Assessing Specific Sexual Behavior: Instrument Development and Validation Techniques

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Abstract

Through the use of multi-modal methods, the purpose of this study was to develop and assess measurement properties of an instrument evaluating specific sexual behaviors of college students and the role alcohol intoxication plays in one's intention to participate in these behaviors. A modified version of N. Krause's instrument development process was applied to create a behavior-specific instrument assessing oral, vaginal, and anal sex behaviors. The process included a review by expert scholars in relevant fields, cognitive interviews with the target population using screen-capture program Camtasia, piloting to assess measurement scales, and a formal investigation. The applied instrument development process employed screen capture software and web-based surveying in a cost-effective format suitable for mixed-method measurement development. The development and application of the instrument provides a clearer understanding of the relationship between alcohol use and sexual activity and aids in the development of effective public health interventions and policies.

Keywords: sexuality, sexual behavior, alcohol use, instrument development, instrument validation, college students

1. Background

One of the overarching goals of *Healthy People 2020*, a US government set of health objectives, is the improvement of reproductive health through promotion of healthy sexual behaviors. A large focus of HIV/AIDS, STI, and teen pregnancy prevention literature has been on comprehending and promoting safer sexual behavior (Hendershot, Stoner, George, & Norris, 2007; Noar, Cole, & Carlyle, 2006; Siegel, Klein, & Roghmann, 1999). According to the 2010 National College Health Assessment 70% of students in the United States have had at least one sexual partner within the past school year. The study goes on to report that of this percentage, 18% practice safe sex by always using a condom, while 4% of students reported no use of pregnancy protection (American College Health Association [ACHA], 2011).

Alcohol, readily available in the college environment, compounds these issues. Alcohol use has been associated with risky sexual behavior on college campuses (Hingson, Heeren, Zakocs, Kopstein, & Wechsler, 2002; Perkins, 2002; Wechsler, Lee, Kuo, & Lee, 2000). Forty two percent of college students who drink heavily also engage in unplanned sex (Wechsler et al., 2000). Casual sex behaviors of college students combined with high-risk drinking influence the simultaneous occurrence of sexual risk-taking, including inconsistent condom use (Abbey, Saenz, & Buck, 2005; Cooper, 2002). Alcohol use is also associated with the increased likelihood of sexual coercion and increased severity of sexual assault (Testa, 2004).

Despite the large amount of research into these risky behaviors, there has been a lack of consensus as to the best way to measure and validate self-reports of sexual behavior and alcohol use (Dawson, 2003; Schroder, Carey, & Vanable, 2003). In addition, many instruments have been created to measure sexual behavior but none measure the entire spectrum of behaviors, including digital sex, oral sex, and anal sex.

The lack of measurement consistency between studies is problematic because comparisons and generalizations are difficult to assess, thus leading to serious public health implications (Pinkerton, Holtgrave, Leviton, Wagstaff, & Abramson, 1998). Studies conducted with inappropriate measures or measures that are not sensitive to certain sexual behaviors, may reach inappropriate conclusions regarding the risk behaviors. Noar, Cole, & Carlyle provide examples of this discrepancy as it relates to condom use (2006). They cite a surveillance study conducted using the percentage (proportional measure) of condom usage as not taking into account the frequency of sexual intercourse. Should the community under surveillance reduce frequency of intercourse, overall risk would be lowered but the outcome would not be portrayed by the proportional measure. Thus accurate behavior measurement is critical for an accurate description of behaviors and their impacts on public health and policy.

The aim of this study was the assessment of specific sexual behaviors of college students and the role alcohol intoxication plays in one's intention to participate in these behaviors. Specifically, the purpose of this study was to develop a survey instrument and assess measurement properties of the instrument using multi-modal methods.

The following research questions guide the present study:

RQ1: How can current sexual risk behavior survey instruments be improved?
RQ2: Can an instrument be developed to collect and assess the specific sexual behaviors of college students?
RQ3: What is the reliability and validity of the Specific Sexual Behavior instrument?

2. Conceptual Framework

2.1 Classical Test Theory

The Classical Test Theory (CTT) guided the development and assessment of the measurements. It is important to note limitations associated with the use of this theory (De Champlain, 2010). The psychometric properties are instrument and sample dependent and cannot be extended to other populations or age groups. Also, the measurement is static, not dynamic as it is a cross-sectional study design. In order to address the research questions, the instrument was composed of a combination of measures including established and validated items, newly developed items, and items specifically revised for the purpose of this study.

2.2 Theory of Planned Behavior

The Theory of Planned Behavior (TPB) is a commonly used theory in sexual risk research since it incorporates perceived control over achievement of behavior as an additional aggregate of intention (Ajzen & Fishbein, 1980; Albarracin, Johnson, Fishbein, & Muellerleile, 2001).

