The Pennsylvania State University

The Graduate School

College of Health and Human Development

A MULTI-METHOD ETIOLOGICAL ASSESSMENT OF ALCOHOL-RELATED SEXUAL VICTIMIZATION AND CONSEQUENCES IN FIRST-YEAR COLLEGE WOMEN

A Dissertation in

Biobehavioral Health

by

Nichole M. Scaglione

Submitted in Partial Fulfillment
of the Requirements
for the Degree of

Doctor of Philosophy

August 2015

The dissertation of Nichole M. Scaglione was reviewed and approved* by the following:

Rob Turrisi
Professor of Biobehavioral Health
Graduate Program Chair
Dissertation Adviser
Chair of Committee

Patricia B. Koch
Professor of Biobehavioral Health

Laura C. Klein
Professor of Biobehavioral Health

Michael J. Cleveland
Assistant Research Professor of Human Development and Family Studies

Margaret A. Lorah
Director of the Center for Women Students

*Signatures are on file in the Graduate School.

Abstract

Background: Alcohol-related sexual victimization and consequences (AViC) disproportionately affect first-year college women in the U.S. Heavy drinking and social factors typical of the college context have been linked to increased AViC risk, while the use of drinking-related and social protective behaviors have been shown to decrease risk. However, there is limited work simultaneously examining these behaviors, specifically at the event-level. **Objective**: The current study examined the effects of alcohol use, drinking protective behaviors, social protective behaviors, and contextual risk factors on AViC at the global level, using a prospective longitudinal design (Aim 1) and at the event-level using daily diary data (Aim 2). Aim 3 utilized ecological momentary assessment (EMA) to examine the processes (via intentions and willingness) that influence decisions to drink, use protective behaviors, or engage in contextual risk on a given day. **Methods**: A random sample of 235 first-year female drinkers completed web-based assessments at the beginning (baseline) and end (3-month follow-up) of their first semester of college (Aim 1). Two-thirds of participants were randomized to an EMA protocol, which included 3-5 short cell phone-based surveys each day for 14 days (Aims 2 & 3). Hypotheses were tested using path analysis (Aims 1 and 2) and hierarchical linear modeling (Aim 3). **Results:** At the global level, typical weekend drinking was positively associated with alcohol-related victimization, but not consequences. This association weakened as individuals used more protective behaviors and more frequently drank in certain contexts (e.g., at parties; with friends). At the event-level, both estimated blood alcohol concentration (eBAC) and variability in eBAC (averaged across individual

drinking occasions) were associated with increased AViC. Drinking protective behavior use moderated these effects; however, social protective behavior use did not. Contextual factors also moderated the associations between event-level eBAC and AViC, such that for individuals who frequently engaged in sexual behavior during/after drinking, as their drinking and variability in drinking increased, so did their risk for AViC. Aim 3 analyses revealed individuals achieved higher eBACs, used more protective behaviors and engaged in greater contextual risk when they had greater intentions and were more willing to do so (across drinking occasions). The effects of willingness and intentions on drinking, protective behavior use, and contextual risk exposure varied within and across days. For example, women engaged in a wider variety of drinking contexts on days when their context intentions were higher than their own mean, and women used more social protective behaviors on days when their willingness to do so increased throughout the day.

Implications: The current study is among the first to simultaneously examine drinking, protective behavior use, and context as predictors of AViC at multiple levels (e.g., global vs. daily). Findings suggest harm-reduction alcohol interventions remain a useful tool in reducing AViC, but that their efficacy might be enhanced by also accounting for daily variability in drinking and by promoting the use of both drinking and social protective behaviors. Momentary examination of decision-making processes revealed that intentions and willingness might influence behavior at different levels, challenging behavioral theories that assume global associations.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACKNOWLEDGEMENTS

I would like to thank Rob Turrisi, my adviser, my committee chair, and most importantly my mentor. Thank you for pushing me to exceed my own expectations and to take on challenges others might consider too ambitious. Thank you for teaching me that science can be both creative and rigorous, and for supporting/encouraging my belief that work and life should be balanced. I would also like to thank Kim Mallett, Michael Cleveland, and Racheal Reavy for their guidance and mentoring. I feel incredibly fortunate to have been part of the PRO Health Lab and to have had so many unique opportunities to work on projects, learn analyses, and meet the people who have influenced your science. When we are all in meetings together, I consider myself so lucky to just be in the room learning from your thought processes and diverse experiences. Thank you for letting me be a fly on your wall. I am looking forward to our continued collaboration and friendships.

To all of the PRO Health students (past and current, especially Lindsey, Brittney, and Nichole—we'll consider Danica an honorary member, too), Diana, and Sarah, thank you for always being willing to help no matter the task. Project IDEAS would not have happened without you. I have enjoyed working with each of you, and I've learned so much in the process. Thank you all for creating such a fun and enriching place to work.

I would like to thank Drs. Koch, Klein, Cleveland, and Lorah for serving on my doctoral committee. Your time and feedback have been invaluable, and I truly appreciate everything you have done to push me to be a better scientist. I would also like to include Drs. Smyth, Testa, and Larimer, for supporting my NIAAA

proposal and for guiding my thinking and methodology throughout the dissertation process.

Mel, Brea, and Lauren, I have learned so much from you, and I appreciate your continuous encouragement and moral support. I've enjoyed our brainstorming sessions and writing days just as much as I've enjoyed our celebratory milestone champagne toasts. I am proud and excited to be your friend and colleague.

To my mom and dad, thank you for your never-ending patience, support, and encouragement. It's been a long, and sometimes bumpy road, and I couldn't have finished this without you. You will never know how much I have appreciated your voices on the other end of the phone, even if neither of us knew exactly what to say. Thank you both for being my #1 fan—you'll have to share the title.

Finally, to my husband Dan, thank you for our life together, and for choosing to start it here in State College. Thank you for challenging me to think about things from a different perspective, and for enduring the emotional rollercoaster that is grad school and "dissertating." Thank you for encouraging me to keep going even when I didn't want to, for forcing me to take a break and relax when I've been going for too long, for keeping me laughing throughout the process, and for reminding me to never take things too seriously.

This research was supported by a Ruth L. Kirschstein National Research Service Award from the National Institute on Alcohol Abuse and Alcoholism (NIAAA F31 AA022274-01A1), by the Hintz Graduate Education Enhancement Fellowship & through travel funding provided by Penn State's Department of Biobehavioral Health.

CHAPTER ONE: INTRODUCTION

Reducing alcohol-related sexual victimization and consequences (AViC) among college students has emerged as a national health priority over the past decade (Modi, Palmer, & Armstrong, 2013; Nicholson et al., 1998; Testa & Livingston, 2009). Between 25% and 33% of college women experience some form of unwanted sex (Flack et al., 2007; Koss, Gidycz, & Wisniewski, 1987; Testa et al., 2009), with the highest risk occurring in their first six-to-eight weeks on campus (Flack et al., 2008). AViC includes any type of unwanted, coerced, or forced sexual activity that occurs while an individual is high, intoxicated, or incapacitated due to alcohol consumption (Testa et al., 2009). The associations between college drinking and sexual victimization and consequences are well established (e.g., Abbey, Ross, McDuffie, & McAuslan, 1996; Scaglione et al., 2014; Testa et al., 2009) and have been the target of recent alcohol intervention efforts (e.g., Testa, Hoffman, Livingston, & Turrisi, 2010). Although such efforts have reduced drinking, reductions in AViC have been less promising (Larimer & Cronce, 2007).

