either reported use in the 6 weeks prior to assault (as described above) *or* use at time of assault of that specific substance.

Use or Abuse Over the Course of Follow-up—Separate indicators for alcohol and marijuana abuse at any time point were based on self reported abuse criteria being met at either time 1, time 2, or time 3 follow-up assessments. Similarly, an overall indicator of recent use at any follow-up time point was based on report of any use in the 2 weeks preceding either the time 1, time 2, or time 3 follow-up assessments. These variables were used in sensitivity, specificity, Positive Predictive Power (PPP), Negative Predictive Power (NPP), and correct classification descriptive and chi-square analyses related to use at time of assault.

2.4. Procedures

As described, women presenting at the hospital for a post-sexual assault forensic examination were assessed by trained project assistants regarding their ability to provide informed consent to participate. In addition to information collected as part of subsequent interview assessments, women consented to allow information gathered as part of the medical exam to be included as part of the current study. Women were randomly assigned to the video intervention or standard services (no video; NV) condition. Video condition participants watched the video before receiving the forensic sexual assault examination. Content included information about psychological and behavioral reactions that may occur after an assault as well as modeling of adaptive coping strategies including exposure to realistically non-dangerous cues. Drug and alcohol use were addressed as behaviors that might increase risk of assault and interfere with recovery. Modeling of identification and differential engagement in and reinforcement by activities and with social contacts that do not involve use of alcohol or drugs was included. Following the exam, participants were scheduled for an initial follow-up interview targeted at 6 weeks post-assault. Interviews were highly structured and were conducted by an experienced bachelor's level coordinator with several years of experience who was blind to treatment condition throughout the course of the study. Interviews were conducted in person with the exception of instances (less than 10% of all interviews) in which they could only be completed by telephone.

2.5 Data Analysis

We employed a data analytic plan that involved: 1) descriptive and chi-square analyses examining use at time of assault as a predictor (sensitivity, specificity, PPP, NPP) of use in the 6 weeks prior to assault; 2) descriptive and chi-square analyses examining use at time of assault as a predictor of overall post-assault use or abuse over the course of one or more

follow-ups within the full sample as well as separately for those in the comparison and intervention conditions; 3) descriptive, chi-square and ANOVA comparisons of alcohol or marijuana abuse, and frequency of use at specific follow-up assessments as a function of use of alcohol or marijuana at time of assault, respectively; and 4) growth modeling to explore longitudinal trajectories of substance use and abuse following sexual assault examining use *either* at time of assault *or* in the 6 weeks prior to assault, as well as intervention condition and interaction between prior use and intervention condition.

3. Results

3.1. Descriptive Analyses

Descriptive data regarding substance use at pre-assault, assault, and all follow-up time points are reported in Table 1. Given the low prevalence of other illicit drug use at time of assault and over the course of follow-up (see Resnick et al., 2007) information about other illicit drug use is not included.

3.2. Hypothesis 1 Use of alcohol and marijuana at time of or just prior to assault will be prevalent

As presented in Table 1, alcohol use was reported by 54%, while marijuana use at time of assault was reported by 12% of participants.

3.3. Hypothesis 2 Alcohol use at time of assault will be a relatively sensitive predictor and marijuana use at time of assault will be a relatively specific indicator of use of same specific substance in the 6 weeks prior to assault

Base rates of reported use in the 6 weeks prior to assault are included in Table 1. More than half of the participants (51%) reported one or more heavy drinking days and 29% reported marijuana use in the 6 weeks prior to assault. To examine the sensitivity and specificity of use at time of assault in classifying those who were using in the 6 weeks prior to the assault, chi-square analyses were conducted. Sensitivity, specificity, PPP, NPP, and correct classification associated with use at time as a predictor of use in the 6 weeks prior to assault are presented in Table 2. Sensitivity in the first column of the table refers to the percent of all those using the substance in the 6 weeks prior to rape who also reported use at time, whereas PPP is the percentage of all those who were using at time who also reported prior use. Specificity refers to the percent of those not using in the 6 weeks prior who were also not using at time of assault, whereas NPP is the percentage of those who reported no use at time who were also not using in the 6 weeks prior. Correct classification refers to the percentage of those accurately predicted positive or negative in terms of prior use based on use at time of assault. Chi-square analyses indicated a significant association between use of alcohol at time of assault and prior heavy use, $\chi^2(1,266)=54.1$, $p<.0005$. Marijuana use at time of assault was also associated with reported prior use, $\chi^2(1,265)=29.9$, p <.0005.