The theory focuses on individual motivation factors as behavioral predictors by assessing the relationship between beliefs, norms, attitudes, intentions, and behaviors (Glanz, Lewis, & Rimer, 2002). Cooper and Orcutt conclude that the complex relationship between alcohol use and sexual behaviors requires the variables to be studied, not in isolation, but in the context of a larger system of interconnected variables (2000). Thus, the TPB emerged as the best theoretical framework to asses these behaviors as they relate to college student risk-taking. The TPB centers on the following constructs:

- Behavioral Intention is the perceived likelihood of performing a behavior and is viewed as the most important determinant of behavior.
- Attitude is the personal evaluation of the behavior and impacts behavioral intention. It is shaped by behavioral beliefs and the evaluation of behavioral outcomes.
- Subjective Norm is the personal beliefs of peer approval or disapproval of the behavior. The construct focuses on behavioral intention as influenced by the motivation to gain peer approval and assesses normative beliefs and motivation to comply.
- Perceived Behavioral Control is the construct that was added to the TRA by Azjen and Drive to account for situations in which behavioral intention is influenced by factors perceived to be beyond personal control. It is shaped by control beliefs and perceived power.

The TPB assumes all other cultural and environmental factors operate through the models' constructs and do not independently predict behavior (Glanz et al., 2002). The TPB is often applied to survey research because it can be used to predict and explain a health behavior in a limited set of constructs (Ajzen, 2002; Ajzen & Fishbein, 1980).

3. Measurements

3. 1 Established Measurements

Existing measurements were used in order to increase instrument validity when possible. When existing measures were not available items were adapted or developed for the purposes of this study. Existing surveillance and behavioral questions come from the American College Health Association's National College Health Assessment II (ACHA-NCHA II) (ACHA, 2011). Additionally, perceived effects were evaluated using items from the Core Alcohol and Drug Survey. This survey is a nationally validated instrument specifically aimed at evaluating college student behaviors (Core Institute at Southern Illinois University, 2006). The items from the above named instruments were kept in their entirety.

Items from the Worry About Sexual Outcomes (WASO) scale were also used. The WASO scale evaluates participants' perceived concerns associated with sexual risk-taking outcomes. The 10-item measure contains two subscales of STI/HIV worry and pregnancy worry and demonstrates internal consistency and satisfactory construct validity (Sales et al., 2009). Since this study includes male participants, the WASO pregnancy items were omitted and gender-neutral pregnancy items were developed for use in this study.

3.2 Relationship Status

Previous research points to relationship status as strongly affecting sexual risk taking in general (Abbey, Saenz, Buck, Parkhill, & Hayman, 2006; Cooper & Orcutt, 2000; Corbin & Fromme, 2002). Surra et al. describe current research focusing on the college population as weak because specific features of relationship status are missing (2007). Further research in sexual risk-taking needs to include a more thorough assessment specific of perceived relationship status. Numerous studies have included measurements of relationship status and other aspects of sexual risk-taking, but none have analyzed the specific effect of perceived relationship status on alcohol use and sexual activity intention (Chambers, 2007; Dedobbeleer, Morissette, & Rojas-Viger, 2005; Stone, Hatherall, Ingham, & McEachran, 2006).

3.3 Specific Sexual Behaviors

Digital sex behaviors are largely not included in the current literature. Though, penetration of the vagina, anus, or oral cavity can occur with the penis, foreign objects, or fingers, distinction between these behaviors are rarely made (Girardin, 1997). Even the term sexual assault includes both sexual contact (fondling) and sexual penetration (rape). However, when forced digital penetration is the only complaint, a medical-legal examination cannot be performed (Evrard & Gold, 1979; Geist, 1988). This is based on decades-old research identifying rape victims by pregnancy, syphilis or gonorrhea diagnosis, ignoring other physical or psychological trauma. Reports of digital-genital contact during sexual assault range from 26% to 55% (Riggs, Houry, Long, Markovchick, & Feldhaus, 2000; Rossman, Jones, Dunnuck, Wynn, & Bermingham, 2004).

Rossman and colleagues conducted a retrospective study documenting the frequency and type of genital injuries in women who solely reported forced digital penetration (2004). During the 3-year span, 941 sexual assault case files were reviewed. Fifty-three cases solely experienced forced digital penetration or manipulation. Of this group, 81% presented genital injuries with a mean of 2.4 injuries per patient. Further research is needed to understand digital behaviors so as to best dictate policy. Little is known about the behavioral norm, such as if it is more likely to occur with other risk behaviors. Even less is known about digital behaviors among college students.

Another behavior of interest is oral sex, which refers to sexual activity involving oral (mouth) stimulation of one's partner's sex organs and includes both fellatio and cunnilingus (Hock, 2007). For several reasons, oral sex can be a preferred form of sexual expression for adolescents and young adults. The behavior cannot produce an unwanted pregnancy, which is often the central focus of their concerns about sexual risks (Sadovszky, Keller, & McKinney, 2002). In some situations, oral sex may be preferred because it is perceived to involve less intimacy than intercourse (Chambers, 2007). In addition, some studies have found that oral sex is not judged to be a form of sexual activity at all, thus allowing participants to view themselves as not being sexually active (Sadovszky et al., 2002; Sanders & Reinisch, 1999).

