The Development and Evaluation of a Web-Based Intervention to Increase Safer Sexual Behavior Among Undergraduate Students: A Randomized Controlled Trial of a Theoretically-Driven Intervention

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ABSTRACT

Despite the high prevalence of sexually transmitted infections (STI) among undergraduate students, a paucity of empirically supported programs aimed at reducing STI transmission exist. The purpose of this study was to develop and test a theory-driven, web-based, safer sex intervention tailored specifically for undergraduate students. A sample of 100 sexually active undergraduate students completed baseline questionnaires assessing sociodemographics, sexual risk taking, history of potentially traumatizing events, endorsement of health behavior theory constructs (e.g. health behavior constructs pertaining to the theory of reasoned action and transtheoretical model), and endorsement of specific barriers to condom use. Results from the 30 undergraduate students who completed questionnaires at 1-month follow up revealed a significant effect of the intervention condition on condom use behaviors, with individuals in the web-based safer sex intervention condition reporting more consistent condom use than individuals in the waitlist control condition. There was no effect of the intervention on ratings of health behavior theory constructs. Results of a hierarchical regression analysis revealed that 31% of the variability in condom use was predicted by the combination of relationship status, condom use intent, and behavioral processes of change. Over half of intervention participants reported that the information presented in the intervention was relevant, they “learned a great deal,” the experience was fun, and they would recommend the workshop to a friend. This study provides preliminary evidence in support of the effectiveness and feasibility of a web-based intervention aimed at increasing safer sexual behaviors among undergraduate students.

Keywords: sexual risk taking, safer sexual behaviors, undergraduate students
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Introduction

Sexually Transmitted Infections (STI): Statement of the Problem

In 2008, not only did STI represent nearly half of the top ten most frequently reported diseases in the United States, but STI accounted for 91% of all infections reported to the U.S Centers for Disease Control and Prevention (CDC; CDC, 2009). In the United States alone, there are 20 million new STI occurring each year and there are currently 65 million people living with an incurable STI (CDC, 2013a). It is estimated that half of all sexually active individuals will acquire genital warts (HPV; Guttmacher Institute, 2006), and one in five Americans will acquire genital herpes (HSV-2), both of which are incurable (Weinstock, Berman, & Cates, 2004).

A number of factors complicate the interpretation of STI prevalence data. First, most STI are asymptomatic and go undetected, yet can still be passed on to sexual partners (Farley, Cohen, & Elkins, 2003). This leads to an underestimation of the actual prevalence rates of STI. Second, there are constant changes in reporting requirements and STI testing methods, which leads to difficulties in determining how much increases in prevalence rates of STI are due to changes in reporting and testing versus actual increases in STI incidence. Third, only chlamydia, gonorrhea, syphilis, hepatitis A, and hepatitis B are part of a national reporting system and are required to be reported to the CDC. This is particularly alarming because some of the more prevalent STI, such as HPV and trichomoniasis, are not being reported and therefore prevalence rates and costs associated with unreported STI can only be estimated. Fourth, surveys conducted to measure the prevalence of STI have not been based on representative samples of the U.S. population, and thus may result in skewed findings. Because of these complications, it is likely that
prevalence rates underestimate the large numbers of STI and are biased towards populations that have the means to access healthcare systems (CDC, 2013b).

Not only are STI extremely prevalent, the health consequences of STI can range from relatively minor infections such as discharge from the genitalia to more serious life altering states such as cancers of the reproductive systems, infertility, and even death. The consequences associated with STI are not limited to medical problems; there are financial repercussions associated with the transmission of STI as well. The direct medical costs associated with STI in the United States are estimated at up to $16 billion each year (CDC, 2013a). The prevalence rates and medical and financial costs of STI are particularly alarming both because they are so high and because STI are among the most preventable of diseases. With the exception of STI that are acquired via childbirth, the risk for STI transmission can be greatly reduced by practicing safer sex behaviors such as abstinence and engaging in less risky sexual behavior (e.g., unprotected sexual intercourse). Given the serious health and financial repercussions of STI, it is imperative that more focus is given to STI prevention efforts.

**Certain Populations are Particularly Vulnerable to STI**

STI negatively impact all communities; however, there are several populations that are particularly vulnerable for either STI transmission, the consequences associated with STI, or both. The following section will describe populations that are considered to be particularly vulnerable including: women, underserved racial and ethnic groups, men who have sex with men, and adolescents and young adults.

**Women.** Women disproportionately bear the long-term consequences of STI. It is estimated that at least 24,000 women in the United States become infertile as a
consequence of undiagnosed and untreated STI each year (U.S. Department of Health and Human Services, 2012). In addition, 20 to 40% of women infected with chlamydia and 10 to 40% of women infected with gonorrhea develop pelvic inflammatory disease which can lead to infertility, ectopic pregnancy and chronic pelvic pain. Furthermore, HPV is the leading cause of cervical cancer. For women who are pregnant, there are increased risks that STI will be transmitted to the fetus in utero or during delivery, which can result in adverse outcomes during pregnancy and infant development.

**Underserved racial and ethnic groups.** In the United States, individuals representing certain underserved racial and ethnic populations such as African American, Hispanic, and American Indian and Alaskan Native individuals have higher rates of chlamydia, gonorrhea, and syphilis than individuals representing other racial and ethnic populations such as Caucasian individuals (CDC, 2013b). It can be speculated that higher prevalence rates are related to the social and economic conditions that tend to be associated with individuals within these groups such as low socioeconomic status, high rates of unemployment, low educational attainment, and a lack of health insurance (Krieger, Waterman, Chen, Soobader, & Subramanian, 2003). These conditions all result in limits to access to sexual health services necessary for STI treatment and prevention.

**Men who have sex with men (MSM).** MSM tend to engage in a number of behaviors that put them at particular risk for STI including having high numbers of sexual partners, faster rates of changing and acquiring new partners, and engaging in high rates of unprotected sexual behavior (CDC, 2011). It has been found that an increasing number of MSM are acquiring STI, including HIV (CDC, 2009). The increases in documented STI among MSM are likely a conservative estimate due to the reliance on detection of
urethral infections rather than testing for pharyngeal and colorectal infections (CDC, 2011).

**Adolescents and young adults.** For nearly every STI, the rates of new infections are highest among persons aged 15 to 24. In the seminal article by Weinstock, Berman and Cates (2004), the authors found that although the 15- to 24-year-old population only represents a quarter of the sexually active population, it has been estimated that nearly half of all new STI cases are occurring within this population. This article was updated in 2013 by Satterwhite and colleagues, who came to the same conclusions. In the often cited article by Eng and Butler (1997), the authors attribute the high prevalence of STI within this population to engagement in sexual risk-taking behaviors including frequent unprotected sexual intercourse and a high number of unprotected sexual partners. Adolescent women, in particular, are more susceptible to infection and STI transmission due to the continued development of their cervix at this time. In adolescent females, the transformation zone of the cervix is larger than later in life. This area is not only more susceptible to the STI acquisition, but it is also the zone from which cervical cancer tends to originate (Meyers et al., 2008). Therefore, adolescent women are not only at particular risk for STI acquisition, but are also at greater risk for the more severe consequences of these infections.

The 15- to 24-year-old population is also one which tends to be strongly influenced by the social and physical environment, including family, friends, romantic partners, school, religious groups, and the general community (Kirby, 2001). A strong influence of the social and physical environment can be a protective factor if there are enough people or groups in the individual’s environment that express safe sex values or
model behaviors that reduce sexual risk taking; however, the opposite can be true in the case where riskier sexual behaviors are promoted and modeled (Kirby, 2001). Because of their engagement in risky sexual behaviors, biological development, and susceptibility to the social and physical environment, the 15- to 24-year-old age group represents a population that is at particular risk for STI transmission.

**The University Campus Represents an Ideal Setting to Access Vulnerable Populations**

Because of the representation of women, individuals representing underserved racial or ethnic groups, MSM, and the age range of undergraduate students, the university campus serves as an ideal setting to access all of these vulnerable populations. In 2009, 56.8% of undergraduate attendees were female, roughly 38% endorsed an ethnicity status other than Caucasian, and 3% endorsed gay or lesbian sexual orientation (Aud et al., 2011; American College Health Association, 2011). These percentages are similar to those found in the U.S. population: in 2011, 50.8% of individuals were female, 36.4% endorsed an ethnicity status other than Caucasian, and roughly 1.7% of adults identified as gay or lesbian (Gates, 2011; U.S. Census Bureau, 2012). Given that the majority of undergraduates are between 18 and 24 years of age, undergraduates make up a significant proportion of the 15- to 24-year-old population. Although the undergraduate population is inclusive of those populations considered to be particularly vulnerable, college students are likely not representative of those individuals who are most likely to experience the most debilitating constellation of medical, psychological, and social consequences of risky sexual behavior. Undergraduates are known to engage in behaviors that put them at particular risk for STI, such as having a high number of sexual partners, a high rate of
unprotected sexual activity, and using alcohol and other drugs in conjunction with sexual activity (Ratliff-Crain et al., 1999). The high rates of engagement in these sexual risk taking behaviors alone make the undergraduate population ideal for safer sex intervention.