The reasons for this gap remain unclear; however, several etiological hypotheses have been posited. First, Mallett and colleagues (2011) have suggested additional predictive pathways could reduce risk, such as protective behavior use. Others have demonstrated the need for more nuanced methods of assessing AViC (Parks & Fals-Stewart, 2004; Weinhardt & Carey, 2000). Finally, recent work in behavioral decision-making has suggested the need to better understand momentary influences on the decisions that could lead to increased or decreased risk of consequences and victimization (Scaglione et al., 2015). By examining 1)

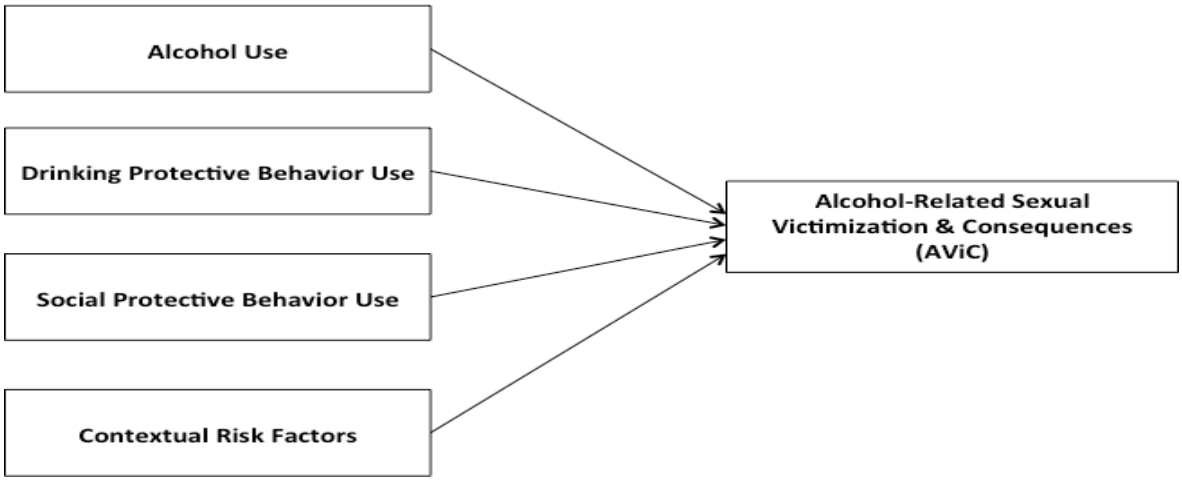
additional predictive pathways; 2) novel methods of measurement; and 3) momentary influences relevant to decision-making, the current study will inform the next steps toward enhancing alcohol interventions to also effectively impact AViC.

Examining Predictive Pathways of AViC in First-Year College Women

Although research has identified heavy drinking as a predictor of sexual victimization and consequences (see Abbey, 2002; Testa et al., 2009), little work has examined other contributing factors that, if addressed, could significantly strengthen intervention efforts. Mallett and colleagues (2015) examined the unique effects of social protective behaviors (e.g., staying/going home with friends; communicating sexual boundaries), drinking protective behaviors (e.g., pacing one's drinks; alternating alcoholic and non-alcoholic beverages), and drinking, on sexual consequences (e.g., regretted, unwanted and forced sex) across the first year of college. Findings revealed social protective behaviors and drinking had significant direct effects on experiencing sexual consequences, while drinking protective behaviors affected sexual consequences indirectly (through decreased alcohol consumption) (Mallett, Turrisi, Cleveland, Scaglione, Reavy, & Varvil-Weld, 2015). This work provided substantial support for examining protective behaviors in conjunction with drinking, though it focused more broadly on sexual consequences, which included, but were not limited to sexual victimization. It is possible the inclusion of other experiences, such as regretted and unprotected sex, obscures the observed relationships with AViC. The current study explores how the broader measure of sexual consequences and a more specific measure of sexual victimization differ as outcomes.

In addition, given the interpersonal nature of sexual risk, and that over 90% of college-based sexual assaults occur between people who know each other (Abbey et al., 1996), the social context of the drinking environment is important to explore (e.g., where and with whom an individual drinks, the gender and intoxication level of peers, whether consensual sex occurs after drinking). Very few studies have accounted for contextual risk factors that might elevate one's risk for sexual victimization and consequences within the drinking environment (Buddie & Parks, 2003; Parks, Hsieh, Collins, Levonyan-Radloff, & King, 2009), and none have examined the effects of drinking and context in conjunction with protective behaviors. As such, the current study builds on this previous work by adding contextual risk as a novel predictive pathway of AViC. Thus, the current study examines alcohol use, drinking protective behaviors (DPB), social protective behaviors (SPB), and contextual risk factors (CRF) as unique predictors of AViC in a sample of first-year female drinkers (see Figure 1).

Figure 1. Conceptual model for assessing AViC predictive pathways



Refining Methods for Measuring Risk

Etiological and intervention studies in the college drinking literature traditionally rely on global assessments of behavior, which average reports of behavior over a defined period of time (e.g., the past month or 90 days) and across participants (see Testa et al., 2010; Turrisi, Mallett, Mastroleo, & Larimer, 2006). For example, numerous studies have prospectively examined the effects of heavy drinking (measured at baseline) on sexual victimization (measured at 3-, 6-, or 12-month follow-up) (Testa, Hoffman, & Livingston, 2010; Testa, Livingston, & Hoffman, 2007; Testa, VanZile-Tamsen, & Livingston, 2007). Although findings suggest that, on average, heavier drinking is associated with higher risk of victimization, questions remain regarding why some drinking occasions result in AViC and others do not. Diary studies and ecological momentary assessment (EMA; real-time assessments of behavior in one's natural environment) can be used to answer such questions by obtaining a more nuanced account of within-person variability and between-person differences in behavior over time (Smyth & Heron, 2011). For example, diary studies have been used to assess within-person changes (i.e., day to day within an individual) in drinking behaviors and sexual risk across individual drinking occasions (Parks & Fals-Stewart, 2004; Patrick & Maggs, 2009; Scaglione et al., 2014). Most recently, EMA has emerged as a recommended method for capturing more immediate changes in decision making that occur prior to or during drinking and social events (Collins, Kashdan, & Gollnisch, 2003; Muraven, Collins, Morsheimer, Shiffman, & Paty, 2005; Shiffman et al., 2008). For example, it would be useful to know how decisions to use protective behaviors change as one becomes more

intoxicated, and in turn how those decisions impact one's risk of consequences and victimization (Scaglione et al., 2015). EMA has been demonstrated as feasible in gaining a multi-level understanding of contextual associations, temporal sequences, and individual differences underlying college student drinking (Collins et al., 2003; Muraven et al., 2005). As of yet, it has not been applied to the examination of risk factors associated with AViC.

Both global- and event-level methods offer unique strengths, play critical roles in understanding AViC, and offer answers to different types of research questions. As such, the current study uses a combination of global and event-level methods to examine the model proposed in Figure 1. Aim 1 uses a prospective longitudinal design to examine the influence of each predictive pathway (measured at baseline) on AViC (measured at follow-up). Aim 2 utilizes daily diary data, captured via an EMA study design (3-5 reports/day for 14 days), to obtain a more nuanced examination of AViC predictors (measured the morning after a drinking occasion). Using drinking as an example, this will provide insight into whether the likelihood of experiencing AViC in the first semester of college is a function of: 1) being a heavier drinker (between-person effects); 2) deviation from one's mean drinking level (i.e., drinking more or less than one's typical amount; within-person effects); or 3) a combination of the two (cross-level interaction effects). Understanding both the global and event-level influences of drinking, DPB, SPB, and CRF could provide unique insight into the tools or skills needed to effectively enhance AViC prevention.