Anal sex is another behavior of interest to this study. It is a behavior that is not often assessed in sexual-risk surveys even though it is the most efficient route for HIV transmission (Baldwin & Baldwin, 2000). Between 20-25% of college-aged adults have participated in anal sex behaviors (Baldwin & Baldwin, 2000; Flannery, Ellingson, & Votaw, 2003). Research also suggests those who participate in anal sex are more likely to participate in other risk behaviors (Baldwin & Baldwin, 2000). Thus further investigation of these specific behaviors is warranted.

4. Instrument Development Process

Krause described a multi-modal technique for the development of close-ended survey questions that effectively bridges both qualitative and quantitative methodological approaches (2002). Sexual behaviors have been thoroughly researched, thus Krause's development process was slightly adjusted to reflect the information already published concerning these behaviors (i.e. focus groups, interviews, etc.). Refer to Figure 1 for a graphic of the instrument development process.

Instrument measures were formatted using Dr. Ajzen's guidelines for constructing TPB instruments (2002). Attitude, subjective norm, perceived behavioral control, and intention are usually assessed directly by means of standard scaling procedures. When developing the scales, the measurements must be directly compatible with the behavior in terms of action, target, context, and time elements. Participants may have trouble understanding questions with negative phrasing, statements containing both subjects and verbs relating to the behavior, or item responses depending on further information, not specified in the question (French, Cooke, McLean, Williams, & Sutton, 2007). Thus, it is critical for the spectrum of sexual behaviors to be clarified in the measurements and for each item to be clear, concise, and completely exhaustive.

Due to the sensitive nature of the subject matter the instrument was designed in the present study to be administered online. Among college students, web-based surveys are more cost effective and convenient than other modes of survey research. A meta-analysis comparing web and mail surveys among college respondents reported the web survey response rate to be 3% higher (Shih & Xitao, 2008). The benefits of utilizing web-based surveys include reduced implementation costs, faster data collection, improved formatting, elimination of data entry, and reduced processing costs (Dillman, 2007). Also, by emphasizing a study's brevity and application of additional reminders a higher response rate is more likely to be achieved (Cranford et al., 2008). Thus, the present study was administered online, notifying participants via multiple reminders to respond to the one-time survey. Participants were told they had the option of discontinuing the survey at any point. In addition, no e-mail or IP addresses were collected in order to ensure the anonymity of the subjects.

4.1 Development of Preliminary Variables

Preliminary measures were developed using Ajzen's guidelines for constructing a TPB questionnaire (Ajzen, 2002). Likert type scales provide precise information on respondents' degree of attitudes and provide high reliability (Creswell, 2008). This format was used for many of the present survey items. Special attention was given to avoid the use of vague words, technical terms, and double-negative wording. The instrument defined the specific sexual behaviors so all respondents' would be using the same definition for their item responses. In addition, the instrument's Flesch-Kincaid Readability Score was 8.6, ensuring the material was suitable for college-aged students.

4.2 Review by Expert Panel

The expert panel consisted of 6 scholars knowledgeable in the area of alcohol use, sexual behaviors, instrument development and statistical analysis. Each panel member received all student notifications, consent forms and the complete preliminary questionnaire. The panel was asked to evaluate the content quality, instrument structure, and ability of the measures to produce data appropriate to answer the stated research questions. In addition, the panel received all participant contact emails, consent process, and cognitive interview probes. Problems with each measure were identified, discussed, and potential solutions were proposed. The panel judged important construct and domain themes of the TPB. In addition to reviewing questions and response formats, the panel was also determined the order of the questions and content of the email notifications and informed consent.

Based upon input from the panel, changes were made to the survey instrument, including removal of erotic touch behaviors. These behaviors are defined as physical acts without penetration, such as massage, groping, and self-masturbation. Erotic touch was initially included as the researcher sought to assess the entire spectrum of behaviors. However, the panel did not define these behaviors as risk-related, as rape, STIs, and pregnancy were generally not associated with erotic touch. Instead, further information was added clarifying digital sex behaviors and additional questions were suggested concerning the consequences of digital sex (attempted assault, etc.).

Further edits included the clarification of the definition of oral sex to include both giving and receiving the sexual act and the clarification of items using the term "sexual activity" by expanding them to include specific sexual behaviors. Double-barreled items were reworded, skip patterns were applied for conditional questions and the instrument was edited to begin with the least sensitive or personal queries. Participant notifications were amended to emphasize the topic, clarify the plea for help, include support for school spirit and further discuss the potential impact of the results on the student population. In addition, a graphic was created and used across all materials (participant notifications, consent and instrument) to highlight and remind participants of the anonymous nature of the instrument. During the course of the editing process, the researcher turned to the literature to support recommended changes as they applied to previous qualitative and quantitative studies of sexual behaviors among college students.