Current Interventions to Reduce STI among the Adolescent and Young Adult Population

Currently, there are no empirically supported intervention programs that are specifically tailored for the university setting. However, there are some reviews of safer sex interventions with a subset of these interventions targeting adults and a greater proportion tailored for adolescents. In a well-regarded article, Noar (2008) conducted a review of meta-analyses of behavioral interventions aimed at reducing risky sexual behavior and found that behaviorally-oriented interventions were consistently effective at significantly increasing safer sex behaviors, and that specific components of effective behavioral interventions included a theoretical basis and an emphasis on skills training. His review resulted in a set of 18 meta-analyses with an average $k = 49$ studies (range: 4 – 350) and an average $N = 15,276$ participants (range: 365 – 110,972). One of the inclusion criteria required the meta-analyses to focus on a defined target population. The meta-analyses included in the review targeted the following populations: MSM (4); drug users (3); heterosexual adults (3), Hispanic/Latino populations (2), sexually active adolescents (2), STI clinic patients (2), HIV positive individuals (1), and individuals with severe mental illness (1). Potential outcomes of the meta-analyses included: increase in condom use, decrease in unprotected sex, decrease in number of sexual partners, decrease in STI acquisition, and a decrease in composite sexual risk – the definition of which
differed across meta-analyses and was not defined in the review. In order to provide a common metric for comparing meta-analyses, the authors converted effect sizes reported as Cohen’s $d$ (a measure of effect size based on differences between means) and Pearson’s $r$ (a measure of effect size based on variance explained) to odds ratios (OR; a measure of effect size that indicated the odds that one group or condition will be more successful than another group or condition) using the equation put forth by Sanchez-Meca, Marin-Martinez, and Chacon-Moscoso (2003). All 11 studies that examined the impact of interventions on condom use found a statistically significant increase in condom use (median OR = 1.34, range: 1.13 – 1.64). Nine of the 11 studies that examined the impact of interventions on unprotected sexual intercourse found a statistically significant decrease in unprotected sex (median OR = .76, range: .57 – .93). All of the five studies that examined the impact of interventions on a composite sexual risk variable found a statistically significant decrease in composite sexual risk (median OR = .78, range: .65 – .86). Three of the eight studies that examined the impact of interventions on number of sexual partners found a statistically significant decrease in number of sexual partners (median OR = .87, range: .74 – 1.54). Overall, the findings from this review point to the efficacy of behavioral interventions at reducing a number of risky sexual behaviors, with the strongest effects found for increasing the odds of condom use and decreasing the odds of acquiring an STI.

To date, three reviews have been performed to evaluate sexual education programs (Advocates for Youth, 2008; Kirby, Laris, & Rolleri, 2007; Kirby, 2001). Kirby (2001) evaluated 250 sexual education programs (for kindergarteners to high school students) and determined ten principles that were consistently found in effective sexual
education programs rather than ineffective sexual education programs. These principles consisted of:

1. A focus on decreasing at least one risky sexual behavior known to lead to STI transmission or unplanned pregnancy.
2. An emphasis on theoretical variables that have been demonstrated to affect risk-taking behavior.
3. A clear message regarding sexual activity and contraception use that is repeatedly reinforced.
4. The inclusion of information about the risks involved in unprotected sexual activity, and discussion of either abstinence or using contraception to avoid these risks.
5. The inclusion of information regarding social pressures that influence sexual behaviors.
6. The inclusion of modeling and practicing of communication, negotiation, and refusal skills.
7. The utilization of teaching methods designed to be personally relevant to and actively involve participants.
8. The incorporation of behavioral goals, materials, and teaching methods that are appropriate to the age, cultural identity, and sexual experience of participants.
9. A sufficient length of time to cover the material.
10. Adequate training of the instructor and the instructors’ belief in the program.
These ten principles can serve as a useful guide for the development of interventions aimed at reducing risky sexual behaviors for undergraduate students.

Kirby, Laris, and Rolleri (2007) followed up on this line of research with their review of 83 curriculum-based safer sexual education programs. Findings from their review revealed that, overall, programs that were based on theory were consistently more effective at increasing safer sexual behaviors. They also examined the effect of the programs on a variety of “moderating factors” including health behavior theory constructs. The authors found mixed support for the impact of programs on ratings of the following health behavior theory constructs: intent (10 out of 14 reported positive effects); normative beliefs around condom use behavior (4 out of 10 studies reported positive effects); condom use attitudes (14 out of 22 reported positive effects); and condom use self-efficacy (12 out of 17 studies reported positive effects). Taken together, the findings from this review indicate that although the majority of sexual education programs positively impact health behavior theory constructs, it is not uncommon for there to be nonsignificant effects.

**Adolescent safer sex program literature review.** From a review of 26 sexual education programs that had been published in peer-reviewed journals, utilized an experimental design, and included at least 100 adolescents, the Advocates for Youth (2008) highlighted 26 sexual education programs that were found to be effective at increasing safer sex behaviors among adolescents. One common factor among the effective sexual education programs within this review was an emphasis on theory. These theories included: social cognitive theory, theory of reasoned action, theory of planned behavior, health belief model, social influence theory, social learning theory and the
theory of gender and power. Findings from the three reviews of sexual education research are supported by reviews and articles describing the utility theory in interventions aimed at increasing safer sexual behaviors (DiClemente et al., 2004; Noar, 2008; 2007; Noar, Pierce, & Black, 2010).

Several constructs from theories of health behavior have been frequently implemented in interventions aimed at increasing safer sex behaviors within the adolescent population. These constructs include training to: 1) increase individuals’ perceived self-efficacy in using condoms, 2) negotiate condom use and sexual behaviors, 3) accurately appraise risk for STI, 4) accurately appraise peer risk behaviors, 5) clarify values, 6) increase positive attitudes and beliefs regarding safer sex behaviors, 7) decrease barriers to condom use, and 8) overcome barriers to condom use. In addition, adolescent programs have consistently included an STI knowledge component in their interventions (DiClemente et al., 2004).

Although theory may be a common factor among effective safer sexual programs and may promote engagement in safer sexual behaviors, it is unclear how effective interventions are at increasing ratings of health behavior theories and how these impact condom use. Studies of web-based interventions aimed at increasing safer sexual behaviors, have found only nominal changes in ratings of health behavior theory constructs despite significant changes in actual sexual behaviors (Hightow-Weidman et al., 2012; Kiene & Barta, 2006). The authors of these studies have suggested that ceiling effects and the possibility that behavioral change may not operate through theoretically predicted variables accounts for this effect. Taken together, it appears that theoretically-driven interventions and programs are more effective at increasing safer sexual behaviors
than interventions that are not informed by theory; however, how the theories operate to influence behavior remains unclear.

**Preliminary Studies that Examine Correlates of Undergraduate Engagement in Sexual Risk Behaviors and to Develop a Safer Sex Intervention Tailored for Undergraduates**

A preliminary study was performed to determine how consistent condom users (low risk, n = 58) and inconsistent condom users (high risk, n = 38) differed on ratings of health behavior theory constructs and STI knowledge. After adjusting for the effects of age, a significant multivariate effect of risk group was revealed \( \Lambda = 0.28, F(9, 64) = 18.52, p < .0001 \), with univariate analyses indicating that intent, normative beliefs, self-efficacy, and behavioral processes of change contributed significantly to the separation of high and low risk groups (Gerber, Carpenter, Cherup-Leslie, & Duckworth, 2009).

A second study was performed to extend the findings from Gerber and colleagues (2009) related to the importance of health behavior theory constructs to undergraduate engagement in sexual risk taking (Shearer, Renqvist, Cherup-Leslie, Petrie, & Duckworth, 2012). Drawing from recommendations by Noar, Cole, and Carlyle (2006) and the seminal paper by Sheeran and Abraham (1994), the second study included a more comprehensive measure of risky sexual behavior that included frequency of condom use, frequency of sexual intercourse, and number of partners was utilized and aimed to test the efficacy of a theoretically-based intervention aimed at increasing the adoption of safer sexual behaviors among undergraduate students. In the two phase protocol, 131 undergraduate students completed an initial survey assessing engagement in sexual risk taking and ratings of health behavior theory constructs. Data from 66 individuals who
endorsed being single and sexually active were used in a hierarchical multiple regression analysis that tested the contribution of age, gender, ethnicity, sexual trauma history, sexual education experience, condom use intent, barriers to using condoms, and knowledge of STI to risky sexual behavior. The full model accounted for 38% of the variance in risky sexual behavior, with condom use intent (11%) and condom use barriers (18%) accounting for significant, independent proportions of the variance in risky sexual behavior. These findings are consistent with other studies that have found a significant relationship between condom use and intent (Fazekas, Senn, & Ledgerwood, 2001; Godin et al., 2008; Molla, Astrom, & Brehane, 2007).

Of the 66 single, sexually active individuals who participated in Phase I of Preliminary Study 2, only five individuals participated in the intervention portion. Given that data from satisfaction questionnaires indicated that 4 out of 5 participants derived benefit from the interventions and 5 out of 5 participants would recommend the interventions to a friend, it is likely that the number of participants who completed Phase II was small due to the burden associated with attending three, two-hour intervention sessions and the possibility that participants perceived the psychological experience credit compensation as not commensurate with the time and effort required to complete the interventions and follow-up questionnaires.

**Web-based interventions.** A promising avenue that will likely counteract the burden associated with face-to-face interventions is the web-based modality. Web-based interventions have numerous advantages including: ease of dissemination, minimal costs post-implementation, standardization of content, potential for tailoring, potential for interactive and multimedia components, and lower avoidance of interventions due to
stigma (Bull, 2008; Cassell, Jackson, & Cheuvront, 1998; Fotheringham, Owies, Leslie, & Owen, 2000; Neighbors et al., 2009; Swendeman & Rotheram-Borus, 2010). A meta-analysis of web-based interventions indicated that there was greater improvement for individuals who participated in web-based interventions compared to non-web-based interventions, with 16 out of 17 studies showing greater positive effects for web-based interventions than face-to-face interventions (Wantland, Portillo, Holzemmer, Slaughter, & McGhee, 2004). Furthermore, it is likely that the advantages of web-based interventions will increase with the continued sophistication and dissemination of technology (Noar, 2011).

Effective web-based interventions have already been established in the areas of smoking cessation, weight loss, headaches, body image, posttraumatic stress, pathological grief, physical activity, panic disorder, tinnitus, diabetes management, and pediatric encopresis (Ritterband et al., 2003); however, the effectiveness of web-based interventions to reduce risky sexual behaviors has yet to be established. In a review of internet and cell phone based HIV/STI prevention programs, Ybarra and Bull (2007) found only three published web-based programs and five web-based programs that were still in development. This finding points to the growing research within this area; however, it also highlights the current lack of empirically-supported web-based interventions aimed at reducing risky sexual behavior. Furthermore, two out of the three published web-based programs and all five of the programs in development were targeted at MSM, with the remaining published program targeting HIV-positive adults. Thus, these programs would likely have limited generalizability to the majority of the undergraduate population.
Despite the lack of empirically supported web-based interventions aimed at reducing risky sexual behavior among young adults, there are a number of computer-based interventions that have been found to be effective at reducing risky sexual behavior. In a meta-analysis of computer technology-based interventions (CBI) to prevent HIV, Noar, Black, and Pierce (2009) found CBIs to have similar efficacy to traditional face-to-face interventions. Using search terms that included computer, internet, and technology as well as HIV, AIDS, condom use, and safe(r) sex, Noar, Black, and Pierce (2009) found 12 studies (cumulative $N = 4,639$) that utilized computer technology in interventions aimed at changing sexual risk behaviors. Ten of the 12 studies were of heterosexual samples, with the remaining two studies targeting MSM. Ten of the interventions were theory-based with the most often cited theories being the transtheoretical model, social cognitive theory, and the theory of planned behavior. The effect size for condom use across the 12 studies was $d = 0.259$, which indicated that the CBIs evidenced a small but statistically significant effect on increasing condom use behavior. The authors converted the effect size of CBIs ($d = 0.259$) to an OR of 1.54, using the equation put forth by Sanchez-Meca, Marin-Martinez, and Chacon-Moscoso (2003) to compare to prior meta-analyses of traditional interventions and found that the OR achieved for CBIs is consistent with traditional interventions. Noar, Black, and Pierce’s (2009) findings lend support to the efficacy of computer-based interventions to reduce risky sexual behaviors, and this modality is a promising avenue for further exploration.

