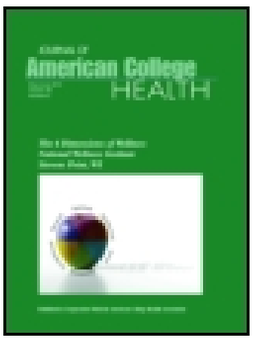

Routledge
Taylor & Francis Group

Journal of American College Health

ISSN: 0744-8481 (Print) 1940-3208 (Online) Journal homepage: http://www.tandfonline.com/loi/vach20

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To cite this article: Tiffany Marcantonio, D J Angelone & Eve Sledjeski (2015): Using a pattern-centered approach to assess sexual risk taking in study abroad students, Journal of American College Health, DOI: 10.1080/07448481.2015.1085058

To link to this article: http://dx.doi.org/10.1080/07448481.2015.1085058

Major Article

Using a pattern-centered approach to assess sexual risk taking in study abroad students

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Received 29 January 2015, Revised 3 July 2015, Accepted 16 August 2015

Abstract

Objectives: The purpose of this study was to examine the impact of several potential factors related to sexually risky behaviors in study abroad students. We utilized a pattern-centered analysis to identify specific groups that can be targeted for intervention. **Participants**: Our sample included of 173 students who studied abroad in a variety of international locations for an average of 4 months. **Method:** Participants completed questionnaires informed by the Triandis Theory of Interpersonal Behavior that have been predictive of risky sex in traditional traveling environments. **Results:** Our analyses revealed three different pathways for risky sexual behavior: Environmental involvement, historical condom use, and intentions to engage in risky sex. **Conclusion:** These findings can be used for identification of specific high-risk groups of students who can be targeted for pre-departure prevention programs.

Keywords

risky sexual activity, study abroad, CART, Triandis Model of Interpersonal Behavior

Study abroad programs have nearly tripled in growth in the past two decades, with nearly 250,000 students studying abroad each year.[1] The number of students traveling abroad is expected to continue to grow at an increasing rate. In fact, legislation and government initiatives are in place to further increase the number of students traveling abroad to 1 million in the next 10 years.[2,3] Given this upward trend, the paucity of empirical research pertaining to study abroad students' experiences and their associated sexual risk is remarkable.[2] Thus, the purpose of the present study is to examine several relevant factors and present preliminary data on sexual risk-taking amongst study abroad students.

The need to understand study abroad students and their relevant behaviors develops from a growing concern over sexual transmitted infections (STI) and the established relationship between risky sexual activity and STI contraction in general. Risky sexual activity is often defined by two specific behaviors that increase vulnerability to an STI: engagement in condomless sex (i.e., oral, anal, or vaginal sex without the use of condoms) and/or sex with a casual partner (i.e., someone the individual is not familiar with). [4, 30] Approximately 20 million people are diagnosed with a STI every year,[4] with the majority between the ages of 20-24. In fact, this age group accounts for at least half of all infected individuals.[4] In addition, according to the CDC prevalence report approximately 39% of young adults are infected with chlamydia and 26% are infected with Human Immunodeficiency Virus (HIV). [5] While risk for STI is heightened by condomless sex, it can also be increased by engaging in sex with a casual partner; since the sexual health history of these partners is unknown.[10,26,28] In fact, many young adults are unknowingly infected and subsequently not getting tested,[5] placing these individuals in

threatening health situations and often leading to reproductive complications or infertility for themselves or their partners.[4]

Recent research has established that study abroad students engage in problematic and risky drinking while abroad.[3, 6, 7] Students reported nearly doubling their drinking while abroad and returning home to drink at significantly higher rates.[6] Underage students also experienced an increase in drinking by almost 170% while abroad, with many of these students reporting that their perceptions of other student's alcoholic consumption influenced their own problematic drinking.[6] Unfortunately, the existing literature has clearly established that intoxication is closely associated with sexual risk-taking in general.[8,9] In fact, approximately 10% of study abroad students neglected to use measures to protect themselves from STIs during sexual activity due to their drinking.[3] Clearly, the more often a student engages in a risky sexual behavior, such as condomless sex or sex with a casual partner, they increase their chance of contracting an STI.[4] Taken together, there are a large number of young adult travelers who are at risk to contract an STI, yet there is limited data on this high-risk population.