3.4. Hypothesis 3 Alcohol and marijuana use at time of assault respectively would be relatively more sensitive and specific indicators of specific substance use and abuse occurring at one or more follow-up assessments. It was expected that marijuana use at any follow-up would be lower among those in the video condition, controlling for marijuana use at time of assault

Sensitivity, specificity, PPP, and NPP and correct classification statistics associated with use at time as an indicator of use and abuse at follow-up are included in Table 2 for the overall sample and as a function of treatment condition. Here sensitivity is the percentage of those with use or abuse at follow-up who reported use at time, specificity is percentage of those without use or abuse at follow-up who were not using at the time, PPP is percentage of those who used at time who reported subsequent use or abuse, NPP is percentage of non-users at

time who did not report subsequent use or abuse. In each case within the full sample, regardless of intervention condition, use of specific substance at time of assault was significantly positively associated with use and abuse at follow-up (all p < .005). Among those in the non-video condition, use at time of specific substance was significantly positively associated with use and abuse at follow-up of that specific substance (all p < .05). Among those in the video condition, findings were similar with the exception of marijuana abuse. In contrast to those in the non-video condition (46.2% vs. 11.7%), prevalence of marijuana abuse at follow-up did not differ among those who were using versus not using at the time of assault (21.1% vs. 10.6%).

Base rate of marijuana use at any follow-up was 28% (32.7% control and 24.8% video). In the overall column in Table 2, it can be seen that regardless of intervention condition, 66% of those who used marijuana at time of assault were recent users at one or more follow-up (PPP). Findings indicated a different pattern for marijuana use at follow-up based on intervention condition as can be seen based on the PPP in the control as compared to the video condition. Among those in the control condition, 92% of participants who reported using marijuana at time of assault had used marijuana within the 2 weeks preceding one or more follow-up interview as compared to 9 of 19 women (47%) in the video condition who reported using marijuana at time of assault. This was a significant difference, $\chi^2(1,32)=6.91$, p <.05. Among those who had not been using marijuana at time of assault, follow-up use was not significantly different among those in the non-video (24.5%) and video (21.8%) conditions.

3.5. Hypothesis 4 Use of each specific substance at time of assault would predict higher prevalence of abuse as well as increased frequency of use at each follow-up time point

Descriptive data regarding prevalence of abuse and frequency of use at each specific follow-up point for alcohol and marijuana as a function of reported use at time of assault are presented in Table 3. Prevalence of abuse and frequency of use for specific substances were higher at each follow-up assessment in association with use of specific substance at time of assault with the exception of marijuana abuse for which this pattern was observed only at time 1 follow-up.

3.6. Hypothesis 5 Trajectories of use and abuse over time would differ as a function of pre-assault or assault related use

3.6.1—As can be seen in Table 1, prevalence of one or more days of heavy drinking in the 6 weeks prior to assault or use of alcohol at time of assault was 66%. Prevalence of marijuana use in the 6 weeks prior to assault or at the time of assault was 32.5%. Use at either time point is referred to as any prior use in these analyses. Longitudinal growth models were estimated with full information maximum likelihood (FIML), which assumes data are missing at random and uses all available data to test various combinations of population parameter estimates until it identifies parameter estimates that yield the best fit to the data as indicated by the highest log-likelihood value (Graham, Olchowski, & Gilreath, 2007). This approach is asymptotically equivalent to multiple imputation (Graham et al., 2007).

3.6.2. Unconditional Growth Models—Unconditional models (i.e., empty growth models without predictors) suggest that there is significant variability in the intercept and variance of alcohol and marijuana abuse and use. However, there does not appear to be significant overall variability in the slope of alcohol and marijuana abuse and use (see Table 4).