With only 15 published studies of web- and computer-based interventions to reduce risky sexual behavior, few conclusions can be drawn regarding how to effectively
increase safer sexual behaviors, particularly within the undergraduate population (Noar, 2011). However, findings from these reviews point to the potential of these interventions for reducing risky sexual behaviors. Because of the benefits associated with computer- and web-based interventions (e.g., low cost of implementation after development, high potential for dissemination, preservation of intervention fidelity due to the standardization of content, and capability for tailoring and interactivity), these types of interventions merit further development and testing.

**Current study: An Intervention to Increase Safer Sex Behaviors among Undergraduate Students**

This project aims to develop and test a theory-driven, web-based, safer sex intervention tailored specifically for undergraduate students. It logically builds upon prior studies (Gerber, et al., 2009; Shearer et al., 2012) that have focused on delineating the relations among health behavior theory constructs and risky sexual behavior. The current project allows for the refinement and empirical evaluation of a safer sexual behavior intervention tailored for undergraduate students. By testing a theory-based intervention, the proposed project will provide much needed data pertaining to the relative utility of health behavior constructs in promoting safer sex practices among college-aged, young adults. Furthermore, the current intervention utilizes web-based technology to decrease the burden associated with the lengthy face-to-face sessions.

The current intervention was offered as an online course through the WebCampus Learn system. This system is widely used by universities and colleges, and particularly so at UNR, thus ensuring that UNR students would be familiar with this modality. In
addition, because of the widespread use of the WebCampus Learn system, it allows for ease of dissemination across other university campuses.

**Hypotheses.** The primary hypotheses of this project are as follows:

1. Participants in the web-based intervention condition will demonstrate significantly higher engagement in safer sex behaviors at follow-up assessments than participants in the waitlist control condition.

2. Participants in the web-based intervention condition will demonstrate significantly higher scores on condom use intentions, normative beliefs around condom use, condom use attitudes, condom use self-efficacy, and condom use pros as well as significantly lower scores on condom use cons and barriers to condom use compared to their baseline at post intervention and follow up. At follow up, web-based intervention participants’ scores on the above constructs will be significantly different in the above directions when compared to participants in the waitlist control condition.

3. Within the web-based intervention condition, condom use intentions and behavioral processes of change will be more predictive of engagement in safer sexual behaviors compared to other health behavior constructs at follow-up assessment.

**Method**

**Participant Recruitment**

Participants were recruited through announcements made at undergraduate-level psychology courses, as well as posted flyers across the university campus. Participants
were instructed to access the web-based consent form via the UNR psychology subject pool (SONA) website. The inclusion criteria for participation in the study were:

1. Participants must be between the ages of 18 and 24. This age window was chosen because individuals between the ages of 18 and 24 are particularly vulnerable to STI and because few empirically tested and supported interventions exist for individuals within this age range. Restricting the sample to individuals within this age range allowed for the development and test of an intervention particularly suited to the characteristics and needs of this population.

2. Participants must be sexually active and engaging in sexual risk taking behavior. To test the effect of the intervention on altering safer sexual behaviors rather than safer sexual intentions, undergraduates who were not sexually active and who already endorsed consistent condom use were excluded from study participation.

3. Participants must not have attended a human sexuality course at the university level. To test the effect of the intervention absent any effect of repeated exposure to the content of the intervention at the collegiate level, undergraduates who had attended a human sexuality course at the university level were excluded from study participation.

Participants

Please see Table 1 for description of the full sample, the completer sample, and UNR undergraduate demographics. A total of 100 students completed baseline questionnaires. The sample ranged in age from 18 to 25 years (M = 20.2, SD = 1.7), and reported an average of 14.7 years of formal education (SD = 1.4, range: 13-19). The majority of participants were Caucasian (69.9%), female (78.6%), and heterosexual
(93.9%). At 1-month follow-up, 30 students completed follow-up questionnaires. The 70 noncompleters did not differ from the 30 completers with respect to age, education, ethnicity, relationship status, or condom use (see Table 2).

The completers sample ranged in age from 18 to 24 years (M = 20.3, SD = 1.6) and reported an average of 14.6 years of formal education (SD = 1.3, range 13-17). The majority of completer participants endorsed being Caucasian (70.0%), female (82.8%), heterosexual (96.6%), and in a monogamous relationship for over a year (62.5%), with 37.9% of participants reporting exposure to sexual trauma (e.g., rape, attempted rape, molestation) and 27.6% of participants endorsing prior STI diagnosis.

Measures

Engagement in risky sexual behaviors. The Sexual Risk Taking questionnaire (SRT-Q; Metzler et al., 1992) is a standardized measure designed to assess the sexual behaviors of young adults. Items of the SRT-Q assess a number of items related to engagement in sexual risk behaviors including but not limited to: alcohol and other drug use in conjunction with sexual activities, prior STI diagnosis, sexual intercourse occurrence, sexual partner information, and birth control and condom use. This measure was administered at baseline and at 1-month follow-up. It was also used to determine the frequency of condom use. Other variables from this measure such as prior diagnoses of STI, birth control use, and the use of alcohol and other drugs in conjunction with sexual activities were used to describe the sexual activities of the sample.

Sociodemographic, Medical, Drug, and Alcohol information. This questionnaire assesses sociodemographic information, health information, drug and alcohol information, information regarding engagement in risky behaviors, and
regarding monogamous relationship status, and barriers to condom use. Although a standardized measure of sexual risk taking was included (sexual risk taking questionnaire; SRT-Q), the SRT-Q only assesses the numbers of times an individual engages in sexual activities, and does not assess the proportion or number of times an individual engages in sexual activities that are unprotected. The number of times an individual engages in sexual activities and the number of sexual partners he or she has engaged with conveys a degree of risk; however, unprotected sexual encounters are a more accurate measure of the number of actual exposures to risk as most STI are acquired and transmitted through unprotected intercourse (Jemmott & Jemmott, 2000). While the SRT-Q includes an item assessing frequency of condom use (e.g., always, most of the time, half of the time, sometimes, and never), it cannot be assumed that multiplying this frequency by the number of times an individual engages in sexual activities will yield an accurate number of times the individual engaged in unprotected sexual activities (Schroder, Carey, Vanable, 2003). For these reasons, items assessing the number of times an individual engages in unprotected vaginal and anal sexual intercourse and the number of unprotected vaginal and anal sexual partners were added to the sociodemographic questionnaire.

There is some evidence that although cons for condom use may not be strongly related to engagement in risky sexual behavior, barriers to using condoms elucidated in a small focus group of UNR students predicted significant and independent proportion of the variance in risky sexual behavior, thus these items were also included in the sociodemographic questionnaire (Shearer et al., 2012). The full Sociodemographic, Medical, Drug, and Alcohol measure was administered only at baseline, with the sexual
risk and monogamous relationship status items administered again at 1-month follow-up, and the barriers items administered again at post-intervention, and 1-month follow-up.

**Condom use intentions.** Condom use intentions were measured according to the specifications put forth by Ajzen and Fishbein (1980). They were assessed with two items, each answered on a 5-point scale (i.e., 1 [strongly disagree] to 5 [strongly agree]): “I intend to use condoms every time I have sex during the next year,” and “I intend to discuss sexual history and sexually transmitted infections with every new partner I have sex with during the next year.” These items were administered at baseline, post-intervention, and at 1-month follow-up.

**Normative beliefs around condom use.** Normative beliefs around condom use were assessed using Bosompra’s (2001) Subjective Norms measure. The measure consists of eight items measured on a 7-point scale. It assesses an individual’s perceptions of his or her peers’ beliefs regarding condom use as well as the individual’s evaluations of peer beliefs. Peers are conceptualized as sexual partners, close friends, parents, and doctors. Bosompra (2001) reported internal consistency reliability estimate of $\alpha = .71$. This measure was administered at baseline, post-intervention, and at 1-month follow-up.

**Condom use attitudes.** Condom use attitudes were measured using items adapted from Thorburn and Bogart (2005). Attitudes about condom use were assessed along five dimensions: bad/good, harmful/beneficial, difficult/easy, dangerous/safe, and immoral/moral, with each dimension answered on a 5-point scale (e.g., 1 [very bad] to 5 [very good]). Thorburn and Bogart (2005) reported internal consistency reliability
estimates for this measure to range from $\alpha = .69$ to .85. This measure was administered at baseline, post-intervention, and at 1-month follow-up.

**Condom use self-efficacy.** The Confidence scale of the Condom Self-Efficacy Scale (CSS) was used to assess condom use self-efficacy (Evers, Saxon, Redding, Rossi, & Levesque, 1996; Redding et al., 2001; Redding et al., 1998; Redding et al., 1996; Redding & Rossi, 1999). This scale consists of five items that assess confidence in engaging in safe sex when really sexually excited, a little drunk or high, a sexual partner is annoyed about having safe sex, feeling depressed, and the risk appears to be low, measured on a 5-point response scale (i.e., 1 [not at all confident] to 5 [very confident]), (Redding & Rossi, 1999). Redding and Rossi (1999) reported internal consistency estimate of $\alpha = .94$ and test-retest reliability estimate of $\alpha = .93$. This measure was administered at baseline, post-intervention, and at 1-month follow-up.