Traveling Environments

While the literature is scarce on risky sexual behaviors amongst study abroad students, there is some research that has examined travelers, broadly defined. The traveling literature establishes that these individuals are at high-risk to engage in risky sexual behaviors, especially when considering the environments visited: Mardi Gras and spring break/island retreats. For instance, Australian students traveling for spring break reported engagement in sexual activity with a partner they had known for less than 24 hours prior to traveling.[10] Once away, these individuals reported continuing to have casual relations, with up to 40% engaging in the

behaviors.[9, 10] Travelers also report using condoms inconsistently on their excursions, with nearly 63% reporting having sex with a casual partner without the use of a condom.[11,12,13] Interestingly, a large minority of travelers reported engaging in risky sexual activity prior to their travels and several reported intentions to engage in risky sexual activity while away.[13]

One specific reason traveling environments may be conducive to an increased number of risky sexual events is the concept of a "*backspace*." This construct describes an environment that is different from the norm and allows an individual to follow their desires without fear of judgment.[10,11,13] With the removal of normal restraints or boundaries, individuals are more likely to engage in risky sexual activity. In addition, the increased availability or consumption of alcohol appears to loosen these restraints further and provides an opportunity to embrace one's inhibitions, such as having sex with a casual partner. This concept has been established in a variety of traveling environments such as Mardi Gras, spring break, "schoolies week," and backpacking environments.[10,14,13] In fact, these environments all share common elements that may allow for a backspace to manifest, such as readily available alcohol, removal from "normal" life, and association with like-minded individuals.[14] While these environments could be considered 'party vacations' and may explain the increase in risk-taking behaviors; research on backpackers found they engaged in condomless sex and sex with casual partners as well. Thus traveling in general may be associated with an increase in risk-taking behaviors.

The traveling environments detailed above appear to share similar characteristics with the study abroad environment. Studying abroad establishes a system of travel with unknown student peers to a variety of locales where the social norms are potentially more liberal than in the United States. In addition, many study abroad courses are graded on a pass/fail basis and

emphasize the importance of embracing the host country and assimilating into the environment.[2] Furthermore, the legal drinking age is often lower than 21 years, providing students, perhaps for the first time, the opportunity to legally consume alcohol and become intoxicated in "public." Thus, studying abroad may serve as another example of a backspace and proffers the question about whether these students maintain an increased likelihood of engaging in risky sexual behaviors while abroad and the types of factors that might influence this risk.

Theoretical Framework

The developing literature on travelers tends to utilize the Triandis Theory of Interpersonal Behavior (TIB) to guide the understanding of risky sexual behaviors[10,13,14] This theory is similar to other cognitive models such as theory of reasoned action and theory of planned behavior.[15,16,17] TIB emphasizes the role that intentions may play in determining behaviors and how values and attitudes may initially affect intentions. This three-level, two-stage model was originally developed to predict engagement in consumer behavior;[17,18] but has subsequently been used by sexologists to understand sexual risk-taking. The first level is based on the individual, and combines affective and cognitive beliefs (*how do I feel and think about engaging in this behavior?*), role beliefs (*is this appropriate behavior for someone of my social status?*), personal normative beliefs (*is engaging in this behavior against my values?*), and subjective social norms (*do I believe my friends engage in this behavior*?) to predict an individual's intentions to engage in risky sexual activity.[17] Intentions represent a culmination of personal motivation/judgments to engage in the behavior under question. The second level combines these intentions with situational conditions (e.g., the environment/alcohol use), perceptions of peers' behaviors, and an

individual's habits (i.e., typical behaviors that occur in similar environments) to predict engagement in a risky sexual activity.[17]

While the TIB has been widely used and is generally successful in predicting behaviors overall, upon closer scrutiny, the broader model does not adequately account for sexual risk-taking behavior. For example, across multiple studies, only affective and cognitive beliefs, sexual habits, intentions, situational conditions, alcohol use, and subject social norms are significant predictors of risky sexual activity in a traveling environment. Therefore, these variables serve as a solid grounding for future research. In fact, when considering these factors, it appears that several could play a role in the study abroad environment. As previously discussed, students are traveling to a new environment, with novel relationships, and provided easy access to alcohol. In addition, these students bring their personal beliefs and historical behaviors on their travels and are provided an opportunity to engage these behaviors with like-minded individuals with a level of anonymity. Therefore, it would appear that study abroad creates an ideal situation to engage in risky sexual behaviors.