3.6.3. Alcohol Abuse and Use Growth Models—To explore whether trajectories of alcohol abuse and use vary over time depending on use at the time of the assault and use in

the previous six weeks, conditional growth models were estimated with alcohol use at the time of the assault or alcohol use in the six weeks prior to the assault, video condition, and the interaction between alcohol use prior to the assault and the video condition as predictor variables. Good model fit was evaluated using Kline's (2005) recommendation that the model chi-square statistic be non-significant, and Hu and Bentler's (1999) recommendations that the Comparative Fit Index (CFI) be greater than .95, the Root Mean Square Error of Approximation (RMSEA) be less than or equal to .06, and the Standardized Root Mean Square Residual (SRMR) be less than .08. Results of a model estimating changes in alcohol abuse over time revealed that the model fit the data well, $\chi^2(4) = 3.6$, $p = .47$, $RMSEA = 0.01$; $SRMR = 0.03$; $CFI = 1.0$, and alcohol use at or in the six weeks prior to the assault was associated with a higher likelihood of meeting criteria for alcohol abuse at intercept. More specifically, the log likelihood of meeting criteria for an alcohol abuse diagnosis at T1 was .31 higher for women who were using alcohol at the time of or prior to the assault when compared to those who were not after controlling for video condition assignment and the interaction between any prior alcohol use and video condition. There were no significant predictors of slope (i.e., change in likelihood of meeting criteria for alcohol abuse) over time. Consistent with the unconditional model results, rate of change in alcohol abuse diagnosis did not differ between groups, indicating that this higher likelihood of alcohol abuse at intercept was maintained over the course of the study for women who were using alcohol at the time of the assault.

When a conditional growth model estimating changes in alcohol use over time was examined, the model fit the data well, $\chi^2(4) = 1.5$, $p = .82$, $RMSEA = 0.01$; $SRMR = 0.02$; $CFI = 1.0$. Alcohol use at the time of the assault or in the six weeks prior to the assault was positively associated with higher intercept of alcohol use frequency (in 2-week assessment time-frame) but a swifter decrease in alcohol use frequency over time. More specifically, alcohol use at the time of the assault or in the six weeks prior to the assault was associated with a 3.6 day increase in number of days drinking at T1 and a .31 decrease in the number of days drinking alcohol at each assessment point after controlling for video condition and the interaction between any prior alcohol use and the video condition.

3.6.4. Marijuana Abuse and Use Growth Models—A growth model estimating the likelihood of meeting criteria for marijuana abuse over time fit the data well, $\chi^2(4) = 1.4$, $p = .84$, $RMSEA = 0.01$; $SRMR = 0.03$; $CFI = 1.0$, and revealed a significant effect of marijuana use at the time of or in the six weeks prior to the assault on the intercept for marijuana abuse at follow-up. Specifically, women reporting marijuana use in the six weeks prior to or at the time of the assault had a .25 higher log-likelihood of meeting criteria for marijuana abuse at intercept after controlling for the video condition and the interaction between any prior use and the video condition. There were no significant predictors of slope (i.e., change in meeting criteria for marijuana abuse) over time. A model predicting the trajectory of marijuana use frequency in the preceding two weeks (at each assessment point) also fit the data well, $\chi^2(4) = 2.9$, $p = .58$, $RMSEA = 0.01$; $SRMR = 0.02$; $CFI = 1.0$, and revealed that marijuana use at time or in the six weeks prior to the assault was associated with higher marijuana use frequency at intercept. Specifically, those using prior to the assault reported using 3.4 more days on average at the T1 assessment than those who did not report any prior marijuana use. Although there was not a main effect for video condition, a significant negative interaction between marijuana use at or prior to the assault and video condition suggested that those who were using at or in the six weeks prior to the assault who were assigned to the video condition reported using 1.5 days less at T1 when compared to those who were using at the time and assigned to the control condition. There were no significant predictors of change (i.e., slope) in marijuana use frequency over time.

4. Discussion

4.1. Main findings

The purpose of the present study was to examine associations between alcohol and drug use prior to a sexual assault (both immediately and distally) and alcohol and drug use over time. Such findings have relevance to approaches that may include substance abuse screening, brief intervention and referral to treatment (SBIRT) (e.g., Madras et al., 2009). Although substance use disorders are associated with numerous deleterious consequences, current emergency department procedures with sexual assault victims do not routinely address these concerns (Cole & Logan, 2008).