**Condom use decisional balance.** The ten-item Decisional Balance measure includes five pros and five cons for condom use (Evers et al., 1996; Redding et al., 2001; Redding et al., 1998; Redding et al., 1996). The measure begins with the statement: “Listed below are several possible advantages of using condoms. HOW IMPORTANT is each of these advantages to you in deciding whether or not to use condoms for either vaginal or anal sex, using the following 5 point scale?” This statement is repeated for the cons items with “disadvantages” substituted for “advantages.” An example of a pro statement is: “I would feel safer.” An example of a con statement is: “It would be a lot of trouble.” Internal consistency estimates for the two scales range from .82 to .88 and test-retest reliability estimates for these scales range from .81 and .89 (Evers et al., 1996;
Redding et al., 2001; Redding et al., 1998; Redding et al., 1996). This measure was administered at baseline, post-intervention, and at 1-month follow-up.

**Processes of change around condom use.** Redding and colleagues (1996) measure of Processes of Change was used to assess 14 cognitive, behavioral, and interpersonal processes of change around condom use (Evers et al., 1996; Redding et al., 2001; Redding et al., 1998; Redding et al., 1996). This 42-item measure begins with the statement: “Here are some thoughts and experiences that can affect people’s condom use. How often in the last 30 days did you do, feel, or think . . . ?” Responses are measured on a 5-point scale (i.e., 1 [never] to 5 [very often]). Internal consistency estimates for the 14 scales range from .65 to .90 and test-retest reliability estimates for these scales range from .65 to .85 (Evers et al., 1996; Redding et al., 2001; Redding et al., 1998; Redding et al., 1996). This measure was administered at baseline, post-intervention, and at 1-month follow-up.

**Prior exposure to potentially traumatizing events.** Because of the relation between exposure to sexual trauma and engagement in risky sexual behavior (Batten, Follette, & Aban, 2002), a measure of exposure to potentially traumatic events has been included. The Stressful Life Events Screening Questionnaire (SLESQ; Goodman, Corcoran, Turner, Yuan, & Green, 1998) is a standardized, 17-item instrument that measures exposure to various traumas including sexual assault, physical assault, illness, accidents, traumatic deaths, and natural disasters. Goodman and colleagues (1998) reported test-retest validity with a median kappa of 0.73 and convergent validity with median kappa of 0.64. This measure was given only at baseline assessment.
Specific knowledge. In order to assess attentional focus to the intervention as well as how much information individuals retained from the intervention, a brief Specific Knowledge measure was included. Participants’ knowledge regarding UNR-specific STI prevalence and correct condom use was obtained using three open-ended questions (e.g., name three of the top STI at UNR). These items were used to determine direct knowledge gained from the intervention and the persistence of this knowledge over time. This measure was administered at baseline, post-intervention, and at 1-month follow-up.

Intervention evaluation. Because satisfaction has been found to be related to treatment outcomes (Ciarlo et al., 1981) and to assess the feasibility of the intervention, a measure to evaluate the intervention was included. The intervention was evaluated using five items with a 5-point response scale (i.e., 1 [strongly disagree] to 5 [strongly agree]). Items assess whether participants found the intervention to be enjoyable, whether he or she learned a great deal, whether the information was new for him or her, whether the information was relevant to him or her, and whether he or she would recommend the intervention to a friend. This measure was administered only at post-intervention assessment to determine satisfaction with the intervention.

Procedure

Participant flow is presented in Figure 1. The study procedures are described in further detail below.

Web-based consent and randomization. The study and its synopsis were posted on the SONA site with a link to the web-based consent form. The web-based consent form included a brief online screening measure to ensure that participants met inclusion criteria. At the end of the web-based consent form, participants were asked if they would
like to participate in the study, and to click on an "I Agree" radio button and provide their email address. If they did not wish to participate, participants had the option of clicking an "I Disagree" radio button and were directed to a page thanking them for consideration of the study. Participant email addresses were used in lieu of a signature and so they could be contacted to be invited to the intervention and baseline assessments. Upon clicking “I Agree” and submitting their email address, participants were randomized into either the web-based intervention or waitlist control condition. Random assignment was established through the use of a computer algorithm (Urbaniak & Plous, 2011). Random numbers (i.e., 1 or 2) were generated using Urbaniak and Plous’s website, http://www.randomizer.org, and these numbers were used to assign participants to the two conditions.

Participants randomly assigned to the web-based intervention condition were invited via email to access the web-based intervention hosted on the UNR WebCampus Learn system. They were given a username generated for the purposes of this study to access the UNR WebCampus Learn system anonymously. Participants randomly assigned to the waitlist control condition were given the option to participate in the web-based intervention after the 1-month follow-up assessment had been completed. They completed baseline and follow-up assessment measures at the same time as the web-based intervention participants.

**Intervention.** The current intervention is theoretically-driven, behavioral, and is informed by findings from reviews conducted by the Advocates for Youth (2008), DiClemente and colleagues (2004), Kirby (2001), and Noar (2008). The resulting intervention focuses on increasing condom use with content that emphasizes theoretical
constructs (i.e., condom use intentions, behavioral processes of change around condom use, normative beliefs regarding condom use, condom use attitudes, condom use self-efficacy, and condom use pros and cons). The intervention is two hours long and consists of baseline assessment, three modules (i.e., risk perception, condom use negotiation skills, and condom use skills), a quiz following each module, and post-intervention assessment. The three modules are logically ordered so that the risk perception module will likely increase intent to use condoms, thus increasing motivation to attend to the following modules. The remaining modules address barriers to condom use, behavioral processes of change around condom use, normative beliefs around condom use, and condom use self-efficacy. The specific curriculum and ordering of modules and assessments are shown in a screen shot of the web-based intervention welcome screen in Figure 2. The modules are described in more detail below.

**Risk perception module.** The main emphasis of the risk perception module is to change normative beliefs regarding the prevalence of STI and to increase intentions to reduce risky sexual behavior. The module references actual prevalence data obtained from the UNR population to tailor the information to the participants. The format consists of an online journal assignment in which participants complete an assessment that calculates their number of sexual partners during the past year multiplied by each of these partners’ numbers of partners for the past year. The resulting numbers are used to engage in a probabilistic self-diagnosis of STI exposure based on the UNR prevalence rates of STI. See Figure 3 for screen shots of this task.

**Condom use negotiation skills module.** The main emphasis of this module is to increase positive normative beliefs regarding condom use, increase positive attitudes
regarding condom use, increase the pros for condom use, decrease the cons for condom use, and increase behavioral processes of change around condom use. The module includes an online journal assignment for each participant to list perceived barriers to condom use as well as identify methods of negotiating these barriers. Additionally, common condom use barriers as well as ideas for negotiating these common barriers are posted to a discussion board accessible by all intervention participants. Participants voted to determine which entries appeared to be the most useful based on perceptions of efficacy and ease of use. As participants completed the online journal assignment, their entries were added to the discussion board so that other participants could observe and evaluate the responses provided by all intervention participants.

**Condom use skill module.** The main emphasis of this module is to increase condom use self-efficacy, increase positive attitudes regarding condom use, increase the pros for condom use, decrease the cons for condom use, and increase behavioral processes of change around condom use. Because there is no “hands-on” component to the online intervention, condom use skills were presented in a video and participants had the opportunity to critique videos in their online journal to determine common errors in condom use.

**Follow-up assessment.** All participants were e-mailed links to fill out assessments at 1-month post-intervention. Follow-up assessment included select items from the Sociodemographic, Medical, Alcohol and Drug measure, and the full SRT-Q, Condom Use Intentions, Subjective Norms, Condom Use Attitudes, Condom Use Self-Efficacy, Decisional Balance, Processes of Change, and Specific knowledge measures
**Research subject payment.** Participants in the web-based intervention were eligible to be compensated with two Psychology Experience Credits for participation in the intervention and participants randomized to the waitlist control condition were eligible to be compensated with one Psychology Experience Credit for baseline assessment. All participants received one entry into a drawing for a $50 gift card after completing each follow-up assessment.

**Data Screening and Analysis**

The SPSS System (version 20) for Windows was used for all analyses. A significance level of $\alpha = .05$ was applied in evaluating the strength of all analyses. Primary analyses were performed on data from the completers sample ($N = 30$). Independent t-tests for continuous variables and chi-square tests for categorical variables were used to test for differences between completers and noncompleters on baseline demographic, risky sexual behavior, and health behavior theory variables.

Random assignment to the safer sex workshop or waitlist control condition resulted in a completer sample that included 14 students in the safer sex workshop and 16 students in the waitlist control condition. Although 62.5% of the sample endorsed being in a monogamous relationship for more than a year, the decision was made to retain these individuals in primary analyses for four reasons: 1) definitions of monogamy can vary widely, for example from lifelong monogamy (one sexual partner across the lifespan), to serial monogamy (several mutually monogamous, non-concurrent partners across the lifespan), to complete promiscuity (one sex act per partner; Conley, Ziegler, Moors, Matsick, & Valentine, 2012), 2) despite serial monogamy, individuals may be engaging in biologically concurrent relationships due to the infectious periods of various STI (Mercer
et al., 2013), 3) many individuals underestimate their sexual partners’ risk behaviors (Warren, Harvey, & Agnew, 2012), and 4) individuals use condoms more consistently with “casual” as opposed to “regular” partners (Warren, Harvey, & Agnew, 2012). These reasons suggest that, although individuals who endorse monogamous relationship status may perceive themselves to be at decreased risk and thus use condoms less consistently, this perception of risk status may be false due to varying definitions of monogamy, the potential for biologically concurrent relationships, and underestimations of partners’ sexual risk taking behaviors.

All continuous variables were tested for normality and univariate and multivariate outliers. One univariate outlier was identified. Deletion of this outlier resulted in 14 individuals in the safer sex workshop condition and 15 individuals in the waitlist control condition. Based on the number of participants completing both phases of the intervention repeated measures analyses of variance (ANOVA) was determined to be the best strategy for testing between groups differences (Simpson et al., 2008; Voelkle & McKnight, 2012). The effectiveness of the safer sex workshop was tested using repeated measures ANOVA in which change from baseline to 1-month follow-up on the outcome measure of condom use was investigated using Time, Condition, and Time x Condition as predictors. Consistent with the literature, Cohen's \( d \) were calculated as a measure of effect size, and this was converted to OR using the equation put forth by Sanchez-Meca, Marin-Martinez, and Chacon-Moscoso, 2003).