4.3 Cognitive Interviews

Following edits based on the experts' comments, cognitive interviews with members of the target audience were conducted. The purpose of the interviews was to assess item interpretability by the participants. Participants may have trouble understanding questions with negative phrasing, clauses to the behavior, or answers depending on further information, not specified in the question (French et al., 2007). Sometimes issues may arise due to cultural and societal differences between the researchers and the participants. Thus, it is critical for the spectrum of sexual behaviors to be clarified in the measurements and for each item to be clear, concise, and completely exhaustive.

Interviewees were recruited via word-of-mouth and asked to think-a-loud while completing the instrument. The cognitive interview focused on assessing four components: comprehension, information retrieval, judgment, and reporting via guiding probes. The interviews assessed cognitive interpretation of the information required for participants need to answer each question. The participant's voice and screen movement were captured with Camtasia Studio 6, a screen capture program which is often used in distance education development and applied as a tool in the observational analysis of internet use (Birru et al., 2004; Buhi, Daley, Fuhrmann, & Smith, 2009).

Similarly to the Krause study, the instrument was introduced to participants in a manner intended to increase motivation and commitment during the lengthy interview (Krause, 2002). Students were provided with an explanation of the time and effort required for instrument development and the importance of their opinions of the current instrument. Cognitive interviews were conducted with 11 students (6 female). The majority of respondents were Caucasian (18% Latino) and the median age was 19. The sample demographics were representative of the overall university. All cognitive interview participants reported their sexuality as heterosexual and 73% reported sexually activity within the past 30 days. About a third of the respondents were in a monogamous relationship, another third were dating, but not in an exclusive relationship, and the final third were neither in a relationship or dating. The cognitive interviews were analyzed via researcher notes, respondent voice recordings and captured screen movement. Findings were used to further edit the instrument. The definition of sexually transmitted infections was clarified, anchors reworded to match the stem, "not applicable" was added to certain response options and the query into sexual partners was expanded to include all sexual behaviors of interest. In addition, greater emphasis was placed on formatting the web survey to include bolded categories, increased spacing, and larger font size.

4.4 Pilot Test

After editing the instrument based on the cognitive interviews, a pilot study was conducted. The pilot study served as a quality check among the target population. A total of 4,000 students, aged 18-24 were randomly selected by the registrar to participate in the pilot study. Invited participants received one initial contact followed by three additional reminders over the course of two weeks. To ensure anonymity participants' IP addresses, names and e-mails were not collected. Respondents were notified of their right to discontinue the questionnaire at any point without retribution. Upon completion of the survey, respondents were directed to an exit page with local alcohol, sexual health, and mental health resources.

Zoomerang, a commercial internet survey software program, was used to collect and store the electronic study data. Data was entered in SAS statistical software package version 9.2. Each question on the survey was coded numerically to facilitate data analysis. Response patterns were assessed by age, gender, sexual preference, and relationship status. The distribution and missing responses were analyzed. Due to the sensitive nature of the survey content extra attention was placed on ceiling and floor effects. Data analysis indicated measurements suffering from polar weight lacked adequate discriminate capability of high versus low levels of health behavior; these measures were eliminated.

A total of 710 students completed the instrument, resulting in a 17.75% response rate. As shown in Table 1, comparability of the pilot sample to the entire University population. Survey length, frequency of distributions for sufficient variance, and an exploratory factor analysis was preformed to examine the structure and psychometric properties of the newly developed scales. Particular attention was given to establishing the reliability and validity of the new instrument. Demographic and prevalence characteristics of the participants were calculated through descriptive statistics which included analysis of respondent and non-respondent characteristics. Since bias may arise from respondent's perceived social norms, participant demographics were matched to the overall university population (Table 1).

Content validity was primarily assessed during the qualitative portion of the protocol. The expert panel and cognitive interviews were used to judge important construct and domain themes. Content validity was also assessed through the clarity, comprehensiveness, and redundancy of items and domains. Since the instrument includes both new and edited measures exploratory factor analysis was conducted to identify if the derived constructs are the same as those hypothesized. Items were discarded if they demonstrated a weak relationship (low factor loading) with the underlying variable. Varimax rotation was used to examine the factor loadings. Items were retained on factors if they had high loadings (i.e., saturated or loadings with an absolute value greater than .40) and were not complex. Cronbach's alpha determined the internal consistency of the scales and provided evidence for items that might be suppressors. Items found to be too difficult, too easy, and/or have near-zero or negative discrimination were replaced with more suitable items.

Minor revisions were made to the instrument including revisions of response items, elimination of questions with low factor loadings and the revision of the STI testing measure to include both 6 month and 12 month time spans. A total of 49 questions, with multiple sub-queries, were retained for the final edition of the instrument.

4.5 Formal Investigation

The registrar's office randomly selected another 4,000 students for the formal investigation. The previously piloted methodology was applied in the formal investigation, with one exception. In order to increase the instrument's response rate, an incentive was offered to the first two and last two participants. On the exit page participants had the option to exit the survey and continue to the incentive form, which required submitting their contact information to be considered for a $50 gift card.