The previous work using TIB to understand risky sexual behavior has relied on variable-centered statistical techniques, including logistic and multiple regression models. In general, these techniques focus on simple prediction of an outcome variable (e.g., risky sex) using several independent/predictor variables (e.g., TIB constructs) to determine the average associations between variables that hold true for all participants within a hypothetical population.[19,20] These models often fail to examine the existence of different subgroups within a population who may experience different patterns of risk factors that ultimately all result in the same negative outcome ("equifinality"). [29]Although identifying these multiple pathways to a risk outcome is

possible with variable-centered approaches (i.e. interaction terms), alternative statistical techniques (i.e. pattern-centered approaches) more easily allow for the examination of all possible interactions without having to be specified by the researcher a priori. The typical TIB evaluation does not test for interactions among the predictors and as a result, researchers have identified specific variables that may increase sexually risky behaviors across all participants. However, given the inconsistency of the traditional TIB constructs, a novel approach to understanding risk, such as pattern-centered statistical techniques,[21] might prove useful. Pattern-centered techniques allow researchers to not only identify predictors of risky sex, but also identify the existence of multiple pathways to risky sex. These techniques focus on classifying risk factors by breaking the population into different subgroups that share similar characteristics, but represent different levels of risk or even the same level of risk.[19, 20] Therefore, this approach allows researchers to identify constellations of risk and protective factors that best predict high- and low-risk groups, ultimately facilitating the development of highly specialized prevention and intervention programs for certain groups of individuals.

One type of pattern-centered approach is Classification and Regression Tree (CaRT). CaRT is an exploratory data mining analysis resulting in a decision tree that classifies participants into different risk groups based on the relationships and interactions between specified predictors and one outcome variable.[19,21] This technique identifies patterns of predictors based on their interactions and relationship to the outcome variable.[29]

In sum, the literature has identified a variety of individual, environmental, and peer factors that can influence risky sexual behavior in travelers including: affective and cognitive beliefs, habits (previous behaviors), intentions, situational conditions, alcohol use, and subject

social norms. Given the similarity of the study abroad environment with the traveling environments previously examined, the aforementioned constructs are thought to generalize to the study abroad environment. To that end, the present study used a pattern-centered analysis (i.e. Classification and Regression Tree [CaRT]) to identify specific groups of students that would be at high risk for engaging in risky sexual activity while studying abroad.

Method

Participants were recruited via social media, word of mouth, and the International Study Center of a midsize public university. Data were collected from Fall 2012 -Spring 2014. Participants were provided a web-based survey link created on SurveyMonkey described via an e-mail inviting students to take part in a study that was developed to understand experiences that occur while studying abroad. Once the participant clicked on the link, they were re-directed to the informed consent and verification that they were at least 18 years old. The survey took approximately 15 minutes to complete and participants were provided an opportunity to earn one of four $25 Amazon.com gift cards as incentive. The Institutional Review Board of the university where data was collected approved all study procedures.

Participants

A total of 275 participants started the online survey. If a participant completed 20% or less of the questionnaires they were dropped from the analyses (n = 89). If participants reported studying abroad outside of the designated age range (18-22) they were also excluded from analyses (n = 13). The final sample consisted of 173 (134 females, 39 males) participants who reported studying abroad between the ages of 18 to 22 (M = 20.2, SD = .93) and spent an average of 3.9 months (SD = 2.5) abroad. The majority studied abroad in Europe (n = 134, 77%).

The sample was largely Caucasian (n = 146, 84.4%) and primarily heterosexual (n = 139, 80.3%). The average age of participants at the time of the survey was 22.40 (SD = 3.17) with an average of 2.23 (SD = 3.14) years passed between studying abroad and completion of the survey.