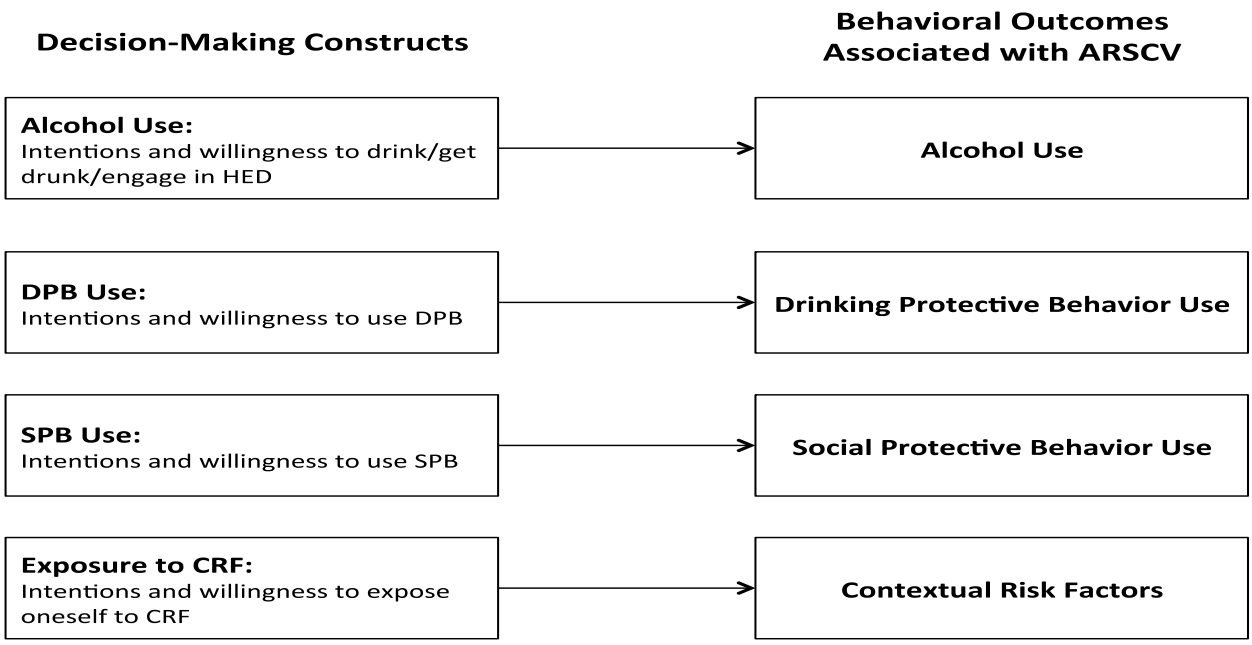
Examining Momentary Influences on Decision-Making

The final step in the current study is to identify momentary influences on the malleable predictors of behavior that can be targeted in intervention efforts. Behavioral decision-making theorists have argued there are reasoned and social reaction influences on behavior (Thornton, Gibbons, & Gerrard, 2002). The reasoned influence asserts behavior is the product of plans (intentions), and the social reaction recognizes some behaviors are not planned, but instead reflect openness to opportunity (willingness) (see Ajzen & Fishbein, 1980; Fishbein & Ajzen, 2010; Gerrard, Gibbons, Houlihan, Stock, & Pomery, 2008). Recent research suggests both intentions and willingness account for unique variance in behavioral outcomes when examined at the global level (Mallett et al., 2015; Scaglione et al., 2015). However, these relationships have not been assessed at the event level, when students are actively engaged in decision making. Event-level analysis of momentary influences on decision-making could be helpful in enhancing current intervention efforts, which are typically based on global relationships and do not adequately account for variability within and between days. It is plausible that intentions and willingness to drink, use protective behaviors, or engage in contextual risk, change throughout the day as new social options become available, or even as a function of mood. Such findings might suggest interventions need to be much more personally tailored to include decision-making skills for different settings.

Aim 3 uses EMA data to conduct a series of four multi-level models examining momentary decisions to drink, use DPB and SPB, and engage in CRF (measured the morning after a drinking occasion), given within- and between-day

levels of intentions and willingness to drink, use DPB and SPB, and engage in CRF, respectively (measured 3 times/day over 14 days; see Figure 2). For example, the drinking model will determine whether the decision to drink (or how much to drink) on a given day is predicted by: 1) average levels of intentions and willingness to drink across days (between-day effects); 2) deviations from one's mean levels of intentions and willingness to drink on that day (within-day effects); or 3) a combination of the two (cross-level interaction effects).

Figure 2. Examining momentary influence of intentions and willingness on behavioral outcomes associated with AViC



<u>In summary, the current study will examine:</u>

1. The relationships between alcohol use, DPB, SPB, CRF, and alcohol-related sexual victimization and consequences (AViC) using a prospective longitudinal design across the first semester of college;

2. The relationships between within- and between-person patterns of alcohol use, DPB, SPB, CRF, (using daily diary data) and experiencing AViC in the first semester of college; and
3. The event-level relationships between decision-making constructs (intentions and willingness) and behavioral outcomes associated with AViC (e.g., drinking, DPB, SPB, CRF) using an EMA design.

Table 1. Glossary of study terms by aim

Construct	Aim(s)	Predictor/Outcome	Definition
AViC	1/2	Outcome	Alcohol-related sexual victimization and consequences experienced in the first semester of college **ASV:** used when referring to alcohol-related sexual **victimization** specifically (Aim 1 results)
Alcohol Use	1	Predictor	Typical weekend drinking
	2/3	Predictor/Outcome	Estimated blood alcohol concentration (eBAC) on a given drinking occasion
DPB	1	Predictor	Typical drinking protective behaviors (e.g., pacing/limiting consumption) used prior to college
	2/3	Predictor/Outcome	Drinking protective behaviors used on a given drinking occasion
SPB	1	Predictor	Typical social protective behaviors (e.g., walking home with friends, watching drinks) used prior to college
	2/3	Predictor/Outcome	Social protective behaviors used on a given drinking occasion
CRF	1	Predictor	Typical contextual risk factors (e.g., where and with whom one drinks) prior to college
	2/3	Predictor/Outcome	The number of contexts encountered and whether an individual had sex after drinking on a given occasion
Intentions	3	Predictor	Intentions to drink, use DPB/SPB or engage in CRF in a given moment on a given day
Willingness	3	Predictor	Willingness to drink, use DPB/SPB or engage in CRF in a given moment on a given day

CHAPTER TWO: LITERATURE REVIEW

Alcohol-Related Sexual Consequences & Victimization: Scope of the Problem

Alcohol-related sexual victimization and consequences (AViC) within the college population have been recognized recently as a national health priority (Modi et al., 2013). Approximately one-in-three or one-in-four college women report unwanted sexual experiences (Flack et al., 2007; Koss et al., 1987; Testa et al., 2009), and alcohol is involved over 50% of the time (Abbey, 2002). Studies indicate first-year students are particularly vulnerable to AViC (Flack et al., 2008; Humphrey & White, 2000; Testa & Hoffman, 2012) due to factors such as increases in drinking, new interpersonal situations, and a general lack of sexual experience (Livingston et al., 2007; Parks, Romosz, Bradizza, & Hsieh, 2008; Testa et al., 2007; Turrisi et al., 2006). In addition to the more immediate physical and psychological consequences, students who experience AViC are also more likely to develop long-term substance abuse problems (Kilpatrick et al., 2003; Ullman & Brecklin, 2003; Wilson, 2010) and experience repeated victimization (Testa et al., 2007; Testa et al., 2010).

Operationalizing AViC. Though the overall prevalence of sexual victimization is well established at 25-33%, rates of AViC are more difficult to estimate, in part due to inconsistent measurement and conflicting literatures. Within the sexual assault literature, sexual victimization is measured using a revised version of the Sexual Experiences Survey (SES-R; Koss et al., 1987; Testa, VanZile-Tamsen, Livingston, & Koss, 2004) and typically includes any unwanted or non-consensual sexual experience obtained through force, coercion, or incapacitation (Abbey, Zawacki, Buck, Clinton, & McAuslan, 2001; Testa et al., 2009; Young, Grey, Abbey, Boyd, &

McCabe, 2008). Thus, AViC would include any unwanted, coerced, or forced sexual activity that occurs while an individual is high, intoxicated, or incapacitated as a result of drinking alcohol. However, the alcohol intervention literature refers more broadly to alcohol-related sexual consequences, which include but are not limited to sexual victimization (Hurlbut & Sher, 1992; Read, Kahler, Strong, & Colder, 2006). For example, the Young Adult Alcohol Problem Screening Test (YAAPST; Hurlbut & Sher, 1992) includes a sub-set of items assessing both sexual risk behaviors (e.g., unprotected sex) and sexual consequences (e.g., regretted, unwanted and forced sex). The current study utilized both measures in an effort to compare prevalence rates elicited by each, and to determine which method of measurement would fit best with the examined AViC predictive pathways.