Hypothesis 1 regarding high prevalence of alcohol or marijuana use at time of assault was supported. More than half of participants reported alcohol use and 12% reported marijuana use at the time of assault. Findings are consistent with other studies indicating approximately half of emergency department based post-sexual assault medical care seekers reporting substance use at time of assault (Avegno, Mills, & Mills, 2007; Boykins, Alvanzo, Carson, Forte, Leisey, & Plichta (2009). Results are also consistent with those reported by Slaughter (2000) and others (Kilpatrick et al., 2007) indicating alcohol and marijuana as most commonly reported drugs. As previously discussed, use may increase risk of assault via multiple mechanisms including possible reduced awareness of danger, actual incapacitation, perception by the assailant that such incidents may be less likely to be reported, or other factors (Kilpatrick et al., 1997). Thus, intervention for substance abuse may reduce subsequent risk of victimization (Cunningham et al., 2009; Kilpatrick et al., 1997).

Hypotheses 2 and 3 focused on the utility of substance use at time of assault as an indicator of substance use in the 6 weeks prior to assault and use/abuse up to 6 months post-assault. Although substance use at the time of assault is assessed as part of the standard exam as descriptive information that may also relate to drug or alcohol facilitation or incapacitation, preexisting use or abuse problems are not routinely assessed at that time (Cole & Logan, 2008; Ledray, 2008). Approximately half of the sample reported one or more heavy drinking days and almost one-third were using marijuana in the 6 weeks prior to assault. As hypothesized, alcohol use at time of assault was a relatively more sensitive and marijuana use at time of assault a relatively more specific indicator of prior use and subsequent post-assault use and abuse. While the majority (75%) of those indicating prior heavy drinking or subsequent alcohol abuse (76%) also reported use of alcohol at time of assault and conversely, most pre-assault (95%) or post-assault (94%) non-marijuana users were also non-users at time of assault; substantial percentages of those with prior use and post assault use and abuse would be missed if predictions were based on assault time frame use alone. Given the significance of the problems of drug and alcohol use and abuse, it would be better to screen all who are being seen to avoid missed cases. As demonstrated by Cherpitel (1995) standardized screening measures of abuse (e.g., Babor, Biddle-Higgins, Saunders, & Monteiro, 2001; French, Roeback, McGeary, Chitwood, & McCoy, 2001) are superior to self report of use just prior to an incident leading to an ED visit.

With regard to hypothesis 3, moderation of the pattern for marijuana use by intervention condition was supported by the data. While this finding may indicate benefits of a brief universal intervention delivered at the time of the medical exam with respect to reduced frequency of marijuana use among those reporting use at time of assault, more traditional SBIRT approaches (e.g., D'Onofrio & Degutis, 2002; Madras et al., 2009) that allow for individualized assessment, targeted feedback, and referral as indicated might have stronger effects in terms of reducing alcohol or drug abuse within this population and as delivered in this type of setting. Findings indicate that SBIRT approaches can be conducted in

emergency rooms and primary health care settings with significant reduction of heavy alcohol and illicit drug use as well as increased positive functioning over the course of long term follow-up (Madras et al., 2009). Automated or computerized interactive approaches have the potential to aid in successful implementation (Gilbert, et al., 2008; Ondersma et al., 2007; Vaca, Winn, Anderson, Kim, & Arcila, 2011) with some strategies including facilitated and automated referral to appropriate substance abuse treatment providers within the community if indicated and desired by the individual (Boudreaux et al., 2009). Protocols that include booster sessions targeting substance abuse among those screened at risk and in depth treatment of PTSD among those who have persistent symptoms (e.g., Zatzick et al., 2010) might also be usefully integrated with SBIRT strategies.

It is important to address barriers to screening for substance abuse that have been identified in the post rape medical setting, including concerns about perceived blame (Cole & Logan, 2008; Ledray, 2008). There may also be specific concerns related to dual roles of nurses in terms of gathering evidence and providing medical care (Du Mont & Parnis, 2003). Thus, asking about prior substance abuse and particularly use of drugs other than alcohol may be purposely avoided. It would be important to work with those at multiple levels of the medico-legal system (e.g., nurses, police, prosecutors, judges) to address and reduce existing barriers to such individualized screening and intervention options to facilitate implementation. It may also be possible to identify strategies to address potential barriers that might include computerized assessment and automated feedback that could be delivered anonymously (e.g., Ondersma, Svikis, & Schuster, 2007). As suggested by Cole and Logan (2008) a universal approach to provision of information and presentation of coping strategies to facilitate reduced substance use or abuse as used here is one approach that might also be employed. Similarly universal provision of community referral resources might be done in a more comprehensive way than is done currently.