Measures

This study was informed by previous work using the TIB model to understand risky sexual behavior in the study abroad environment. However, given that several constructs have never been significantly predictive within the overall TIB model, these constructs were omitted from our study; thus only those constructs that had demonstrated previous support were included in our model. However, in accord with the mandated instrument development procedures as described by Triandis,[17] initial development of the constructs included qualitative work. The goal of this qualitative "elicitation phase" is to clarify the behaviors found in a certain sample and to understand how to properly measure engagement in such behaviors. Thus, two gender specific focus groups with students who had previously studied abroad were queried to gain an understanding of their experiences. The groups had a same gender researcher who posed open-ended questions to the participants about their experiences abroad. Specifically, the researchers were interested with the specific time (college period), context (study abroad), and behavior of interest (risky sexual activity). Information collected from these focus groups was examined using a content analysis to formulate specific themes in the study abroad environment. These focus groups assisted the researchers to develop several quantitative measures that were created for this sample based on the TIB model. These final measures (see below) were developed after consultation with the existing literature using the TIB to understand risky sex, as well as

information from the elicitation/qualitative phase noted above. Means and standard deviations for the measures are listed in Table 1.

Affective Beliefs

Affective beliefs were measured using a 10-item scale highlighting a range of adjectives that describe how participants *felt* about having sex with someone they met while studying abroad measured on a 7-point likert scale, with 1 being the first adjective in each pair and 7 the last. The adjectives included in this measure were sexually conservative/sexually liberated, unattractive/attractive, disempowered/empowered, angry/happy, bad about myself/good about myself, guilty/proud, lonely/not lonely, serious/fun loving, ordinary/adventurous and sad/glad.[13] Participant's scores for each item were averaged to create a total score, with higher scores indicating more positive feelings about having sex with someone they met while studying abroad. Cronbach's alpha for the affective measure was .94.

Cognitive Beliefs

Cognitive beliefs were measured similarly on a 5-item scale highlighting a range of adjectives that describe how participants *thought* about having sex with someone they met while studying aboard measured on a 7-point likert scale, with 1 being the first adjective in each pair and 7 the last. The adjectives included in this measure were bad/good, irresponsible/responsible, not fun/fun, negative/positive, and stupid/smart.[13] Participant's scores for each item were averaged to create a total score, with higher scores indicating positive evaluations of having sex with someone they met while studying abroad. Cronbach alpha for the cognitive measure was .94.

Situational Conditions

This measure was created from the elicitation phase and similar research on this construct[13] to measure situations/experiences that could provide an increase opportunity for sexual behavior with a new partner. These situational conditions describe the details of the study abroad environment where students are immersing themselves and potentially associating themselves with risky sexual activity. Individuals were asked, "While studying abroad how often did the following happen?" and provided a list of 12-items that represented the study abroad environment measured on a 4-point likert scale (1 = never, 4 = frequently) to determine the extent that participants expected to be involved with each experience. An example item was "It seemed like everyone was having sex" or "You tried to pick someone up." High scores on the scale represented greater participation in a sexualized environment in study abroad. Cronbach's alpha for the measure was .74.

Alcohol Use

This measure was created to assess study abroad students alcohol use while abroad. Participants were asked to indicate the frequency for which they engaged in several behaviors, including "You drank alcohol," "You got drunk," and "You drank in the middle of the day" measured on a 4-point likert scale (1 = never, 4 = frequently). High scores represented greater use of alcohol in study abroad. Cronbach's alpha for the measure was .80.

Prior Risky Sexual Activity

This variable consisted of two questions about condom use and number of casual partners prior to studying abroad. Condom use was measured on a 5-point likert scale (0 = always, 5 = never), asking participants how often they used a condom prior to studying abroad with higher scores representing less condom use (and higher levels of risk). Prior casual partnering was also

measured through an open-ended question that asked participants to fill in the number of partners (oral, anal, vaginal) they had prior to studying abroad. Both questions were placed into the CART model as continuous variables.

Subjective Social Norms

Triandis (1980) and current literature [10,13,14] establish that perceptions of peers' activity can influence behavior. Therefore, a measure of perceived peer sexual activity was added as a predictor of sexual behavior. Participants were asked "How many of your friends would be likely to have sex with someone new they met while studying abroad?" on a 5-point likert scale (1 = none, 5 = all of them).