The formal data collection (with incentive) lead to a 20.8% response rate (832 respondents), a 3% increase from the pilot administration. Table 1 presents a comparison of the final sample with the university population. Respondent behavioral measures were compared to a national sample (Table 2) and were found to be somewhat comparable.

The final student notifications, consent information, and survey can be found in appendices C, D, and E, respectively. The continued development process of the behavior-specific sexual risk survey will be presented in a series of substantive papers exploring the applicability of the Theory of Planned Behavior to predict intention to participate in specific sexual behaviors while intoxicated and the applicability of a risk-level typology.

5. Results

Application of the Krause instrument development process lead to 50 preliminary measures assessing specific sexual behaviors and the role of alcohol intoxication in the intention to participate. The initial measures included a spectrum of sexual behaviors: erotic touch, digital, oral, vaginal, and anal sex. The expert panel suggested the removal of erotic touch behaviors as they are not risk-related, resulting in the deletion of sub-questions from behavior-specific items. Three additional questions were created to address the consequences of specific sexual behaviors. Definitions were clarified, items reworded, and skip patterns were added. Participant notifications were edited to emphasize the topic and the anonymous nature of the study design.

Fifty three questions were presented in the student cognitive interviews. Participant comments and screen movements were recorded during the think-a-loud process. This allowed accurate analysis of verbal comments and inferences, as well as specific movement over response options and instrument structure. This information led to changes in response options, readability, the creation of 3 screening questions and 4 sub-questions relating to specific-sexual behavior. Screen-capture software has previously been used as a methodology assessing internet usage (Birru et al., 2004; Buhi et al., 2009). Results of the present study prove it to be a cost effective, rich data collection technique for instrument development.

The piloted instrument contained 56 questions assessing digital, oral, vaginal, and anal sexual behaviors and the role of alcohol intoxication in these behaviors. The factor analysis resulted in the removal of two measures across 3 sexual behaviors (total of six items) due to poor loadings. The removed items included: "when it comes to (oral, vaginal, anal) sex behaviors, how motivated are you to meet the expectations of your parents" and "I am confident I can resist (oral, vaginal, anal) sex advances" respectively from the constructs Motivation to Comply and Perceived Behavioral Control. Another item was removed from further analyses as it loaded on the wrong factor. "Availability of free alcoholic drinks influences my decision to participate in digital sex" was theorized as part of Perceived Power but loaded on Control Beliefs. Exploratory factor loadings ranged from .56 to .84. Internal consistency was demonstrated for the instrument overall (χ= 0.83) and for each factor except Perceived Behavioral Control (oral sex χ= -0.17, vaginal sex χ= 0.46, anal sex χ= 0.31). Factor loadings and estimates of internal consistency are shown in Table 3-4. In addition to the elimination of questions with low factor loadings, the item assessing STI testing was revised to include both 6 month and 12 month sub-items.

During the pilot study, the total numbers of items were reduced from 56 to 49. The formal investigation of the 49 items was conducted with an additional sample 4000 students. Survey methodology remained the same except for one notable difference; the use of an incentive. By offering participants the opportunity to receive one of four $50 gift cards, the response rate increased 3%.

6. Discussion

Although the establishment of an instrument is an ongoing task requiring replication across a series of studies, the present study results provides structured guidelines and encouraging results. To date, concurrent alcohol use and sexual activity has been difficult to assess. This study contributes to exploratory efforts in this field via development of measures specific to alcohol use and sexual behavior risk. The present instrument development process aids in addressing measurement and validation of self-report sexual behavior; which currently lacks consensus in the literature (Dawson, 2003; Schroder et al., 2003). In addition, this instrument is the first to assess a spectrum of specific sexual health behavior, including digital, oral, vaginal, and anal sex behaviors and how they relate to alcohol intoxication.

The applied eight-step instrument development process provided explicit guidelines for mix-modal analysis development. By reviewing the literature to identify relevant concepts of sexual behavior and alcohol use, preliminary measures were cultivated. These measures where then reviewed by a panel of experts, edited and tested among the target population with cognitive interviews. The application of Camtasia Studio in the cognitive interviews, proved to be a cost effective method to capture not just the vocal response, but also the participant's screen interaction with the web survey. This aspect of the analysis proved fruitful because the researcher was able to analyze how the participant interacted with the survey design, response options, length, and overall construction. The web-based design of the instrument also proved to be modestly cost-effective with a small incentive and provided increased anonymity for participants.

Caution must be applied in generalizing the results of this study to a broader college student sample. The results may not be transferred to campuses without a comparable environment and social scene. In addition data collection occurred during a specific time interval and thus does not follow respondents longitudinally to view personally normative behaviors. It is also important to note the mixed-methodology of the instrument development process can be costly and labor-intensive. However, the present study provides a comprehensive description of the sexual behaviors of college students and aids in addressing the gap in our knowledge base.