Theoretical Factors that Impact AViC Risk

The factors that influence AViC are multi-determined and may occur more or less in the presence of different interpersonal or environmental conditions (Abbey et al., 1996; Benton et al., 2006; LaBrie & Pedersen, 2008; Neal & Carey, 2007). The current research is unique in that it simultaneously examined four distinct pathways known to independently contribute to or reduce AViC: drinking, drinking protective behaviors (DPB), social protective behaviors (SPB), and contextual risk factors (CRF) (Martens et al., 2004; Noel, Maisto, Johnson, & Jackson, 2009; Ullman, 2003).

College Drinking. Studies show over 80% of students have consumed alcohol in the past month (Baer, 2002; Johnston, O'Malley, Bachman, & Schulenberg, 2007), and 40% report having at least one heavy drinking episode (consuming four or more

drinks in a two hour period for females) in the past two weeks (Wechsler, Dowdall, Davenport, & Rimm, 1995). Despite earlier work that showed women drank significantly less than men (Engs & Hanson, 1990; Wechsler et al., 1995), more recent work suggests the gender gap is closing among college students (e.g., Keyes, Grant, & Hasin, 2008). Heavy drinking among college women has been associated with numerous sexual consequences, as well as with increased frequency and severity of sexual victimization (Abbey, 2002; Hingson, Heeren, Winter, & Wechsler, 2005; Testa et al., 1999; Turrisi et al., 2009; Vicary & Karshin, 2002). Despite increased intervention efforts within the past decade (see Larimer & Cronce, 2007), heavy drinking has only moderately decreased, and rates of AViC remain unchanged.

Alcohol is involved in at least 50% of sexual assaults within the college population (Abbey, McAuslan, Zawacki, Clinton, & Buck, 2001; Core Institute, 2010; Ullman, 2003), making AViC a dangerous and frequently occurring problem. Alcohol increases the likelihood of sexual consequences and victimization through physiological, cognitive, and motor impairment (Abbey, 2002). Alcohol myopia models have been used to explain a portion of this phenomenon, suggesting alcohol's impairment on cognitive functioning leads to a narrowed focus on only the most salient situational cues, particularly when conflict between impelling cues and inhibitory cues is high (Steele & Josephs, 1990). Similarly, intoxicated individuals have difficulty processing more distal risk cues, which suggests decisions made when intoxicated are based more on arousal than on thoughtfully processed risks (Davis et al., 2007; Steele & Josephs, 1990). This is important in the context of

AViC, as intoxication likely decreases risk perception and consequence recognition. Further, alcohol's physiological and motor impairment may make it more difficult to physically fend off a potential perpetrator (Abbey, 2002).

Protective Behaviors. Despite the clear association between heavy drinking and sexual consequences and victimization, not all drinkers experience AViC. One theory behind this inconsistency is that students are using protective behaviors while drinking (see Ray, Turrisi, Abar, & Peters, 2009). Previous work has demonstrated students who regularly use protective behaviors are significantly less likely to experience consequences (e.g., Martens et al., 2004), and alcohol-based interventions that include a protective behavior component are among the most effective at reducing related consequence (e.g., BASICS; Dimeff, Baer, Kivlahan, & Marlatt, 1999). Further, students identify "personal responsibility" (e.g., staying with trusted friends; not exceeding personal limits) as the best protective method for preventing AViC (Smith et al., 2011), and they report already using a number of protective strategies while drinking (Delva et al., 2004; Lewis et al., 2010; Ray et al., 2009; Scaglione et al., 2015). Taken together, these findings suggest protective behaviors might be valuable targets for decreasing AViC (Delva et al., 2004; Smith et al., 2011).

Despite the wide variety of behaviors that protective strategies include (e.g., alternating alcoholic and non-alcoholic drinks, using a designated driver, watching one's drink, walking home with trusted friends), they are often grouped together and studied without differentiation (e.g., Martens et al., 2004). However, closer examination reveals that some behaviors directly address the *way* in which one

drinks (drinking protective behaviors; DPBs), while others target *the context or environment* in which one drinks (social protective behaviors; SPBs) (Ray et al., 2009). Although DPBs (Martens et al., 2004) and SPBs (Breitenbecher, 2008; Moore & Waterman, 1999) have been independently linked to decreases in AViC, the first study to examine them simultaneously suggests DPBs and SPBs affect sexual risk differently (Mallett et al., 2015). Given AViC can result from both alcohol consumption and social interaction, a clear understanding of how DPBs and SPBs function together, across contexts and in conjunction with alcohol, is necessary to improve intervention efforts.

Contextual Risk Factors. CRFs include aspects of the social drinking context that influence one's behavior (e.g., relationship to peers, location, group size, and gender consistency within the group) (Buddie & Parks, 2003; Parks et al., 2008). Research suggests college women will continue to drink and socialize with the same people at parties and in bars, even after receiving unwanted sexual attention (Buddie & Parks, 2003; Parks & Fals-Stewart, 2004; Parks et al., 2008), highlighting the need to examine the factors within the social environment that might result in increased risk. For example, Abbey and colleagues (1996) have asserted at least 90% of college sexual assaults occur between people who know each other, most commonly an acquaintance or casual dating partner. Additional risk of sexual victimization exists between dating partners if they have previously consumed alcohol during consensual sexual activity. Taken together, these factors make it difficult for women to accurately perceive risk and take the necessary protective precautions against sexual victimization (Cue, George, & Norris, 1996).

Research has also examined drinking location as a contextual risk factor. Parks and Miller (1997) found women who drank in bars were disproportionately more likely to experience both physical and sexual aggression. Being with a younger crowd and leaving the bar with strangers were particular contextual factors influencing the relationship between bar drinking and increased risk for violence (Buddie & Parks, 2003). Other research has shown that just by being in a bar, women are more likely to be perceived as sexually available by their male peers (Parks & Scheidt, 2000). Though first-year students are likely too young to be drinking in bars, these social characteristics have been observed within party settings as well (Abbey et al., 1996).

Finally, Borsari & Carey (2001) indicate other characteristics of the peer group might also be important factors, as they found being older and drinking within an established peer group were protective against alcohol-related risk. Conversely, new students might be at higher risk due to the fact they are developing new peer groups, lack familiarity with the group's members, and may not be confident in their drink refusal skills (Borsari & Carey, 2001). Previous work has also found students are at increased risk for heavy drinking when they socialize in larger, mixed-gender groups (Baer, 2002; Burger, 2014; Clapp et al., 2006). However, few studies have examined the direct effects of these interpersonal contextual factors on rates of sexual victimization or consequences. The current study aimed to link the literature reviewed above in an attempt to develop a cumulative measure of contextual risk, as none of these social characteristics occur in isolation (Baer, 2002).

Theories Applied to Understanding Risk

The current study utilized decision-making theories that regularly inform college-based interventions (e.g., Ajzen & Fishbein, 1980; Janz & Becker, 1984). The Theory of Planned Behavior (see Ajzen & Fishbein, 1980; Fishbein & Ajzen, 2010) posits behavior is the product of plans (intentions), whereas the Prototype-Willingness Model (see Gerrard et al., 2008; Thornton, Gibbons, & Gerrard, 2002) asserts a dual-process framework suggesting some behaviors are planned, while others occur as a result of openness to opportunity (willingness). Most of the work in behavioral decision-making has examined these constructs independently, identifying adolescents' and young adults' intentions to engage in risk behaviors (Guilamo-Ramos et al., 2008), intentions to use protective behaviors (Turchik & Gidycz, 2012), and willingness to experience consequences (Mallett, Varvil-Weld, Turrisi, & Read, 2011). Other research has suggested intentions and willingness can be complementary, but unique predictors of behavioral outcomes (Mallett et al., 2011; Scaglione et al., 2015). For example, Mallett and colleagues (2011) previously found both intentions to avoid consequences and willingness to experience consequences accounted for unique variance in experiencing consequences across the first year of college. This relationship was consistent across all types of consequences (e.g., physical, academic, social, and sexual). Additionally, in a recent examination of SPBs, Scaglione and colleagues (2015) found students' intentions and willingness to use SPBs uniquely predicted SPB use over six months. Taken together, these findings highlight the dual influence of both planning and openness on behavioral decision-making.