Intentions

Intentions represent a combination of two questions that ask participants specifically about their intentions to use a condom and engage in sexual activity abroad. Each item is on a 7 point likert scale (1 = strongly disagree, 7 = strongly agree). Questions included, "I intended to use a condom during sexual activity (oral, anal, vaginal) while studying abroad" and "I intended to engage in sexual activity with a casual partner (someone you had just recently met) while studying abroad." Higher scores represent higher intentions to engage in risky sexual behavior while studying abroad.

Risky Sexual Activity Abroad

This outcome variable was measured in two separate ways, via reported condom use and number of casual partners while abroad. Participants were asked how often they used a condom while studying abroad on a 5-point likert scale (0 = always, 5 = never) with higher scores representing less condom use (and higher levels of risk). Participants were also asked to self-

report the number of casual partners (oral, anal, vaginal) they had while studying abroad. A casual partner was defined as someone the individual had known for a week or less. All variables were dichotomized into risky (1) or not risky (2). If a participant endorsed sleeping with 1 or more casual partners they were placed in the risky category. If a participant endorsed using a condom less than always, they were dichotomized into the risky category. This definition is consistent with current literature examining risky sexual behaviors.[13,23,24,25,27]

Results

Participants retrospectively reported a range of sexual partners (risky or not) from 0-40. In terms of risky sexual activity, participants reported engagement in sexual activity with a casual partner, with estimates ranging from 0-20. In addition, participants reported using condoms "over half the time" at home. Thus suggesting that prior to traveling abroad, students were engaging in a range of risky behaviors. Approximately half of the sample reported no risky sexual behavior while studying abroad (n = 91, 53%) while 12 (7%) reported condomless sex abroad, 46 (27%) reported sex with a casual partner while abroad, and 24 (14%) reported engaging in both condomless sex and sex with a casual partner while abroad. Participants reported using a condom "over half the time" and the number of casual partners ranged from 0-20 while abroad.

Classification and Regression Tree Analysis

For the CART analysis, seven variables were included as predictors of study abroad risk groups. The optimal tree identified three variables as the best predictors of the four risk groups: situational conditions, condom use at home, and intentions to engage in sex abroad (see figure 1). As a result, this optimal tree resulted in 4 terminal nodes with one node predominantly

classifying the "low risk" group (1: no risky sexual behavior abroad), and three nodes classifying the "high risk" groups (2:condomless sex; 3: sex with a casual partner only; 4: both condomless sex and sex with a casual partner). These four terminals nodes represent four different subgroups of participants or different pathways each defined by a different pattern of predictor variables. No terminal node successfully predicted the "condomless sex" group. Overall, the optimal tree correctly identified 70% of the condomless sex and sex with a casual partner group and 89% of the sex with a casual partner only group into one of the three "high risk groups." Furthermore, 85% of the no risky sexual behavior abroad group was correctly classified into the one low risk group.

First Pathway

The first pathway in the tree included individuals who reported a low mean score on situational conditions (mean <2.4) and classified 57% of the sample. The majority of these individuals were at low sexual risk while studying abroad (78%) due to their low immersion with their environment abroad.

Second Pathway

The second pathway included individuals who reported a higher mean score on situational conditions (mean ≥2.4) and no history of condomless sex and classified 24% of the sample. The majority of these individuals had engaged in casual sex while studying abroad (73%). Therefore, students who did report a high immersion in their environment but had no history of condomless sex were still engaging in sex with a casual partner while abroad.

Third Pathway

The third pathway included individuals who reported a higher mean score on situational conditions (mean ≥2.4), a history of condomless sex, and low intentions to engage in risky sexual behavior (mean <2), which classified 4% of the sample. The majority of these individuals had engaged in casual sex while studying abroad (71%). Thus, participants who reported a high immersion in their environment, with a history of condomless sex and low intentions to engage in the behavior were engaging in casual sexual activity while abroad.

Fourth Pathway

The fourth pathway included individuals who reported a higher mean score on situational conditions (mean≥2.4), a history of condomless sex, and high intentions to engage in risky sexual behavior abroad (mean ≥2), which classified 15% of the sample. The majority of these individuals had engaged in both condomless sex and casual sex while studying abroad (figure 1). Thus, individuals who reported high immersion in their environment, with a history of condomless sex and high intentions to engage in risky sexual behavior engaged in both risky sexual behaviors.