Further research should focus on continued development of the measures and specific properties of the 49-item instrument. Further testing with other college-student populations is necessary to establish required psychometric measures. In addition, inclusion of additional risk behaviors or measures to better describe these public health perils should be considered. Continued review of the applied instrument development process is warranted as newer technologies and techniques are developed and assessed.

7. Conclusions for Consideration

The lack of measurement consistency between studies evaluating alcohol use and sexual activity is problematic because comparisons and generalizations are difficult to assess (Pinkerton et al., 1998). The aim of this study was to develop an instrument to assess specific sexual behaviors among college students and the role alcohol intoxication plays in one's intention to participate in these behaviors. The Classical Test Theory provided the framework for development and assessment of the measurements. In addition, the Theory of Planned Behavior was used to both predict and explain the health behaviors, as well as to guide formatting and structure of individual items. The instrument development process included review by an expert panel, cognitive interviews with sample participants, and pilot investigation. Edits and revisions were finalized following pilot testing and the survey readied for final administration. The applied instrument development process employed screen capture software and web-based surveying in a cost-effective format suitable for mixed-method measurement development. The development and application of the instrument provides a clearer understanding of the relationship between alcohol use and sexual activity and aids in the development of effective public health interventions and policies.

Figure 1. Instrument development process

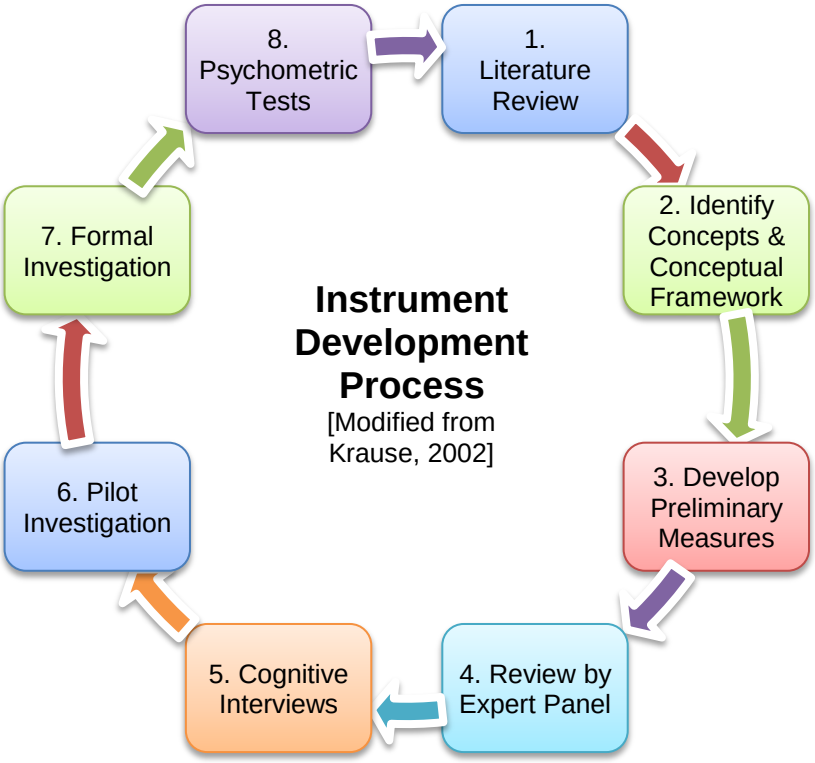

Table 1. Study sample comparison to total university population

Demographic		University Population	Current Study Pilot Study	Formal Investigation
Gender	Male	45.0%	39.0%	33.0%
	Female	55.0%	61.0%	67.0%
Race	White/Caucasian	60.4%	67.2%	64.6%
	Black/African American	10.2%	12.5%	7.5%
	Asian	8.7%	6.4%	5.8%
Ethnicity	Hispanic	15.4%	18.3%	17.5%
Age	18	18.3%	19.9%	14.7%
	19	20.2%	20.1%	25.7%
	20	21.7%	25.2%	24.0%
	21	20.3%	23.1%	22.1%
	22	8.9%	7.8%	9.7%
	23	3.0%	2.8%	2.4%
	24	1.4%	1.0%	1.4%

Table 2. Comparison of study sample and the National College Health Assessment II Sample

	Current Study (n = 832)	ACHA-NCHA II* (n = 30,093)
Participation at least once within the past 30 days		
Oral	48.0%	41.7%
Vaginal	47.6%	45.4%
Anal	6.3%	4.7%
Number of drinks consumed last time they "partied"/socialized		
0	23.6%	32.6%
1-2	28.0%	19.6%
3-4	20.9%	18.4%
5-6	15.5%	13.3%
7-8	5.5%	6.8%
9 or more	6.5%	9.3%
Consumed 5 or more drinks in a sitting during the last 2 weeks		
N/A, Don't drink	26.0%	26.8%
None	26.5%	40.6%
1-2 times	23.5%	21.0%
3-5 times	9.2%	9.1%
6 or more times	4.8%	2.6%
Experienced the following within the past 12 months, as a consequence of their drinking		
Sex without giving consent	2.9%	1.5%
Sex without getting consent	1.1%	0.4%
Unprotected sex	17.5%	11.6%
Experienced without consent during the past 12 months:		
Sexually touched	9.9%	5.9%
Attempted sexual penetration	5.9%	2.3%
Sexually penetrated	3.3%	1.5%
Intimate relationship that was (past 12 months)		
Emotionally abusive	9.8%	9.8%
Physically abusive	4.4%	2.4%
Sexually abusive	2.6%	1.6%