Due to a small sample size, rather than testing ratings of each health behavior theory construct separately, two composite variables were created: 1), health behavior theory constructs that promote condom use (i.e., condom use intentions, normative
beliefs regarding condom use, condom use attitudes, behavioral processes of change around condom use, cognitive processes of change around condom use, condom-specific processes of change around condom use, condom use self-efficacy, and condom use pros) and 2), health behavior theory constructs that reduce the likelihood of condom use (i.e., condom use cons and barriers to condom use). To evaluate the potential impact of the safer sex workshop on health behavior theory variables, two repeated measures ANOVA were performed in which changes from baseline to 1-month follow-up on the outcome measures of a composite variable of health behavior theory constructs that promote condom use and a composite variable of health behavior theory constructs that reduce the likelihood of condom use were investigated using Time, Condition, and Time x Condition as predictors.

Results

Univariate and chi-square analyses were performed to compare safer sex workshop and waitlist control groups on Sociodemographic variables. There were no significant differences between participants in the safer sex workshop and waitlist control conditions on demographic variables of age, gender, ethnicity, education, and relationship status (See Table 3).

Effectiveness of Safer Sex Workshop on Altering Condom Use Behavior

Table 4 presents the results of the repeated measures ANOVA with treatment condition (i.e., safer sex workshop or waitlist control) as the fixed between-groups effect, time (i.e., baseline and 1-month follow up) as the fixed within-subjects effect, and participant as the random effect. The Condition x Time interaction was significant for condom use behaviors, $F_{1, 24} = 4.4; p < .05; d = 0.80; OR = 3.74$ (see Fig. 1). This
implies that changes in condom use were different across the two conditions over time and the workshop participants 3.74 times more likely than waitlist control participants to use condoms (McHugh, 2009). This amount of change is considered a "large" effect (Cohen, 1988). Students who participated in the safer sex workshop condition endorsed significantly more consistent condom use behaviors over time than the waitlist control condition.

**Effectiveness of Safer Sex Workshop on Altering Ratings of Health Behavior Theory Variables**

Table 4 presents the results of the series of repeated measures ANOVA with treatment condition (i.e., safer sex workshop or waitlist control) as the fixed between-groups effect, time (i.e., baseline and 1-month follow up) as the fixed within-subjects effect, and participant as the random effect. There was no significant interaction effect for health behavior theory constructs that support condom use, nor were there significant time or condition effects. There also was no significant interaction effect for health behavior theory constructs that reduce the likelihood of condom use, nor were there significant time or condition effects.

**Impact of Health Behavior Theory Constructs on Condom Use Behavior**

Prior studies of web-based interventions aimed at increasing safer sexual behaviors have found only nominal changes in ratings of health behavior theory constructs despite significant changes in actual sexual behaviors (Hightow-Weidman et al., 2012; Kiene & Barta, 2006). Consistent with these studies, findings from the current study revealed only nominal changes in ratings of health behavior constructs. Therefore, as a post-hoc analysis, a regression analysis that included baseline data from the full
sample was performed to compare the utility of theory of reasoned action and transtheoretical model variables at explaining condom use behavior.

Consideration of the theoretically indicated variables as well as the relations among variables in the present dataset indicated the inclusion of the following variables in the hierarchical multiple regression analysis predicting condom use behavior: relationship status, condom use intent, and behavioral processes of change. Candidate variables for the hierarchical multiple regression analysis were checked for collinearity and were identified by checking condition indices and variance proportions. The intercorrelations among these variables are presented in Table 5. The full model was significant $F(3, 79) = 11.6, p = 0.00$, and accounted for 31% of the variance in condom use behavior (see Table 6). In the last step, only behavioral processes of change made separate and unique contributions to the variance in condom use behavior.

**Secondary Analyses**

**Determining the effect of the web-based intervention on ratings of health behavior theory constructs.** Results of the within-subjects ANOVAs are presented in Table 7. There were few significant changes on ratings of health behavior theory constructs from baseline to 1-month follow up. With normative beliefs showing a decrease in ratings at follow-up and condom use pros showing an increase at follow up. These finding suggests that the workshop did not have a great impact on participant ratings of health behavior theory constructs.

**Determining the effect of the web-based intervention on specific knowledge.** Results of the within-subjects ANOVAs are presented in Table 7. Scores on the Specific Knowledge measure significantly increased at post-intervention assessment and these
increases were maintained at 1-month follow up. This suggests that workshop participants attended to workshop content and the knowledge gained from the workshop was retained at 1-month follow up.

**Determining satisfaction with the web-based intervention.** Overall, web-based intervention participants were satisfied with the intervention (M = 16.9, SD = 3.9, R = 8-25). In specific, 65.3% of the sample agreed or strongly agreed the information presented in the intervention was relevant, 61.2% of the sample agreed or strongly agreed they “learned a great deal,” 53.0% of the sample agreed or strongly agreed the experience was fun, 51.1% of the sample agreed or strongly agreed they would recommend the workshop to a friend, and 26.5% of the sample agreed or strongly agreed the information was new.

**Discussion**

The purpose of the current study was to develop and test a theory-driven, web-based, safer sex workshop tailored specifically for undergraduate students. Follow-up data between workshop and waitlist control groups were compared to determine the effectiveness of the web-based workshop at increasing safer sex behaviors (e.g., condom use) and altering ratings of health behavior theory constructs. Findings suggest that the web-based workshop was effective at increasing safer sex behavior (the primary goal of this study) and produced few significant changes in ratings of health behavior theory constructs. In addition, the results from analyses performed on the full sample at baseline point to the importance of both condom use intentions and behavioral processes of change at explaining condom use behavior.
Effect of the Intervention on Condom Use and Other Sexual Behaviors

**Condom use.** As hypothesized, undergraduate students who participated in the web-based workshop endorsed significantly more consistent condom use behaviors over time than the waitlist control condition. Specifically, individuals who participated in the web-based workshop endorsed using condoms “rarely” at baseline and then “about half the time” at 1-month follow-up. Individuals in the waitlist control condition tended to endorse using condoms “rarely” at baseline and this pattern of endorsement remained stable at 1-month follow-up. This amount of change is in keeping with findings from the current literature evaluating the effect of interventions aimed at increasing condom use among a variety of populations (Noar, 2008). When specifically compared to meta-analyses of other computer-based interventions aimed at reducing sexual risk taking and interventions aimed at reducing sexual risk taking among adolescents and heterosexual adults the odds ratios for condom use behavior, condom use skills, and unprotected sexual partners are within the same range if not considerably higher (Johnson et al., 2003; Logan et al. 2002, Mullen et al., 2002; Neumann et al., 2002).

**Other sexual behaviors.** The odds ratios for the effect of the web-based intervention on unprotected sexual partners (OR = 1.5) and frequency of unprotected sexual (OR = 1.24) intercourse are consistent with previously published meta-analyses (Johnson et al., 2003; Logan et al. 2002, Mullen et al., 2002; Neumann et al., 2002). These findings are promising given the emphasis on the adoption of safer sexual behaviors within the present study.
Effect of the Intervention on Health Behavior Theory Constructs

There were no significant differences between the waitlist control condition and web-based workshop on composite health behavior theory variables at 1-month follow-up nor were there significant changes within the web-based workshop condition from baseline to post-workshop assessment. These findings are consistent with Kirby, Laris, and Rolleri’s (2007) review that found mixed support for the ability of curriculum-based programs at changing ratings of health behaviors. Studies of web-based interventions aimed at increasing safer sexual behaviors have found only nominal changes in ratings of health behavior theory constructs despite significant changes in actual sexual behaviors, which is also consistent with the pattern of results from the present study (Hightow-Weidman et al., 2012; Kiene & Barta, 2006).

Given the heavy emphasis on peer responses in the workshop (e.g., the use of discussion board, exercises involving rating others’ responses, and presentation of data specific to UNR), it is somewhat surprising that the workshop did not have a positive effect on normative beliefs that was maintained over time. The normative beliefs measure is a composite of an individual’s beliefs that others would approve of his or her condom use behavior multiplied by how important this approval is to the individual. It is possible that the sample comes from a generation that places a value on individuality and being unique (Twenge, 2006) rather than conforming to social norms.

Utility of Health Behavior Theory Constructs at Explaining Condom Use Behavior

Results of the regression analysis revealed that the combination of relationship status, condom use intent, and behavioral processes of change predicted just under a third of the variability in condom use. These findings are consistent with existing health
behavior theory literature that has found a positive association of condom use to behavioral processes of change (Elwood & Vega, 2005; Gullette & Turner, 2004; Naar-King et al., 2006; Noar, Morokoff, & Redding, 2001; Posner et al., 2004; Wallace et al., 2007) and intent (Fazekas, Senn, & Ledgerwood, 2001; Godin et al., 2008; Molla, Astrom, & Brehane, 2007). The results of the current study allowed for the novel comparison of intent and behavioral processes of change and is therefore the first study to demonstrate the additive utility of behavioral processes of change and intent at predicting condom use behavior.

**Secondary Analyses Related to Specific Knowledge and Participant Satisfaction**

Secondary analyses revealed that individuals in the safer sex workshop condition demonstrated significant increases in measures of Specific Knowledge at post-intervention and these changes were maintained at 1-month follow-up. The Specific Knowledge measure consisted of content that was directly targeted in the intervention including average number of sexual partners at UNR, common STI at UNR, condom use barriers and negotiation strategies, and steps to using condoms effectively. As such, the Specific Knowledge measure assesses whether intervention participants attended to the material presented and whether it was presented in a manner that allowed for adequate retention. It is not a knowledge measure per se; however, the information queried within the Specific Knowledge measure corresponds to information about the UNR population in specific that relates to risk for STI.

Consistent with other online studies, secondary analyses revealed high participant satisfaction with the workshop (LaGrange et al., 2012; Schiff, Witte, & El-Bassel, 2003). On average, participants "agreed" that the material presented in the safer sex workshop
was relevant, they learned a great deal, the workshop was fun, they would recommend it to a friend, and that the information presented was new. Of note, although most of the sample endorsed that the information presented was relevant and that they "learned a great deal", just over a quarter of participants endorsed that the information was "new."