Comments

The purpose of this study was to use a pattern-centered analysis to understand different types of high and low risk groups of study abroad students who potentially engage in risky sexual activity while studying abroad. This study was informed by previous research utilizing the TIB and establishes empirical support for factors predicting risky sexual behaviors in study abroad students. In this study, 7% of students reported engaging in condomless sex, 27% reported engaging in sex with a casual partner and 14% reported engaging in both behaviors. Of all the characteristics thought to be predictive of risky sexual behavior in a study abroad sample,

it appears that three were significantly influential: situational conditions, historical experiences with condom use, and intentions to engage in risky sexual activity.

The analyses revealed four risk sub-groups: a low risk and 3 high-risk groups to engage in the behavior. Interestingly, all the pathways split at the situational condition factor (immersion in the environment). This suggests that the environment is an influential factor in leading to risky behaviors. In fact, students who are reporting that they spend significant time engaging their study abroad environment ($M > 2.4$), are at higher risk in engage in risky sexual activity. Approximately, 71% of the sample that engaged in risky sex had reported immersing themselves in the study abroad environment. When examining the study abroad environment, it appears highly sexualized, with a majority of students reporting, "it seemed like everyone was hooking up" and they were "fooling around in a sexual way with someone they met." That said, one goal of study abroad is to "immerse oneself in another culture;" [2] therefore, these students may be embracing this environment to its fullest, affording them opportunities to meet new people, visit bars/clubs, and engage novel experiences, such as having sex with a student of another country. This appears similar to previous research conducted on travelers, suggesting that people notice the behaviors of their peers and subsequently embrace these sexual behaviors themselves.[10,13,14] With an increase in risky sexual activity, the chance of STI contraction increases; thus, a large number of students could be placing themselves in potentially harmful situations. Although not the focus of the current study, it is possible these students are also at risk for an unwanted sexual experiences to occur given the relationship between risky sex and sexual assault.[23] Ultimately, students should be advised about the types of environments they are visiting and associated consequences.

In addition to the environment, it appears that historical experiences of condom use are also influential on condom use while abroad. Research suggests that future risk experiences can be understood in context of previous behaviors[24, 25] and this relationship has been supported in the current study. The lack of consistent condom use prior to studying abroad was associated with a continuation of this behavior while abroad. One explanation for this link could be that condom usage is a habitual tendency. Given that many college students and young adults report condomless sex, there is a high likelihood that they will not practice safer sex abroad. Therefore, one mechanism for prevention of risky sex in study abroad could be specifically targeting condom use and working to increase consistency.

Intentions also appeared to have a unique effect on risky sexual activity while studying abroad. Students with low intentions to engage in risky sexual activity, but had previous experiences with the behavior and a high involvement in the study abroad environment, engaged in risky sexual activity. When examining this construct, participants are asked if they *intended* to engage in a socially unacceptable behavior, risky sexual activity. Thus, they may not report intentions to engage in this behavior because of social desirability. However, despite reporting low intentions to engage the behavior, it still occurred, suggesting that some may actually intend to do so, but simply not report it. Intentions may also be superseded by individual tendencies, such as previous risky behaviors or the associated environment. Thus, intentions may not serve as an appropriate predictor of risky sexual behavior due to a variety of outside factors that may mediate/moderate this relationship. Related, interventions should focus on the risk behaviors rather than intentions of engaging in such behavior.

Interestingly, study abroad students who did report intentions to engage in risky sexual activity, had a previous history of risky sexual behavior and immersed themselves in the environment, ultimately engaging in *both* condomless sex and sex with casual partners. The influence of intentions establishes some concern for the thought pattern of high-risk individuals. If students are reporting intentions to engage in a potentially problematic, undesirable and unsafe behavior, what other concerning thought patterns could they engage in and how do these influence their behaviors? Researchers should examine potential thought patterns/personality traits this group may have, such as intentions with substance use and alcohol expectancies. Intentions also suggest that someone wants to obtain a goal, perhaps these students are more goal driven or are higher sensation seekers than other high-risk groups; thus, making them more likely to actually engage these behaviors. Researchers could also examine this population longitudinally to better understand the relationship intentions shares with behaviors. It is possibly that these intentions are interacting with other variables and therefore, could make it difficult to discern their relationship with risky sex when examined through cross-sectional research. In addition, by retroactively reporting on these intentions, students may under report due to the time gap between when they studied abroad and the survey.