Examining Risk at Different Levels

Most of the previous work examining AViC has been conducted at the global level. As such, it is well established that heavy drinking is associated with increased risk for AViC over time (Abbey, 2002; Ullman, Karabatsos, & Koss, 1999). For example, Testa and colleagues have examined the prospective relationships between drinking, sexual victimization, and re-victimization, as well as how these relationships vary based on intimate partner or non-intimate partner perpetration (see Testa et al., 2007). Further interest in how these relationships function within and across individual drinking occasions has prompted the emergence of a smaller body of work which utilizes diary-based event-level methods (e.g., Patrick & Maggs, 2009; Scaglione et al., 2014). Findings from these studies reveal that not only are heavy-drinking women at increased risk of experiencing sexual consequences, but risk increases for all women as they exceed their own "normative" levels of drinking (Neal & Carey, 2007; Scaglione et al., 2014; Testa & Collins, 1997). Taken together, both global and event-level findings hold important implications for prevention. For example, the global approach would suggest harm-reduction intervention techniques should aim to decrease overall alcohol consumption, while the event-level approach suggests interventions should also encourage women, particularly light and moderate drinkers, not to stray from their "typical" levels of drinking.

Most recently, ecological momentary assessment (EMA) has emerged as an even more nuanced event-level method allowing for the repeated measurement of decision-making behaviors, as they occur "in real time" and in participants' natural environments (Shiffman & Stone, 1998; Shiffman, Stone, & Hufford, 2008).

Capturing behaviors in real time has the ability to shed light on momentary shifts in drinking, protective behavior use, or context, which collectively might impact AViC risk. Although EMA has not been used to examine event-specific decision-making in relation to AViC, several studies have demonstrated its utility in understanding college drinking behavior (Collins et al., 2003; Muraven et al., 2005; Piasecki et al., 2011; 2012; 2013).

As demonstrated by the literature in this area, global and event-level methods answer different types of research questions, and both hold important implications for prevention. In addition, each method comes with its own set of strengths and weaknesses. For example, global-level research is ideal for early etiological work exploring relationships across people (Weinhardt & Carey, 2000). It is also the preferred method for evaluating intervention effects, as daily and momentary changes are typically not expected. Relative to event-level methods, global-level research tends to be more cost-effective and less burdensome on participants. In contrast, event-level research is ideal for studying processes that are expected to change daily or from moment to moment (Scollon, Kim-Prieto, & Diener, 2003; Smyth & Heron, 2011), as both diary and EMA methods allow for the separation of within- and between-person effects. However, event-level methods tend to be more expensive and more burdensome for participants (Piasecki, Hufford, Solhan, & Trull, 2007; Scollon et al., 2003). As both methods provide valuable information regarding the relations between constructs at different levels (and/or different time intervals), the current study utilized global (prospective longitudinal design) and two types of

event-level (daily diary and EMA design) assessment to test the hypotheses outlined below.

The Current Study

The current study was developed in consideration of the previously presented literature, which outlines the multidimensional nature of AViC. Much of the previous work in this area has focused heavily on the relationships between alcohol and either victimization or consequences, using primarily global-level assessment. The studies that have examined alternative predictive pathways of AViC have studied them in isolation or using somewhat limited measurement. In addition, little work has focused on the decision-making processes that influence the predictors of AViC. The current study addressed these gaps in three ways. First, AViC was studied using a multidimensional framework that simultaneously accounted for drinking behaviors, protective behavior use, and contextual risk (see Figure 1). Second, the hypothesized framework was examined both globally (Aim 1), to see how these constructs operate "on average," and at the event level (Aim 2), to see how daily fluctuations in behavior impact AViC risk across the first semester of college. Finally, the current study utilized existing behavioral decision-making theories to examine the momentary processes (via intentions and willingness) that influence decisions to drink, use protective behaviors, or engage in contextual risk on a given day (Aim 3). Specific hypotheses are presented by Aim below.

Hypotheses

Aim 1. The study's first aim examined the relationship between alcohol use, DPB use, SPB use, exposure to CRF (all measured at baseline), and AViC

(measured at follow-up), using a prospective longitudinal design, across the first semester of college. In order to examine behaviors during the highest-risk period for first-year women (Flack et al., 2008), baseline assessments occurred prior to or within the first few weeks of arriving on campus, and follow-up occurred at the end of the semester (approximately 3 months post-baseline). Given what is known from the literature that has examined these paths independently (Baer, 2002; Buddie & Parks, 2006; Delva et al., 2004; Ray et al., 2009; Testa & Livingston, 2009), it was expected:

1a. Alcohol use would be positively associated with AViC;

1b & 1c. Based on previous work (Mallet et al., 2015), DPB use would not be significantly associated with AViC, and SPB use would be negatively associated with AViC; and

1d. CRF would be positively associated with AViC.

Given the complex social nature of AViC (Abbey et al., 1996), it was anticipated drinking behaviors, DPB, SPB, and CRF would interact with each other. As these constructs have not been examined simultaneously, examination of interaction effects was exploratory.

Aim 2. Aim 2 examined how event-level patterns of alcohol use, DPB use, and SPB use varied by context (measured daily) and affected AViC risk across the first semester of college (measured daily and at follow-up). The daily diary assessments were part of a larger EMA framework, which consisted of a daily waking recall assessment and two signal-contingent assessments (survey responses prompted by a signal) that occurred in the afternoon and evening. On

days when students reported drinking, they were also asked to complete event-contingent drinking logs (self-initiated in response to beginning a drinking event) at the beginning and end of each drinking event. For Aim 2, event-level behavioral patterns were estimated using the daily waking recall assessments. Because hypotheses for this aim included between-person effects, within-person effects, and cross-level interaction effects for each predictor, an example using only the alcohol pathway is provided below. It was expected that:

2a. Individuals who consumed more alcohol on average (across drinking occasions) would experience more AViC in their first semester of college, relative to individuals who typically consumed less (between-person effects);

2b. Individuals who would be at greater risk for AViC on days when they consumed more alcohol (within-person effects); and

2c. The association between event-level drinking and AViC would be stronger among individuals who consumed less alcohol on average (cross-level interaction effects).

Similar hypotheses were tested for DPB, SPB and CRF. Due to the interactive nature of these pathways, it also was expected significant cross-level interactions would emerge between behaviors. Again, examination of interaction effects between behaviors was exploratory. Example hypotheses include:

2d. The strength of the association between event-level variability in drinking and AViC would be stronger among individuals who used fewer SPBs on average (across drinking occasions);

2e. The positive association between event-level drinking and AViC would be stronger among individuals who more frequently engaged in sex after drinking; and

2f. The negative association between event-level DPB use and AViC would be stronger among individuals who encountered an above average number of unique contexts across drinking occasions.

Aim 3. The purpose of Aim 3 was to explore the event-level relationships between decision-making constructs (intentions and willingness) and behavioral outcomes associated with AViC. Utilizing the EMA framework, within- and between-day assessments (via the daily waking recall and the 2 signal-contingent reports) of intentions and willingness to drink, use DPB and SPB, and engage in CRF were used to predict the likelihood of drinking, DPB and SPB use, and CRF encountered, respectively, on a given day. The analyses for this aim resulted in a series of hierarchical linear models, each with the following hypotheses (again, examples using only the alcohol pathway):

3a. At Level 3 (Between-person effects), individuals would consume more alcohol if they had intentions and willingness to consume a higher number of drinks, on average;

3b. At Level 2 (between-day/within-person effects), individuals would consume more alcohol on days when they had intentions and willingness to consume a higher number of drinks (averaged across all three assessments); and

3c. At Level 1 (within-day/within-person effects), individuals would consume more alcohol on days when their intentions and willingness to drink increased throughout that day.