**Study Strengths**

The current study has a number of strengths. These strengths include the randomized controlled design, the design of the workshop, the novel comparison of theory of reasoned action and transtheoretical model constructs, and the web-based modality. The randomized controlled research design provided for a more than adequate test of the efficacy of the web-based safer sex workshop. Randomization allowed for any baseline differences between groups to be due to chance rather than recruitment procedures to maximize the potential for equal groups. Essentially, by randomizing undergraduates to either the workshop or waitlist control condition and by controlling all other aspects of the study, potential threats to internal validity were minimized (Sibbald & Roland, 1998). The workshop content and design were informed both by the literature and preliminary studies performed by the current author and her colleagues (Gerber et al., 2009; Shearer et al., 2012). The workshop was theory driven and incorporated principles of effective sexual education programs established by the Advocates for Youth (2008), DiClemente and colleagues (2004), Kirby (2001), and Noar (2008).

Another strength of the present study was the emphasis on comparing health behavior theory constructs to determine how the constructs from multiple theories may work together to predict condom use behavior (Noar, 2007). An emphasis was placed upon determining how much health behavior theory constructs overlaps as well as how
they additively explain condom use. Noar and Zimmerman (2005) describe this process as crucial to moving the health behavior theory literature forward.

A final strength of the present study lies in the effectiveness and feasibility of the web-based modality utilized. The advantages of web-based programming are thoroughly conveyed in the introduction section. The present study is consistent with findings from reviews of other web-based interventions aimed at changing behaviors that have found this modality to be particularly efficacious (Wantland, et al., 2004). Furthermore, the widespread use of the WebCampus Learn system and other online learning technology both at UNR and other university campuses allows for ease of replication at UNR as well as dissemination across other universities (Blackboard, Inc., 2014). The widespread use of the WebCampus Learn System by several university campuses ensures that the costs associated with adopting the program are very low, and these costs are further mitigated by the savings in personnel and facilities costs that would be required in a face-to-face intervention. Overall, the positive outcomes of the study, participant satisfaction, feasibility, and affordability of this intervention point to the benefits of this program for both undergraduate students as well as university systems.

**Study Limitations**

Although the current study has a number of strengths, certain limitations need to be acknowledged. These limitations include high attrition, small sample size, and reliance on self-report measurement.

**Attrition.** Analyses of the full and completer samples revealed no differences between those who did and did not complete follow-up assessments. Therefore, it can be tentatively concluded that undergraduates who completed follow-up assessments were
generally representative of the full sample of participants. This mitigates concerns that lower participation rates at 1-month follow-up reflected some form of bias (e.g., bias toward those who found the intervention particularly helpful or salient). Despite incentives in the form of psychology experience credits and being entered into a drawing for a $50 gift card, only a third of participants completed follow-up assessment. This points to the inadequacy of this amount of incentive and future studies would benefit from having greater resources to incentivize follow-up participation. The timing of the intervention may have also played a role in desire to complete follow-up assessment. For example, participants who enrolled in the workshop at the end of the semester may not have benefited from extra credit one month following workshop participation. Although it appears that the completer sample was representative of the full sample, the number of dropouts at 1-month follow-up is still problematic and limits confidence in the follow-up results.

**Sample size.** The small sample size limited the number of analyses performed and the resulting analyses were underpowered. The lack of sufficient power can lead to increases in Type II errors, which can make the results of the present study misleading (Kelley & Maxwell, 2003; Muller & Benignus, 1992; Sedlmeier & Gigerenzer, 1989). Ultimately, due to a lack of power, the nonsignificance of certain findings is not reliable, and thus replication is warranted.

**Recruitment and inclusion criteria.** Study participation was limited to sexually active, sexual risk taking, undergraduate students. Although the undergraduate population is representative of those populations considered to be particularly vulnerable, undergraduate students are likely not representative of those individuals who are most
likely to experience the most damaging effects of medical, psychological, and social consequences of engaging in sexual risk taking behaviors. Representativeness of the sample was also limited by the lack of representation of male students and students of color. It is possible that recruitment materials may have appealed more to Caucasian female students.

**Self-report methodology.** Self-report is the dominant method of sexual behavior data collection (McCallum & Peterson, 2012) and it is not without limitations. Although self-report measures of sexual behavior tend to be unreliable due to multiple types of bias, which include underreporting of stigmatized behaviors and overreporting of what are perceived to be normative behaviors (Weinhardt et al, 1998), this is the dominant method of sexual behavior data collection (McCallum & Peterson, 2012). In addition, the burden associated with other forms of data collection (Fenton, Johnson, McManus, & Erens, 2001) outweighed the potential benefits for the purposes of the current study.

In summary, although findings from the present study must be interpreted cautiously due to problems of attrition, sample size, representative of the sample, and reliance on self-report methodology, the findings point to the feasibility of the web-based safer sex intervention and certainly warrant replication.

**Future Directions**

The findings from this pilot study certainly warrant replication on a larger scale. The rich quantitative and qualitative data gained can be used to further tailor and streamline future studies. Future studies should not only increase sample size overall, but actively recruit a diverse sample to include males, individuals who do not endorse monogamous status, other underserved populations, and more clinically relevant
populations (e.g., students presenting to the Student Health Center for STI testing). In this way, the intervention can be further refined to meet the unique needs of each of these populations (Albarracin, Albarracin, & Durantini, 2008).

Assessments could be enhanced by adding weekly assessment points to increase the reliability of reporting related to sexual behaviors performed between assessment points. The addition of later follow-up assessment points (e.g., 3 and 6 months post-intervention) would indicate whether the findings from the present study continue to be stable over time. Adding additional time points would also maximize generalizability to other studies of interventions aimed at reducing sexual risk taking behavior (Noar, 2008).

Alternative or additional methods of obtaining sexual risk taking data (e.g., partner reports of sexual behaviors, STI testing, mobile phone applications) as well as measures of health behavior theory constructs should also be considered in order to maximize the validity of these data as well as avoid potential ceiling effects (Hightow-Weidman et al., 2012; Kiene & Barta, 2006). Of course, in order to obtain an adequate sample throughout the study period, alternative methods of incentivization, increases in incentivization, and the timing of incentives should be considered. For example, future studies may consider restricting recruitment and enrollment period to ensure participants would desire extra credit at follow-up time points.

In an effort to maximize recruitment and participation, future studies may benefit from varying recruitment materials, asking participants what made them choose to participate in the current study, emphasizing participant confidentiality and anonymity, and employing recruitment and retention procedures that motivate participation based on intrinsic rather than extrinsic factors. Finally, to further maximize information collected
regarding the web-based modality, assessment of the amount of engagement participants had with the website in general and each workshop module in particular could be added. The web-based workshop could be made more interactive by incorporating (individual-specific or group-wide) experimenter-provided feedback into the journal and discussion portions of the workshop modules.

**Conclusion**

The findings from the current study highlight the efficacy and feasibility of the theory-driven, web-based safer sex workshop at increasing engagement in safer sexual behaviors among undergraduate students. The findings point to the importance of saliency and tailoring of the workshop to the specific needs of the target population. The preliminary evidence in support of the workshop warrants replication and additional studies to determine the role of theory in promoting condom use as well as the actual mechanisms of change in condom use behavior. Despite the limitations, the present study highlights the feasibility of this novel web-based safer sex workshop. This intervention has potential to address the great need for programs aimed at reducing risky sexual behavior among the undergraduate population – a population that is particularly vulnerable to and accounts for a high proportion of STI transmission.
References


on October 13, 2011.


diseases: the case for screening. *Preventive Medicine, 36*, 502-509.


safer sex among college students: Stage of change and gender-based differences.

*Psychology and Health, 14*, 467-486.


Wallace, L. M., Evers, K. E., Wareing, H., Dunn, O. M., Newby, K., Paiva, A. . . .


Table 1
Baseline Full and Completer Sample Demographics and Comparison to UNR Student Population Demographics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Full Sample Demographics (N = 100)</th>
<th>Completer Sample Demographics (N = 29)</th>
<th>UNR Student Demographics (N= 15,694)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>20.37</td>
<td>20.23</td>
<td>21.9</td>
</tr>
<tr>
<td>Gender (Female)</td>
<td>80.2%</td>
<td>82.8%</td>
<td>52.5%</td>
</tr>
<tr>
<td>Caucasian</td>
<td>72.7%</td>
<td>69.0%</td>
<td>64.3%</td>
</tr>
<tr>
<td>African American</td>
<td>1.0%</td>
<td>0.0%</td>
<td>3.5%</td>
</tr>
<tr>
<td>Hispanic/Latino</td>
<td>12.1%</td>
<td>13.8%</td>
<td>16.1%</td>
</tr>
<tr>
<td>Asian or Pacific Islander</td>
<td>5.1%</td>
<td>3.4%</td>
<td>7.2%</td>
</tr>
<tr>
<td>American Indian or Alaskan Native</td>
<td>1.0%</td>
<td>0.0%</td>
<td>0.8%</td>
</tr>
<tr>
<td>Multiple Racial/Ethnicity Selection</td>
<td>8.1%</td>
<td>13.8%</td>
<td>5.9%</td>
</tr>
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</table>

Note. Only gender for both full and completer samples found to be significantly different from UNR student population data ($p < 0.0001$ for both samples).
Table 2

Full and Completer Sample Demographics at Baseline

<table>
<thead>
<tr>
<th>Variable</th>
<th>Attriters (N = 71)</th>
<th>Completers (N = 29)</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>20.24 (1.8)</td>
<td>20.31 (1.6)</td>
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<td>.86</td>
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<td>Education</td>
<td>14.77 (1.4)</td>
<td>14.55 (1.3)</td>
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<td>.9</td>
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<td>Ethnicity (Caucasian)</td>
<td>74.2%</td>
<td>65.5%</td>
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<tr>
<td>Gender (Female)</td>
<td>80.6%</td>
<td>79.3%</td>
<td>.88</td>
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</tr>
<tr>
<td>Monogamy Status</td>
<td></td>
<td></td>
<td>.12</td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>29.9%</td>
<td>11.1%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monogamous for less than a year</td>
<td>35.8%</td>
<td>37.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monogamous for over a year</td>
<td>34.3%</td>
<td>51.9%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exposure to Sexual Trauma</td>
<td>20.9%</td>
<td>37.9%</td>
<td>.08</td>
<td></td>
</tr>
<tr>
<td>Condom Use</td>
<td>1.46 (.91)</td>
<td>1.38 (68)</td>
<td>.18</td>
<td>.68</td>
</tr>
<tr>
<td>HBT that Support Condom Use</td>
<td>266.18 (81.97)</td>
<td>240.24 (72.87)</td>
<td>2.16</td>
<td>.15</td>
</tr>
<tr>
<td>HBT that Reduce Condom Use</td>
<td>16.18 (5.84)</td>
<td>15.93 (6.41)</td>
<td>.04</td>
<td>.85</td>
</tr>
<tr>
<td>Workshop Satisfaction</td>
<td>17.22 (3.65)</td>
<td>15.93 (4.67)</td>
<td>1.02</td>
<td>.32</td>
</tr>
</tbody>
</table>