Data partially supported hypothesis 4, indicating increased alcohol abuse and *use* of either substance at each follow-up assessment. Findings may be seen as consistent with studies highlighting the self-medication properties of alcohol use and abuse and marijuana use and/ or may reflect other factors related to maintenance of use/abuse over time.

Hypothesis 5, relating to the trajectory of use and abuse over the course of follow-up revealed that alcohol and drug use in the 6 weeks prior or at time of the assault was associated with higher initial abuse and use at the T1 follow-up, which occurred less than 3 months post-assault). Following initial assessment, substance abuse and use appeared to level off, with women reporting substance use in the 6 weeks prior or at time of assault maintaining higher rates of abuse and higher levels of use over the remaining follow-up assessments (3–6 months and 6 months). The one exception to this pattern involved alcohol use frequency, which was higher among women who were drinking in the 6 weeks prior to or at the time of assault, but decreased at a faster rate for these women when compared to those who did not report any prior drinking. This finding warrants further investigation, but may be consistent with possible recognition of problem use following a traumatic event that may be related to use either directly at time of assault or more indirectly as a function of ongoing use and associated risk behaviors. It is important to note that women who were drinking at or prior to the assault reported substantially higher drinking frequency at T1, and although their drinking frequency declined at a steeper rate when compared to women who were not using alcohol at time of or prior to the assault, the actual amount of change was relatively small (approximately 1/3 of a day less on average at each assessment point). Nonetheless, this finding may suggest that delivering substance abuse services in the aftermath of a rape may capitalize on a potential catalyst effect by targeting women who may be most amenable to making changes in their substance abuse patterns. As further support for the potential promise in targeting women using at the time of an assault, the

present study revealed that women who were using marijuana prior to or at the time of the assault who also received a video intervention actually had lower marijuana use frequency at T1 while those who were using marijuana in the 6 weeks prior to or at the time of assault who did not receive the intervention reported using marijuana significantly more days on average at T1.

4.2. Limitations of study

The assessment of substance use in the weeks prior to rape was retrospective based on self-report at first follow-up interview and thus may be affected by recall bias and/or validity of self report of such information. Recent *alcohol* use at each follow-up was not restricted to heavy use and as such, may have included a wide range of intra-daily frequency of use. Findings related to the interaction between the intervention and prior marijuana use are promising, however, it will be important to examine such patterns in additional or larger samples that may include different types of brief screening and intervention strategies. Finally, onset of substance use and abuse may develop following initial or earlier victimizations. Longitudinal studies that include younger samples are needed to further elucidate the potential reciprocal patterns of sexual assault violence and substance use or abuse.

4.3. Implications of findings and Conclusions

Substance use and later abuse problems are prevalent among recent sexual assault victims seen for post assault medical care. SBIRT approaches targeting substance abuse may be usefully implemented with this population in this setting. Research to address barriers to implementation, development and/or evaluation of optimal approaches is recommended.

Acknowledgments

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Highlights

We examine prevalence of reported use of alcohol/ marijuana at time of sexual assault

We examine drug use at time of assault in association with reported pre assault use

We examine prior use and trajectory of drug use and abuse over time

Impact of a brief intervention on post assault drug use is assessed

Table 1

Descriptive statistics regarding alcohol use, alcohol abuse, marijuana use, and marijuana abuse at all assessment time-points.

	Pre-Assault	Assault	Any Prior	Any Follow-up
	% yes (N)	% yes (N)	% yes	% yes (N)
Alcohol Use	51.1% (136)[1]	54.1% (145)	66.4% (178)	66.0% (177)
Alcohol Abuse		----		28.0% (75)
Marijuana Use	29.1% (77)[2]	11.9% (32)	32.5% (87)	28.0% (75)
Marijuana Abuse		----		13.4% (36)

[1] Base N = 266

[2] Base N=265

Table 2

Sensitivity, specificity, positive and negative predictive power associated with use at time of assault

| | Prior Substance Use | Follow-up Substance Use and Abuse | | | | | |
| | | Overall | | Control | | Video | |
Alcohol Use at Assault	Prior Alc Use	Alc Abuse @ FU	Alc Use @ FU	Alc Abuse @ FU	Alc Use @ FU	Alc Abuse @ FU	Alc Use @ FU
Sensitivity	.76	.75	.67	.67	.63	.81	.70
Specificity	.69	.54	.70	.54	.69	.54	.71
PPP	.72	.39	.81	.39	.80	.38	.82
NPP	.73	.85	.52	.78	.47	.89	.56
CC	.73	.60	.68	.58	.64	.61	.70
MJ Use at Assault	**Prior MJ Use**	**MJ Abuse @ FU**	**MJ Use @ FU**	**MJ Abuse @ FU**	**MJ Use @ FU**	**MJ Abuse @ FU**	**MJ Use @ FU**
Sensitivity	.29	.28	.28	.35	.34	.21	.23
Specificity	.95	.91	.94	.92	.99	.89	.92
PPP	.71	.31	.66	.46	.92	.21	.47
NPP	.77	.89	.77	.88	.76	.89	.78
CC	.76	.82	.76	.83	.78	.81	.75