Cross-level interactions were explored when there was sufficient power to do so. A sample interaction hypothesis might include: Among individuals who had a higher-than-average willingness to drink, their likelihood of doing so would be higher on days when their intentions to drink increased throughout the day. Such an interaction would be descriptive of a planning process that occurs, perhaps after an opportunity to go out to a party has been presented. Examining the data in this way acknowledges decision-making constructs may vary within a day, between days, and across people, and that between-person differences may also influence how individuals vary within and across days.

CHAPTER THREE: METHODOLOGY

The study design described below was significantly influenced by results from a pilot study, which was conducted in Fall 2013 to test methodological approaches and students' reactions to participation in a complex EMA protocol. A detailed overview of the pilot study and resulting methodological recommendations are presented in Appendix A.

Current Study: Description of Participants

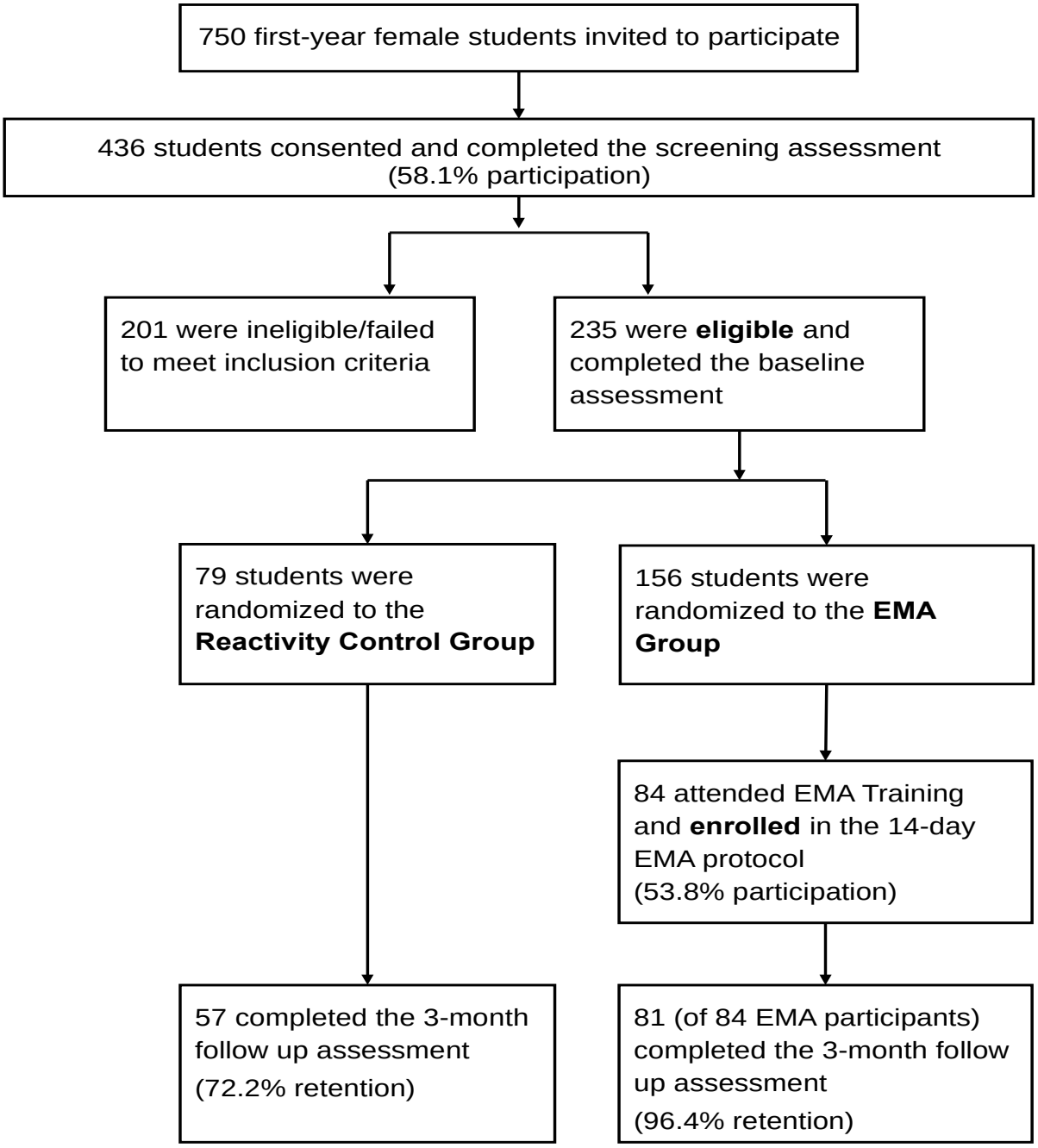
Participants were randomly selected female, first-year students (N = 235) at a large, public university in the northeastern US. Eligible participants a) were female; b) were first-year students (at least 18 years old); c) consented to participate; d) completed a screening assessment; e) endorsed having a 4G network smart phone; and f) reported at least one heavy drinking episode (i.e., four or more drinks in a single occasion; Wechsler et al., 1995) in the month prior to entering the study. Of the 750 first-year women invited to the study, 436 (58.1%) enrolled and consented to participate. Approximately 54% (n = 235) of enrolled students met eligibility criteria and were invited to continue in the study. These initial response rates are similar to those achieved in other studies using the same web-based recruitment methods (e.g., Turrisi et al., 2013).

Of the 235 participants enrolled and eligible to complete the study, the mean age was 18.06 (*SD* = .24) years. Most participants were Caucasian (91.1%), heterosexual (98.7%), not in relationships (69.4%), and living or intending to live in on-campus residence halls (99.1%).

Recruitment & Data Collection Procedures

Aim 1: Baseline & Follow-Up Procedures. Female participants were randomly selected from the registrar's list of first-year students at a large, public northeastern university. Invitation letters explaining the study, procedures, and compensation, and containing a URL and PIN for accessing the survey were mailed to potential participants just before (Cohorts 1 & 2) or just after (Cohort 3) arriving on campus in Fall 2014. Participants also received emailed invitations and up to seven reminders. Students who logged on were directed to the informed consent describing the study procedures. Following the provision of consent, students were routed to the web-based screening survey. At the conclusion of the screening survey, ineligible students (e.g., light or non-drinkers; individuals without access to a 4G smartphone) were compensated $5 for their time and removed from the participant list. Students who met eligibility criteria were immediately directed to the 30-minute baseline survey, for which they were compensated $15, with potential to earn a $5 bonus ($20 total) for rapid completion, within three days of the initial invitation email. Approximately three months post-baseline, participants who completed baseline and all other study procedures (see Aim 2 methods below; n = 163) were invited to complete a 15 minute follow-up assessment using similar procedures, for which they were compensated $10. See Figure 3 for the participant flow chart.

Figure 3. Participant flow diagram for Project IDEAS



Aims 2 & 3: EMA Study Procedures. Immediately following completion of the baseline assessment described above, two-thirds of participants were randomized to an EMA group (n = 156), and one-third was randomized to a reactivity control group (n = 79), using a computerized randomization algorithm. Individuals assigned to the reactivity control group were thanked for their time and informed they would be contacted to complete the follow-up assessment in approximately 3 months. Individuals in the EMA group were immediately routed to a scheduling tool, which invited them to continue in the study by selecting from available EMA training sessions. Participants who did not schedule electronically, or who missed their scheduled time, received up to three phone calls and two additional emails inviting them to (re)schedule. Approximately 54% (n = 84) of individuals randomized to the EMA group attended training and enrolled in the event-level portion of the study.