Note. HBT = Health behavior theory. HBT that Support Condom Use includes condom use intentions, normative beliefs regarding condom use, condom use attitudes, behavioral processes of change around condom use, cognitive processes of change around condom use, condom-specific processes of change around condom use, condom use self-efficacy, and condom use pros. HBT that Reduce Condom Use includes condom use cons and barriers to condom use. Workshop Satisfaction was for Safer Sex Workshop participants only, therefore n = 32 in the Attriters Sample and n = 14 in the Completers sample.
Table 3  
Completer Sample Demographics by Condition at Baseline

<table>
<thead>
<tr>
<th>Variable</th>
<th>Waitlist Control (n = 15)</th>
<th>Safer Sex Workshop (n = 14)</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>20.21 (1.5)</td>
<td>20.42 (1.8)</td>
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</tr>
<tr>
<td>Education</td>
<td>14.53 (1.2)</td>
<td>14.57 (1.5)</td>
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</tr>
<tr>
<td>Ethnicity (Caucasian)</td>
<td>66.7%</td>
<td>64.3%</td>
<td>.75</td>
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</tr>
<tr>
<td>Gender (Female)</td>
<td>66.7%</td>
<td>92.9%</td>
<td>.08</td>
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</tr>
<tr>
<td>Monogamy Status</td>
<td></td>
<td></td>
<td>.83</td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>0%</td>
<td>0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monogamous for less than a year</td>
<td>40.0%</td>
<td>35.7%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monogamous for over a year</td>
<td>60.0%</td>
<td>64.3%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exposure to Sexual Trauma</td>
<td>31.3%</td>
<td>46.2%</td>
<td>.41</td>
<td></td>
</tr>
<tr>
<td>Condom Use</td>
<td>1.38</td>
<td>1.31</td>
<td>.07</td>
<td>.79</td>
</tr>
<tr>
<td>HBT that Support Condom Use</td>
<td>235.2</td>
<td>240.8</td>
<td>.04</td>
<td>.85</td>
</tr>
<tr>
<td>HBT that Reduce Condom Use.</td>
<td>16.7</td>
<td>16.2</td>
<td>.06</td>
<td>.81</td>
</tr>
</tbody>
</table>

Note. HBT = Health behavior theory. HBT that Support Condom Use includes condom use intentions, normative beliefs regarding condom use, condom use attitudes, behavioral processes of change around condom use, cognitive processes of change around condom use, condom-specific processes of change around condom use, condom use self-efficacy, and condom use pros. HBT that Reduce Condom Use includes condom use cons and barriers to condom use.
Table 4
Means at Baseline and 1-Month Follow-Up and ANOVA Results for Condom Use, HBT that Promote Condom Use, and HBT that Reduce Condom Use

<table>
<thead>
<tr>
<th>Variable</th>
<th>Waitlist Control (n = 15)</th>
<th>Safer Sex Workshop (n = 14)</th>
<th>F Test for Condition by Time Interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline M (SD)</td>
<td>1 Month M (SD)</td>
<td>Baseline M (SD)</td>
</tr>
<tr>
<td>Condom Use</td>
<td>1.4 (1.6)</td>
<td>1.4 (0.8)</td>
<td>1.0 (0.5)</td>
</tr>
<tr>
<td>HBT that Support Condom Use</td>
<td>235.2 (66.9)</td>
<td>240.8 (86.2)</td>
<td>262.7 (71.6)</td>
</tr>
<tr>
<td>HBT that Reduce Condom Use</td>
<td>16.7 (6.1)</td>
<td>16.2 (5.6)</td>
<td>14.9 (5.0)</td>
</tr>
</tbody>
</table>

Note. *d* = Cohen’s *d*. OR = Odds Ratio. HBT = Health behavior theory. HBT that Support Condom Use includes condom use intentions, normative beliefs regarding condom use, condom use attitudes, behavioral processes of change around condom use, cognitive processes of change around condom use, condom-specific processes of change around condom use, condom use self-efficacy, and condom use pros. HBT that Reduce Condom Use includes condom use cons and barriers to condom use.
Table 5
Correlations among Sociodemographic Variables, Health Behavior Theory Variables, and Condom Use

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Age</td>
<td></td>
<td>--</td>
<td>-.22*</td>
<td>-.05</td>
<td>.77***</td>
<td>.18</td>
<td>.07</td>
<td>-.24*</td>
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<tr>
<td>2. Gender</td>
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<td></td>
<td>-.05</td>
<td></td>
<td>-.10</td>
<td></td>
<td>.17</td>
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<tr>
<td>3. Ethnicity</td>
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<td>--</td>
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<td>-.09</td>
<td></td>
<td>.17</td>
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<td>.04</td>
</tr>
<tr>
<td>4. Education</td>
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<td></td>
<td>.12</td>
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<td>.04</td>
<td></td>
<td>-.18</td>
</tr>
<tr>
<td>5. Relationship Status</td>
<td></td>
<td>--</td>
<td></td>
<td>.18</td>
<td></td>
<td>-.14</td>
<td></td>
<td>.08</td>
</tr>
<tr>
<td>6. Exposure to Trauma</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>--</td>
<td>-.03</td>
<td></td>
<td>.06</td>
</tr>
<tr>
<td>7. Condom Use Intent</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>--</td>
<td>-.21*</td>
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</tr>
<tr>
<td>8. Condom Use Attitudes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>--</td>
</tr>
</tbody>
</table>

Note. Gender is coded as male = 0; female = 1. Ethnicity is coded as Caucasian = 0; non-Caucasian = 1. Relationship status is coded as single or monogamous for less than a year = 0; monogamous for over a year = 1. Exposure to trauma is coded as no exposure to potentially traumatizing events = 0; exposure to potentially traumatizing events = 1.

*p <.05. **p <.01. ***p < .001.
Table 5 (continued)
Correlations among Sociodemographic, Health Behavior Theory, and Condom Use Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Condom Use Normative Beliefs</th>
<th>Behavioral Processes of Change</th>
<th>Cognitive Processes of Change</th>
<th>Condom Use Processes of Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Age</td>
<td>-.14</td>
<td>-.16</td>
<td>-.12</td>
<td>-.12</td>
</tr>
<tr>
<td>2. Gender</td>
<td>.07</td>
<td>-.04</td>
<td>.08</td>
<td>.12</td>
</tr>
<tr>
<td>3. Ethnicity</td>
<td>.14</td>
<td>.21*</td>
<td>.20</td>
<td>.18</td>
</tr>
<tr>
<td>4. Education</td>
<td>-.16</td>
<td>-.17</td>
<td>-.10</td>
<td>-.15</td>
</tr>
<tr>
<td>5. Relationship Status</td>
<td>-.25*</td>
<td>-.17</td>
<td>-.16</td>
<td>-.13</td>
</tr>
<tr>
<td>6. Exposure to Trauma</td>
<td>-.18</td>
<td>-.08</td>
<td>-.21</td>
<td>-.17</td>
</tr>
<tr>
<td>7. Condom Use Intent</td>
<td>.47***</td>
<td>.43***</td>
<td>.46***</td>
<td>.43***</td>
</tr>
<tr>
<td>8. Condom Use Attitudes</td>
<td>-.08</td>
<td>.04</td>
<td>.04</td>
<td>.02</td>
</tr>
</tbody>
</table>

Note. Gender is coded as male = 0; female = 1. Ethnicity is coded as Caucasian = 0; non-Caucasian = 1. Relationship status is coded as single or monogamous for less than a year = 0; monogamous for over a year = 1. Exposure to trauma is coded as no exposure to potentially traumatizing events = 0; exposure to potentially traumatizing events = 1.

*p < .05. **p < .01. ***p < .001.
### Table 5 (continued)
Correlations among Sociodemographic, Health Behavior Theory, and Condom Use Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Condom Use Self-Efficacy</th>
<th>Pros for Condom Use</th>
<th>Cons Against Condom Use</th>
<th>Condom Use Barriers</th>
<th>Condom Use</th>
</tr>
</thead>
<tbody>
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<td>-.16</td>
<td>-.15</td>
<td>-.01</td>
</tr>
<tr>
<td>2. Gender</td>
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<td>-.02</td>
<td>-.08</td>
<td>-.14</td>
</tr>
<tr>
<td>3. Ethnicity</td>
<td>-.13</td>
<td>.22*</td>
<td>.12</td>
<td>-.14</td>
<td>.15</td>
</tr>
<tr>
<td>4. Education</td>
<td>.07</td>
<td>-.12</td>
<td>-.12</td>
<td>.04</td>
<td>-.07</td>
</tr>
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<td>5. Relationship Status</td>
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<td>-.02</td>
<td>.04</td>
<td>-.23*</td>
</tr>
<tr>
<td>6. Exposure to Trauma</td>
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<td>-.27**</td>
<td>-.05</td>
<td>.34**</td>
<td>-.05</td>
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<tr>
<td>7. Condom Use Intent</td>
<td>.10</td>
<td>.38***</td>
<td>.11</td>
<td>-.15</td>
<td>.32**</td>
</tr>
<tr>
<td>8. Condom Use Attitudes</td>
<td>.06</td>
<td>.06</td>
<td>-.13</td>
<td>-.02</td>
<td>-.09</td>
</tr>
</tbody>
</table>

Note. Gender is coded as male = 0; female = 1. Ethnicity is coded as Caucasian = 0; non-Caucasian = 1. Relationship status is coded as single or monogamous for less than a year= 0; monogamous for over a year = 1. Exposure to trauma is coded as no exposure to potentially traumatizing events = 0; exposure to potentially traumatizing events = 1.