* Data from ACHA-NCHA II Fall 2010 Report

References

Abbey, A., Saenz, C., & Buck, P. O. (2005). The cumulative effects of acute alcohol consumption, individual differences and situational perceptions on sexual decision making. *Journal of Studies on Alcohol, 66*(1), 82(89).

Abbey, A., Saenz, C., Buck, P. O., Parkhill, M. R., & Hayman, L. W., Jr. (2006). The effects of acute alcohol consumption, cognitive reserve, partner risk, and gender on sexual decision making. *Journal of Studies on Alcohol, 67*(1), 113(119).

Ajzen, I. (2002). Constructing a TPB questionnaire: Conceptual and methodological considerations. Retrieved July 28, 2008, from http://www.people.umass.edu/aizen/pdf/tpb.measurement.pdf

Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior*. Englewood Cliffs, NJ: Prentice Hall.

Albarracin, D., Johnson, B. T., Fishbein, M., & Muellerleile, P. A. (2001). Theories of reasoned action and planned behavior as models of condom use: A meta-analysis. *Psychological Bulletin, 127*(1), 142-161. doi: 10.1037/0033-2909.127.1.142

American College Health Association. (2011). American College Health Association - National College Health Assessment II (ACHA-NCHA II) Reference Group Data Report Fall 2010. Baltimore: American College Health Association.

Baldwin, J. I., & Baldwin, J. D. (2000). Heterosexual Anal Intercourse: An Understudied, High-Risk Sexual Behavior. *Archives of Sexual Behavior, 29*(4), 357-373. doi: 10.1023/A:1001918504344

Birru, M. S., Monaco, V. M., Charles, L., Drew, H., Njie, V., Bierria, T., . . . Steinman, R. A. (2004). Internet Usage by Low-Literacy Adults Seeking Health Information: An Observational Analysis. *Journal of Medical Internet Research, 6*(3).

Buhi, E. R., Daley, E. M., Fuhrmann, H. J., & Smith, S. A. (2009). An observational study of how young people search for online sexual health information. *Journal of American College Health, 58*(2), 101-111.

Chambers, W. C. (2007). Oral Sex: Varied Behaviors and Perceptions in a College Population. *Journal of Sex Research, 44*(1), 28-42.

Cooper, M. L. (2002). Alcohol use and risky sexual behavior among college students and youth: evaluating the evidence. *J Stud Alcohol Suppl*(14), 101-117.

Cooper, M. L., & Orcutt, H. K. (2000). Alcohol use, condom use and partner type among heterosexual adolescents and young adults. *J Stud Alcohol, 61*(3), 413-419.

Corbin, W. R., & Fromme, K. (2002). Alcohol use and serial monogamy as risks for sexually transmitted diseases in young adults. *Health Psychol, 21*(3), 229-236.

Core Institute at Southern Illinois University. (2006). Core Alcohol and Drug Survey Results. Retrieved November 2009, from http://www.core.siuc.edu/

Cranford, J. A., McCabe, S. E., Boyd, C. J., Slayden, J., Reed, M. B., Ketchie, J. M., . . . Scott, M. S. (2008). Reasons for nonresponse in a web-based survey of alcohol involvement among first-year college students. *Addictive Behaviors, 33*(1), 206-210.

Creswell, J. W. (2008). *Educational research : planning, conducting, and evaluating quantitative and qualitative research*. Upper Saddle River, N.J.: Pearson/Merrill Prentice Hall.

Dawson, D. A. (2003). Methodological issues in measuring alcohol use. *Alcohol Res Health, 27*(1), 18-29.

De Champlain, A. F. (2010). A primer on classical test theory and item response theory for assessments in medical education. *Medical Education, 44*(1), 109-117. doi: 10.1111/j.1365-2923.2009.03425.x

Dedobbeleer, N., Morissette, P., & Rojas-Viger, C. (2005). Social network normative influence and sexual risk-taking among women seeking a new partner. *Women Health, 41*(3), 63-82.

Dillman, D. A. (2007). *Mail and internet surveys : the tailored design method*. Hoboken, N.J.: Wiley.

Evrard, J. R., & Gold, E. M. (1979). Epidemiology and Management of Sexual Assault Victims. *Obstetrics & Gynecology, 53*(3), 381-387.

Flannery, D., Ellingson, L., & Votaw, K. S. (2003). Anal Intercourse and Sexual Risk Factors Among College Women, 1993-2000. *American Journal of Health Behavior, 27*(3), 228-235.