The EMA training session included a detailed explanation of the study procedures (e.g., instructions on when and how to respond to EMA signaling) and how to input data on individuals' cellular devices using the Snap Mobile application (app). To ensure participants understood the study protocol and training content, they were asked to take a brief post-training quiz. All incorrect responses were reviewed. To assure implementation fidelity across training sessions, two trained research assistants independently coded checklists of 21 items that should have been covered. There were no significant differences in participant knowledge or in implementation fidelity scores when compared across cohorts or trainers, suggesting EMA training was implemented with fidelity.

EMA data collection included at least 3 daily assessments for a period of 14 days. Daily assessments included: 1) an event-contingent waking recall, where participants recounted their drinking and social behaviors from the night before and indicated their intentions and willingness with respect to potential drinking and social events later that day; and 2) two signal-contingent assessments, randomly-timed to occur between 2pm and 6pm in the afternoon and between 7pm and 11pm in the evening, which captured momentary measures of intentions and willingness. On days when participants consumed alcohol, they were asked to complete additional event-contingent drinking logs, which assessed alcohol consumption, DPB and SPB use, and CRFs, at the beginning and end of *each* drinking event. Participants were trained to signal the beginning of a drinking event when they started drinking, changed locations, or switched peer groups, suggesting potential for multiple drinking events within each drinking day/occasion.

All surveys were available via the Snap Mobile app, a program installed on the home screen of each participant's smartphone. For all signal-contingent assessments, participants received text messages prompting them to log in to their app and complete the appropriate survey. Participants received reminder texts 30 minutes after the original text and again 30 minutes before the survey closed. Although participants were trained to initiate morning recall surveys upon waking, reminders to do so were sent at 9am during the week and at 10am on weekends. To access surveys, participants logged in to the app using their study PIN and password and selected the survey indicated in the text message (e.g., waking recall vs. random prompt survey). In contrast, participants were instructed to initiate the

event-contingent drinking logs via their Snap apps when they began drinking. Each drinking survey concluded with a reminder to complete additional surveys at the end of that event and at the beginning of each new drinking event throughout the night.

EMA participants were compensated $30, with a $20 bonus if they achieved at least 90% compliance on the waking recall assessments. The waking recall was selected as the focus of the incentive bonus because that assessment served as the "back up" and fidelity-check to data entered in the drinking logs. Thus, EMA-eligible participants who completed the entire study with good compliance earned up to $80 for their participation [baseline ($20), EMA ($50), & follow-up ($10)]. To further encourage EMA compliance, participants were also entered into a lottery for each survey they completed. Lottery entries were designed to be commensurate with the participant burden associated with each assessment (i.e., participants received one entry for each waking and signal-contingent survey, two entries for each drinking log initiation, and five entries for each end-of-event drinking log). Five lottery winners were randomly selected at the end of the study, with prizes ranging between $50 and $250.

Reactivity Control Group. Participants randomized to the reactivity group (n = 79) were demographically and behaviorally similar at baseline to those in the EMA group. Reactivity participants completed the baseline and follow-up assessments, with the potential to earn $30, as described in Aim 1 procedures. Seventy-two percent (n = 57) of reactivity participants completed the 3-month follow-up assessment. A summary of the recruitment and procedures timeline can be found in Table 2.

Table 2. Summary of study timeline by cohort

	August				September				October				November				December			
Week	*1*	*2*	*3*	*4*	*1*	*2*	*3*	*4*	*1*	*2*	*3*	*4*	*1*	*2*	*3*	*4*	*1*	*2*	*3*	*4*
Cohort 1																				
Recruitment	X	X	X																	
EMA Training				X	X															
EMA						X	X													
Follow-Up																	X	X		
Cohort 2																				
Recruitment			X	X	X															
EMA Training						X	X													
EMA								X	X											
Follow-Up																	X	X		
Cohort 3																				
Recruitment							X	X	X											
EMA Training										X	X									
EMA												X	X							
Follow-Up																	X	X		

Measures

All measures used within the current study were pilot tested and had good reliability (all $\alpha > 0.70$). Detailed descriptions of measures for each construct are presented below by aim. Measures for Aims 1 and 2 are presented together because they examine the same constructs; however, each measure is first described in terms of its global-level assessment (Aim 1) followed by its event-level assessment (Aim 2). Table 3 summarizes the time points at which each measure was assessed. All measures can be found in Appendix B.

Aims 1 & 2:

Outcome Measures

Alcohol-Related Sexual Victimization & Consequences (AViC). AViC were assessed using items from a revised version of the Sexual Experiences Survey (SES-R; Koss et al., 1987; Testa et al., 2004) and the Young Adult Alcohol Problem Screening Test (YAAPST; Hurlburt & Sher, 1992).

The current study used six items from the SES-R to assess the number of times (0, 1, 2, 3, 4+) participants experienced unwanted sexual advances (i.e., touching, kissing, or vaginal, anal, or oral sex), due to incapacitation from alcohol or drugs. Participants were asked to indicate the number of experiences they had in the year prior to college (baseline; α = 0.77) and in their first semester (follow-up; α = 0.71). Items were summed to create an index of alcohol-related sexual victimization at each time point. Within the daily waking recall assessment, if participants endorsed drinking the day before, they were also asked whether they experienced any of the six unwanted sexual advances during or after drinking (0 = no; 1 = yes). A sum score was created to indicate the total number of victimization experiences associated with each drinking occasion.

Six items from the YAAPST were used to measure the frequency with which students experienced sexual consequences (e.g., unwanted, unplanned/unprotected, regretted, or forced sex), scored on a five-point scale ranging from *0* (0 times) to *4* (10 or more times) (see Mallett et al., 2013). For Aim 1, participants indicated the number of times they experienced each consequence in the year prior to college (baseline; α = 0.86) or since beginning school (follow-up; α = 0.80). Items were summed to create a sexual consequence index at each time point. Within the daily waking recall assessment, if participants endorsed drinking the day/night before, they were asked to indicate whether they experienced any of the six sexual consequences during or after drinking (0 = no; 1 = yes). A sum score was created to indicate the total number of consequences associated with each drinking occasion.

AViC Predictors

Alcohol Use. At baseline, typical drinking was assessed using the Daily Drinking Questionnaire (DDQ; Collins, Parks & Marlatt, 1985), which asked participants to indicate how many drinks they consumed on each day of a typical week. Reports of Friday and Saturday drinking were summed to create a measure of "typical weekend drinking." The same measure was used at follow-up to test for reactivity to EMA participation. Within the daily waking recall assessment, if participants indicated drinking the night before, they were asked to indicate the number of drinks they had during that event, over how many hours, and at what time they started drinking. These items were modeled off of the assessment of peak drinking in the Quantity, Frequency, Peak scale (QFP; Dimeff, Baer, Kivlahan, & Marlatt, 1999). Using both number of drinks and hours over which they were consumed, estimated blood alcohol concentrations (eBACs) were calculated for each drinking occasion (see Scaglione et al., 2014). The definition of a standard drink (12 oz. of beer or wine cooler, 8.5 oz. of malt liquor, 4 oz. of wine, 3.5 oz. fortified wine, or 1.5 oz. of hard liquor) was provided throughout all assessments to assist with drink estimates (NIAAA, 2000; Wechsler et al., 2002).

Drinking Protective Behaviors (DPB). DPBs assessed six behaviors students use to either pace or limit their alcohol consumption (see Ray, Turrisi, Abar, & Peters, 2009; Sugarman & Carey, 2007; Werch & Gorman, 1986). Sample items included, "When drinking, I determine in advance not to exceed a certain number of drinks," and "I alternate between alcoholic and non-alcoholic beverages." Using a 5-point scale ranging from *Never* (0) to *10+ times* (4), participants indicated how often

they used each of the six DPBs in the year prior to college. Items were summed to create a baseline index of DPB use (α = 0.93). To test for EMA reactivity, the follow-up assessment measured DPB use since beginning school (α = 0.89). Within the daily waking recall, if participants reported drinking the day/night before, they were also asked to indicate which behavior(s) they used while drinking (1 = Yes; 0 = No). A sum score was created to indicate the number of DPBs used within each drinking occasion.