Note: PPP = Positive Predictive Power; NPP = Negative Predictive Power; CC = Correct Classification; Alc = Alcohol; MJ = Marijuana; FU = Follow-up

Table 3

Chi-square and ANOVA analyses for alcohol and drug abuse and use outcomes

	Alcohol Abuse χ^2 (p)						Alcohol Frequency F (p)		
	T1 Yes	T1 No	T2 Yes	T2 No	T3 Yes	T3 No	T1 M (sd)	T2 M (sd)	T3 M (sd)
Use at Time	χ^2 (1, N = 214)= 7.9 **		χ^2 (1, N = 133)= 6.0 **		χ^2 (1, N = 219)= 72 **		F(1, 214)=29.8 ***	F(1, 128)=30.3 ***	F(1, 215)=15.9 ***
Yes	22% (n=25)	78% (n=89)	22% (n=16)	78% (n=57)	26% (n=31)	74% (n=90)	3.7 (4.1)	3.5 (3.1)	3.3 (3.6)
No	8% (n=8)	92% (n=92)	7% (n=4)	93% (n=56)	11% (n=11)	89% (n=87)	1.1 (2.6)	0.9 (1.9)	1.5 (2.7)
	Marijuana Abuse						Marijuana Frequency		
	T1 No		T2 Yes	T2 No	T3 Yes	T3 No	T1 M (sd)	T2 M (sd)	T3 M (sd)
Use at Time	χ^2 (1, N = 214)= 5.8 **		χ^2 (1, N = 133) = 3.2		χ^2 (1, N = 219) = 1.9		F(1, 214) =13.2 ***	F(1, 129) =8.0 **	F(1, 215) =7.7 **
Yes	18% (n=5)	82% (n=23)	17% (n=3)	83% (n=15)	14% (n=4)	86% (n=24)	2.5 (4.4)	2.8 (4.5)	2.4 (4.5)
No	5% (n=10)	95% (n=176)	5% (n=6)	95% (n=109)	7% (n=13)	93% (n=178)	0.6 (2.2)	0.7 (2.6)	0.8 (2.5)

Note:

*
$p<.05$;

**
$p<.01$,

***
$p<.001$

Table 4

Unconditional Models				
	Intercept	Variance	Slope	Variance
Alcohol Abuse	**.16**[***]	**.04**[*]	.003	.002
Marijuana Abuse	**.08**[***]	−.02	−.001	.004
Alcohol Frequency	**1.15**[***]	.22	−.02	.003
Marijuana Frequency	**.83**[***]	.28	.009	.029
Alcohol Abuse Conditional Model				
Alcohol at or pre Assault	**.31**[***]	**.07**	−.02	.02
Video Condition (video = 1)	.01	.07	−.01	.02
Interaction (pre-alcohol X video)	−.12	.09	.03	.02
Alcohol Frequency Conditional Model				
Alcohol at or pre Assault	**3.6**[***]	**.68**	**−.31**[*]	**.13**
Video Condition (video = 1)	.48	.71	−.15	.13
Interaction (pre-alcohol X video)	−.57	.87	.22	.16
Marijuana Abuse Conditional Model				
Marijuana at or pre Assault	**.25**[***]	**.05**	−.01	.01
Video Condition (video = 1)	−.02	.03	.002	.01
Interaction (pre-marijuana X video)	.004	.07	−.10	.07
Marijuana Frequency Conditional Model				
Marijuana at or pre Assault	**3.4**[***]	**.52**	.07	.10
Video Condition (video = 1)	−.06	.37	−.09	07
Interaction (pre-marijuana X video)	**−1.5**[*]	**.66**	−.16	.12

[*]
p <.05,

[**]
p <.01,

[***]
p <.001