French, D. P., Cooke, R., McLean, N., Williams, M., & Sutton, S. (2007). What do people think about when they answer theory of planned behaviour questionnaires?: A 'think aloud' study. *Journal of Health Psychology, 12*(4), 672-687.

Geist, R. (1988). Sexually related trauma. *Emergency Medical Clinics of North America, 6*, 439-466.

Girardin, B. W. (1997). *Color atlas of sexual assault*. St. Louis: Mosby.

Glanz, K., Lewis, F. M., & Rimer, B. K. (2002). *Health behavior and health education : theory, research, and practice*. San Francisco: Jossey-Bass.

Hendershot, C. S., Stoner, S. A., George, W. H., & Norris, J. (2007). Alcohol use, expectancies, and sexual sensation seeking as correlates of HIV risk behavior in heterosexual young adults. *Psychol Addict Behav, 21*(3), 365-372. doi: 2007-13102-010 [pii]10.1037/0893-164X.21.3.365

Hingson, R., Heeren, T., Zakocs, R., Kopstein, A., & Wechsler, H. (2002). Magnitude of alcohol-related mortality and morbidity among U.S. college students ages 18-24. *J Stud Alcohol, 63*(2), 136-144.

Hock, R. R. (2007). *Human Sexuality*. Upper Saddle River, NJ: Pearson Education.

Krause, N. (2002). A Comprehensive Strategy for Developing Closed-Ended Survey Items for Use in Studies of Older Adults. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences, 57*(5), S263-S274. doi: 10.1093/geronb/57.5.S263

Noar, S., Cole, C., & Carlyle, K. (2006). Condom Use Measurement in 56 Studies of Sexual Risk Behavior: Review and Recommendations. *Archives of Sexual Behavior, 35*(3), 327-345.

Perkins, H. W. (2002). Surveying the damage: a review of research on consequences of alcohol misuse in college populations. *Journal of Studies on Alcohol Supplement, 63*(2), S91(10).

Pinkerton, S. D., Holtgrave, D. R., Leviton, L. C., Wagstaff, D. A., & Abramson, P. R. (1998). Model-Based Evaluation of Hiv Prevention Interventions. *Evaluation Review, 22*(2), 155-174.

Riggs, N., Houry, D., Long, G., Markovchick, V., & Feldhaus, K. M. (2000). Analysis of 1,076 cases of sexual assault. *Annals of Emergency Medicine, 35*(4), 358-362.

Rossman, L., Jones, J. S., Dunnuck, C., Wynn, B. N., & Bermingham, M. (2004). Genital trauma associated with forced digital penetration. *The American Journal of Emergency Medicine, 22*(2), 101-104.

Sadovszky, V., Keller, M. L., & McKinney, K. (2002). College Students' Perceptions and Practices of Sexual Activities in Sexual Encounters. *Journal of Nursing Scholarship, 34*(2), 133-138. doi: doi:10.1111/j.1547-5069.2002.00133.x

Sales, J. M., Spitalnick, J., Milhausen, R. R., Wingood, G. M., DiClemente, R. J., Salazar, L. F., & Crosby, R. A. (2009). Validation of the worry about sexual outcomes scale for use in STI/HIV prevention interventions for adolescent females. *Health Educ. Res., 24*(1), 140-152. doi: 10.1093/her/cyn006

Sanders, S. A., & Reinisch, J. M. (1999). Would you say you "had sex" if...? *JAMA, 281*(3), 275-277. doi: jbr80459

Schroder, K. E., Carey, M. P., & Vanable, P. A. (2003). Methodological challenges in research on sexual risk behavior: I. Item content, scaling, and data analytical options. *Ann Behav Med, 26*(2), 76-103.

Shih, T.-H., & Xitao, F. (2008). Comparing Response Rates from Web and Mail Surveys: A Meta-Analysis. *Field Methods, 20*(3), 249-271. doi: 10.1177/1525822x08317085

Siegel, D. M., Klein, D. I., & Roghmann, K. J. (1999). Sexual behavior, contraception, and risk among college students. *Journal of Adolescent Health, 25*(5), 336-343.

Stone, N., Hatherall, B., Ingham, R., & McEachran, J. (2006). Oral sex and condom use among young people in the United Kingdom. *Perspect Sex Reprod Health, 38*(1), 6-12. doi:10.1363/psrh.38.006.06

Surra, C. A., Boettcher-Burke, T. M. J., Cottle, N. R., West, A. R., & Gray, C. R. (2007). The Treatment of Relationship Status in Research on Dating and Mate Selection. *Journal of Marriage and Family, 69*(1), 207-221.

Testa, M. (2004). The role of substance use in male-to-female physical and sexual violence: A brief review and recommendations for future research. *Journal of Interpersonal Violence, 19*(12), 1494-1505. doi: 10.1177/0886260504269701

Wechsler, H., Lee, J. E., Kuo, M., & Lee, H. (2000). College Binge Drinking in the 1990s: A Continuing Problem. *Journal of American College Health, 48*(5), 199-210.