*p < .05. **p < .01. ***p < .001.
Table 5 (continued)
Correlations among Sociodemographic, Health Behavior Theory, and Condom Use Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>9</th>
<th>10</th>
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<th>14</th>
<th>15</th>
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<tr>
<td>9. Condom Use Normative Beliefs</td>
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<td>.46***</td>
<td>-.03</td>
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<td>.89***</td>
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<td>.24*</td>
<td>-.29**</td>
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<td>11. Cognitive Processes of Change</td>
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<td>.04</td>
<td>.51***</td>
<td>.23*</td>
<td>-.36**</td>
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<td>.42***</td>
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<tr>
<td>13. Condom Use Self-Efficacy</td>
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<td>-.32**</td>
<td>-.24</td>
<td>.07</td>
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<tr>
<td>14. Pros for Condom Use</td>
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<tr>
<td>15. Cons Against Condom Use</td>
<td>--</td>
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<td>.13</td>
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<tr>
<td>16. Condom Use Barriers</td>
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<td></td>
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<tr>
<td>17. Condom Use</td>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. Gender is coded as male = 0; female = 1. Ethnicity is coded as Caucasian = 0; non-Caucasian = 1. Relationship status is coded as single or monogamous for less than a year = 0; monogamous for over a year = 1. Exposure to trauma is coded as no exposure to potentially traumatizing events = 0; exposure to potentially traumatizing events = 1.  
*p < .05. **p < .01. ***p < .001.
<table>
<thead>
<tr>
<th>Predictor Variable and Step</th>
<th>$R^2$</th>
<th>$\Delta R^2$</th>
<th>$\beta$</th>
<th>$F$ Model</th>
<th>$p$</th>
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<tbody>
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<td>Step 2:</td>
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<td>.07</td>
<td>6.50</td>
<td>.002</td>
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<tr>
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<tr>
<td>Condom Use Intent</td>
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<tr>
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<td>.000</td>
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<tr>
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</tr>
<tr>
<td>Condom Use Intent</td>
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<td></td>
</tr>
<tr>
<td>Behavioral Processes of Change</td>
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<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. Relationship status is coded as single or monogamous for less than a year = 0; monogamous for over a year = 1.
Table 7
Means at Baseline, Post-Workshop, and 1-Month Follow-Up and ANOVA Results for Health Behavior Theory Variables and Specific Knowledge

<table>
<thead>
<tr>
<th>Variable</th>
<th>Baseline</th>
<th>Post-Workshop</th>
<th>1 Month</th>
<th>F Model</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Condom Use Intent</td>
<td>6.6 (1.3)</td>
<td>7.0 (1.2)</td>
<td>6.4 (2.3)</td>
<td>1.3</td>
<td>.30</td>
</tr>
<tr>
<td>Condom Use Attitudes</td>
<td>21.2 (4.1)</td>
<td>22.7 (3.0)</td>
<td>22.6 (2.8)</td>
<td>1.1</td>
<td>.27</td>
</tr>
<tr>
<td>Condom Use Normative Beliefs</td>
<td>70.3 (45.9)</td>
<td>88.5 (45.9)</td>
<td>64.2 (45.2)</td>
<td>3.7</td>
<td>.04</td>
</tr>
<tr>
<td>Behavioral Processes of Change</td>
<td>35.3 (13.2)</td>
<td>44.3 (18.0)</td>
<td>40.6 (17.9)</td>
<td>.84</td>
<td>.45</td>
</tr>
<tr>
<td>Cognitive Processes of Change</td>
<td>39.6 (15.4)</td>
<td>44.3 (19.7)</td>
<td>44.9 (20.3)</td>
<td>.81</td>
<td>.46</td>
</tr>
<tr>
<td>Condom Use Processes of Change</td>
<td>44.9 (17.7)</td>
<td>50.5 (22.0)</td>
<td>52.2 (20.6)</td>
<td>.90</td>
<td>.43</td>
</tr>
<tr>
<td>Condom Use Self-Efficacy</td>
<td>15.1 (5.5)</td>
<td>17.2 (4.7)</td>
<td>16.8 (4.9)</td>
<td>1.2</td>
<td>.32</td>
</tr>
<tr>
<td>Pros for Condom Use</td>
<td>19.5 (6.4)</td>
<td>23.1 (7.2)</td>
<td>22.2 (8.8)</td>
<td>5.4</td>
<td>.01</td>
</tr>
<tr>
<td>Cons Against Condom Use</td>
<td>13.1 (5.1)</td>
<td>13.9 (6.7)</td>
<td>11.6 (5.3)</td>
<td>.55</td>
<td>.59</td>
</tr>
<tr>
<td>Condom Use Barriers</td>
<td>2.9 (1.2)</td>
<td>3.2 (1.5)</td>
<td>3.1 (1.3)</td>
<td>.23</td>
<td>.80</td>
</tr>
<tr>
<td>Specific Knowledge</td>
<td>10.4 (2.1)</td>
<td>16.5 (1.6)</td>
<td>14.2 (2.2)</td>
<td>54.5</td>
<td>.000</td>
</tr>
</tbody>
</table>
Figure 1. Participant flow.

Web-Based Consent and Screening

Randomization

Allocated to web-based intervention group:
- Emailed access to intervention.
- Intervention will include baseline assessment, intervention, and post-intervention assessment

Allocated to waitlist control group:
- Emailed baseline assessment.

Allocation

Follow-up

Emailed 1-month follow-up assessment.

Emailed 1-month follow-up assessment.

Emailed invitation to web-based intervention.
Figure 2. Web-based intervention welcome screen.
Figure 3. Web-based intervention risk perception task.

Before beginning this exercise, please enter your assigned username and CDRGP ID:

**Username:**

First letter of your middle name (if no middle name, write "x"): 

First letter of the month you were born in:

First letter of your sex: Male or Female

First letter of your father’s first name (if unknown, write “y”):

First letter of your mother’s first name (if unknown, write “a”):

Please answer the following items honestly and thoughtfully. Remember that all responses are confidential. Your responses will be graded based on the quality and length of your responses.

1. Make a list of your sexual partners during the past year:
   
   For example: Tom, Todd, Tim, Tony, and Ted.

   The average number of yearly sexual partners of UNR students is **1.2**.

2. How does your number compare?

   For example: I had 5 sexual partners so my number of sexual partners is higher than the average number at UNR.

3. Now, write down your best guess of how many sexual partners each of your partners had in the year before you had sex with them.

   For example: Tom (3), Todd (0), Tim (10), Tony (2), and Ted (5).

4. Calculate your global number of sexual partners by adding the number of people you had sex with during the past year with each of their estimated number of partners.

   Your global number of sexual partners takes into account the number of sexual partners your sexual partners have had during the past year because some STI can still be transmitted up to a year after sexual contact. This number is likely smaller than your true global number since we are not estimating how many partners your partners’ partners have had, and so forth.

   For example: 3 sexual partners + 0 + 10 + 2 + 5 = 20
   
   25 would be my global number of sexual partners.
1 in 30 college students will acquire genital herpes (HSV-2), an incurable STI that is spread via skin-to-skin contact.

9. Divide your global number of partners by 30.
   This is potentially the number of people with genital herpes with whom you have had sex.
   For example, 25/30 = 0.83, so potentially 1 of the people I have had sex with had genital herpes.

1 in 40 college students will acquire gonorrhea, an infection that is cured by antibiotics and is spread via fluid contact.

10. Divide your global number of partners by 40.
    This is potentially the number of people with gonorrhea with whom you have had sex.
    For information regarding gonorrhea: http://www.ncbi.nlm.nih.gov/pubmedhealth/PMH0004526/
    For example, 25/40 = 0.625, so potentially 1 of the people I have had sex with had gonorrhea.

11. Based on this assessment, how many and which STI have you potentially come into contact with?
    Note that this assessment was limited to the 5 most common STI at UNR (i.e., genital warts [HPV], trichomoniasis, chlamydia, genital herpes [HSV-2], and gonorrhea) and did not factor into account other common STI such as pubic lice.
    For example, based on the examples in this assessment, I have potentially come into contact with at least 5 different STI genital warts, trichomoniasis, chlamydia, genital herpes, and gonorrhea.

12. What is your reaction to the STI you have potentially come into contact with?

13. Which STI are the most alarming to you and why?

14. What surprised you about this exercise?

15. How does this exercise change or not change your opinions regarding STI and protecting yourself from STI?
Figure 4. Web-based intervention negotiation task.

<table>
<thead>
<tr>
<th>Before beginning this exercise, please enter your assigned username and CDROP ID.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Username:</td>
</tr>
<tr>
<td>First letter of your middle name (if no middle name, write &quot;Z&quot;):</td>
</tr>
<tr>
<td>First letter of the month you were born in:</td>
</tr>
<tr>
<td>First letter of your sex: Male or Female</td>
</tr>
<tr>
<td>First letter of your father's first name (if unknown, write &quot;Y&quot;):</td>
</tr>
<tr>
<td>First letter of your mother's first name (if unknown, write &quot;X&quot;):</td>
</tr>
</tbody>
</table>

In this exercise you will be asked to describe common barriers that get in the way of using condoms (e.g., "Condoms ruin the mood"). You will be asked to think of 3 barriers.

*Please make sure each barrier is different and please use full sentences since your answers will be graded based on describing 3 separate barriers and the length of your responses.*

Please describe 3 barriers that can get in the way of using condoms.

<table>
<thead>
<tr>
<th>Condom Use Barrier #1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condom Use Barrier #2</td>
</tr>
<tr>
<td>Condom Use Barrier #3</td>
</tr>
</tbody>
</table>

In this assignment you will be asked to describe how you would negotiate using condoms despite the barrier described (e.g., if the barrier is "condoms ruin the mood" negotiation strategies could be "I would make condoms sexier," "I would put the condom on as a part of foreplay," "condoms may ruin the mood, but I would insist on using them anyway").

*Please make sure each negotiation strategy is different and please use full sentences since your answers will be graded based on describing the 3 negotiation strategies and the length of your responses.*

Please describe how you would negotiate past the barriers you described, so that condoms can be used effectively.

<table>
<thead>
<tr>
<th>Negotiation for Condom Use Barrier #1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negotiation for Condom Use Barrier #2</td>
</tr>
<tr>
<td>Negotiation for Condom Use Barrier #3</td>
</tr>
</tbody>
</table>
Figure 5. Web-based intervention discussion board task.
Figure 6. Condom use between conditions over time.
Figure 7. Health behavior theory constructs that promote condom use between conditions over time.
Figure 8. Health behavior theory constructs that reduce condom use between conditions over time.