In addition, studying abroad is a risky endeavor in that students are traveling alone to a foreign county. Therefore, the willingness to engage in this behavior may be associated with engaging in other risk-taking behaviors, such as condomless sex or sexual activity with casual partners. Future researchers should include measures of general risk taking or sensation seeking to determine if these differences exist between study abroad students and other college-attending students. From an intervention perspective, by gaining an accurate understanding of study abroad

students personalities and behaviors, intervention can be properly designed to target them. Based on this data, interventions could be created providing psychoeducation on condom use, safer sex, and the plethora of risk factors identified that increase engagement in the behavior.

The use of CART analysis grants researchers the opportunities for specific targeting interventions. It provided an opportunity to identify several groups in terms of their risky sexual behavior, a noteworthy improvement over previous attempts in using the TIB to predict sexual risk. In fact, the CART model classified over 71% of the risky groups and 51% of non-risky sample, suggesting a fairly solid tool for identifying risk pathways. However, out of the seven factors placed in the model, only several combinations of three variables were predictive of risky sexual activity. Thus, this tree based model provided a sensitive statistical analysis to further explain specific pathways that are predictive of risky behaviors in a novel environment. In addition this statistical analyses created three unique pathways to predict risky sexual activity, implying that equilfinality is reached through CART. This provides an opportunity for future research to target three distinct pathways that influence risky sexual activity while traveling.

When understanding the benefits to CART it is important to note that there are other methods to examine this population. While the researchers did not examine change scores, it is noted in the results section that students maintained the same condomless sex behaviors and reported sexual engagements with a similar number of partners abroad. Future studies should aim to measure change scores of study abroad students to further inform intervention. Understanding if students increase, decrease or maintain the same behaviors while abroad provides another key area for behavioral intervention.

Limitations

Nonetheless, the present study should be considered exploratory and interpreted within context of its limitations. One limitation relates to the nature of the sample. A majority of participants identified as heterosexual, Caucasian, and female; perhaps limiting our ability to generalize the findings. However, the participants likely represent the demographics of current study abroad students; although given national trends, it is likely that future study abroad students may be more heterogeneous. Future research should aim to involve multiple university settings to gather a more diverse and larger sample size. In addition, the analyses were conducted using cross-sectional data, with students studying abroad in the past two years. When reporting on historical behaviors, students may report inaccurate information due to cognitive dissonance. Thus, students could report that they engaged in less risky activity than they actually did, or decide that they never "intended" to engage in any risky behaviors. Future research should aim to study this population longitudinally to understand how previous experiences influence risky sexual activity for this group and to potentially gain a more accurate response from students.

Another limitation to this study could be the dichotomous scoring of the risky sexual measure (not risky/risky) that may impact findings; however this is consistent with previous research using TIB to predict risky sex.[10,13,14] Unfortunately, the scoring of risk measures varies in the literature,[26,27] with researchers using both dichotomous and continuous scoring procedures. Future researchers in this area should work to identify a more consistent measurement scheme, including defining risky sex.

Conclusions

Despite the potential limitations, this study is one of the first to examine risky sexual behavior in the study abroad environment and the first to examine such behaviors using a

pattern-centered (CART) analysis. The study was exploratory in nature and established that there is potential to identify several high-risk groups by condensing the variety of risk factors that have been historically examined in context of sexual risk. Data-mining analyses, like CART, may be helpful to understand risky sexual behaviors due to their ability to create decision points that manifest high-risk groups. While the factors significant in the CART analyses were similar to previous research, future research should examine additional factors that may play a role with risky sexual behaviors, such as sexual sensation seeking. More importantly, the findings suggest that specialized groups of risky travelers can be identified; thus prevention programs can be specifically tailored to ultimately decrease risk. While most study abroad programs engage students in pre-departure meetings and trainings to prepare them for their time away, our findings suggest the use of a more individually tailored approach for the varying risk groups. Future research should then examine the effectiveness of engaging such individualized prevention programs for study abroad (or other groups of high risk individuals).

Acknowledgments

The ASSeRT Lab

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Table 1 Intercorrelations Among Continuous Independent and Dependent Variables

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*
1. INT	-	.30**	.13	.32**	.36**	.27**	.14	.30**
2. SITc		-	.42**	.50**	.56**	.51**	.54**	.62**
3. PRSA			-	.24**	.23**	.27**	.29**	.37**
4. SSN				-	.56**	.46**	.38**	.45**
6. CB					-	.84**	.37**	.49**
7. AB						-	.28**	.47**
8. ALCu							-	. 27**
9. RSAA								-
M (SD)	1.7(.43)	2.2(.63)	1.7(.43)	3(1.8)	3.8(.84)	4.3(1.5)	2.9(.84)	1.4(.49)
N	*173*	*166*	*164*	*172*	*172*	*172*	*166*	*173*

Note.. INT = Intentions; SITc = Situational Conditions; PRSA = Previous Risky Sexual Activity; SSN = Subjective Social Norms; CB = Cognitive Beliefs; AB = Affective Beliefs; ALCu = Alcohol use; RSAA = Risky Sexual Activity Abroad;

* $p < .05$. ** $p < .01$

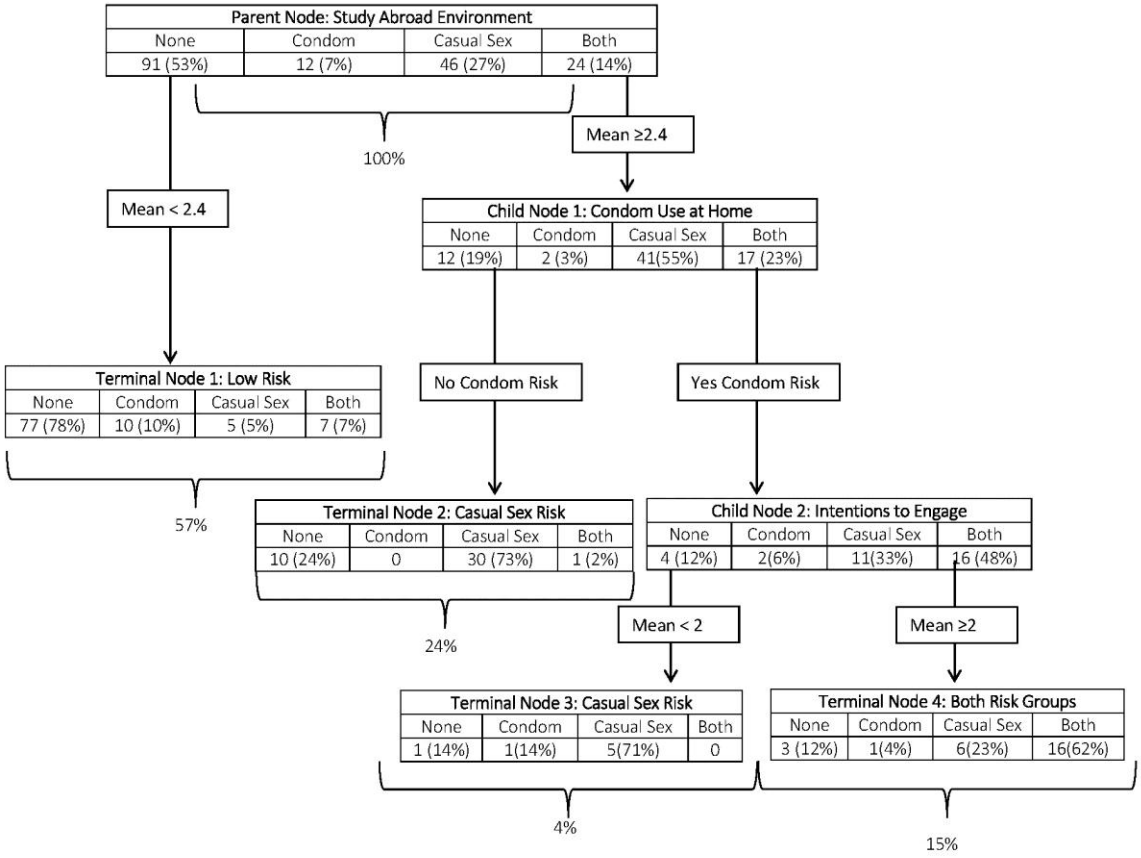

Figure 1. Optimal CaRT model predicting four risky sex groups.