Social Protective Behaviors (SPB). SPB use was measured using seven items from the Dating Self-Protection Against Rape Scale (DSPARS; Moore & Waterman, 1999; see Scaglione et al., 2015). Sample items included, "Letting a friend or family member know where you are and whom you are with…communicating your sexual intentions clearly to a potential dating partner… and providing for your own transportation so you don't have to depend on others." Participants reported how often they used each of the seven SPBs in the year prior to entering college, using a 5-point scale ranging from *Never* (0) to *10+ times* (4). Items were summed to create a baseline index of SPB use (α = 0.94). To test for EMA reactivity, the follow-up assessment measured SPB use since beginning school (α = 0.89). Within the daily waking recall assessments, if participants reported drinking the day/night before, they were also asked to indicate which behavior(s) they used while drinking (1 = Yes; 0 = No). A sum score was created to indicate the number of SPBs used within each drinking occasion. The sexual communication item was dropped from this scale, as it was only asked if participants also engaged

in sexual behavior during/after their drinking occasion; thus, the event-level SPB scale was based on six items.

Contextual Risk Factors (CRF). CRF were assessed using 10 items developed from previous work (Buddie & Parks, 2003; Cooper, 1994; Senchak, Leonard, & Greene, 1998) and through Project IDEAS pilot testing. These items examined where students drink (e.g., at home, a party, a tailgate, or a bar), with whom (e.g., a friend, significant other, family member, acquaintance), and the male-to-female ratio of their typical drinking group. Because the target outcome was sexual in nature, CRF also included consensual sexual behaviors that could lead to elevated levels of sexual risk after drinking (e.g., frequently having sex after drinking). With response options ranging from *Never* (0) to *10+ times* (4), participants indicated how frequently they encountered each context in the year prior to college (baseline). Preliminary analyses suggested the contexts assessed fell on a continuum from risky to protective. As such, these items could not be summed to create an index of contextual risk, so each context was explored individually (see analytic strategy). The daily waking recall assessments defined CRF using two items: 1) the number of unique drinking/social contexts an individual encountered during her drinking occasion; and 2) whether she engaged in any consensual sexual activity during (or after) her drinking occasion.

Aim 3:

In addition to the measures described above, Aim 3 assessed behavior-specific intentions and willingness momentarily throughout each day of the EMA period. These measures were pilot tested with good reliability in Project IDEAS.

Behavior-Specific Intentions. The waking recall and each signal-contingent assessment (afternoon and evening) asked participants about the activities they intended to engage in later that day. They were presented with a set of questions specific to each AViC predictor. Using drinking as an example, they were asked, “Do you **intend** to engage in any social activities today/tonight?” and “Do you **intend** to drink?” If answered affirmatively, participants were asked to indicate the number of drinks they intended to have and which DPBs and SPBs they intended to use. Participants also indicated the social context in which they intended to drink (e.g., with whom, where) and whether they intended to hook up or engage in any sexual behavior that day.

Behavior-Specific Willingness. Similar to intentions, participants were presented with a set of willingness questions specific to each AViC predictor. For example, they were asked, “Are you **willing** to engage in social activities tonight, should the opportunity arise?” and “Are you **willing** to drink?” If affirmed, participants indicated the number of drinks they were willing to have and which DPBs and SPBs they were willing to use. Participants also indicated the social context(s) in which they were willing to drink (e.g., with whom, where) and whether they were willing to hook up or engage in sexual behavior.

Additional Measures:

Demographic Questionnaire. The demographic questionnaire was presented to all participants within the screening survey and assessed age and birth sex (to confirm traditional first-year female status), weight (to calculate eBAC), race,

ethnicity, sexual orientation, athletic participation, Greek status, and relationship status.

Screening Items. In addition to the demographic questionnaire, the screening survey included two additional sets of questions determining participant eligibility. First, participants were asked, “Do you use a 4G smart phone as your primary phone?” (0 = no; 1 = yes). Second, participants were asked to complete a two-step process to ensure they were drinkers with a recent heavy drinking episode. Participants indicated the age at which they first had more than a few sips of alcohol (Response options: Never, 10 or younger, 11, 12, 13, 14, 15, 16, 17, 18). If they identified as drinkers, participants were asked to indicate the number of drinks they consumed on their heaviest drinking occasion in the past month (using the QFP; Dimeff et al., 1999). To continue to the baseline survey, participants needed to endorse having had four or more drinks on their most recent peak occasion.

Table 3. Summary of measures by aim and assessment period

	Aim 1		Aim 2 Diary	Aim 3 EMA	
	Baseline	**Follow-up**	**WR**	**MA**	**DL**
Main Outcome:					
Alcohol-related Sexual Victimization & Consequences (R-SES; YAAPST)	X	X	X		X
AViC Predictors:					
Alcohol Use (DDQ; QFP)	X	X	X		X
Drinking Protective Behaviors	X	X	X		X
Social Protective Behaviors (DSPARS)	X	X	X		X
Contextual Risk Factors	X	X	X		X
Behavior-Specific Predictors:					
Intentions and willingness to drink/engage in HED			X	X	
Intentions and willingness to use DPB			X	X	
Intentions and willingness to use SPB			X	X	
Intentions and Willingness regarding social context and sexual behavior			X	X	
Additional Measures:					
Demographic questionnaire	X				
Screening items	X				

Note. WR = Waking recall; MA = Momentary assessment; DL = Drinking log

Analytic Strategy

Preliminary Analyses

Descriptive statistics, t tests, and analyses of variance (ANOVAs) were used to examine potential sources of bias due to attrition, reactivity to participation in EMA, and cohort effects.

To examine differences due to attrition, a dummy-coded variable was created to identify individuals who completed both baseline and follow-up assessments (1) and those who completed baseline only (0). Chi-square analyses and t tests were used to examine differences between these groups on demographic and pre-college drinking characteristics, as well as on baseline drinking, protective behavior use, CRF exposure, and AViC.

To assess reactivity to EMA participation, a series of 2 (Group: EMA vs. Reactivity Control) by 2 (Time: Baseline vs. follow-up) mixed analyses of variance (ANOVA) were used to examine changes in drinking, protective behavior use, CRF exposure, and AViC within each group. A significant group X time interaction effect was interpreted as possible reactivity to EMA participation. All significant interactions were followed up with Tukey's HSD post-hoc tests to examine mean differences.

Finally, to compare cohorts, ANOVAs were conducted on baseline drinking, protective behavior use, CRF exposure, and AViC (Aim 1). ANOVAs also compared person-level means calculated from daily measures of drinking, protective behavior use, and CRF exposure that were aggregated across all drinking events (Aim 2). Significant differences were followed up with Tukey's HSD post-hoc tests.

Analysis of Study Aims

Aim 1. To examine the relationship between AViC and alcohol use, DPB, SPB, and CRF exposure, using a prospective longitudinal design across the first semester of college. Zero-order correlations were computed between AViC outcomes and hypothesized predictors. Analyses revealed significant associations with sexual victimization, but no significant associations with sexual consequences. Thus, subsequent Aim 1 analyses were only examined for alcohol-related sexual victimization (ASV). Next, a series of path models examined the hypothesized main and interaction effects using Mplus (v6.2; Muthen & Muthen, 1998; 2010), which utilizes a full-information maximum likelihood (FIML) approach for handling missing data, can estimate asymmetric confidence intervals, and does not require an assumption that all constructs be normally distributed.

The examination of hypotheses (1a-1d) occurred in several steps. First, main effects were examined by regressing ASV (assessed at follow-up) onto baseline typical weekend drinking, DPB use, SPB use, and CRF exposure, respectively. Second, exploratory two-way interaction analyses were examined by regressing ASV onto two predictors (main effects) and their interaction term, using a step-wise procedure. For example, to examine the moderation effect of DPB use on the association between drinking and ASV, sexual victimization was first regressed onto typical weekend drinking and DPB use, then the drinking X DPB use interaction term was added to the model. All significant interactions were graphed, using means and values +/- 1 standard deviation (SD) from the mean, and followed-up with Tukey's HSD post-hoc tests to examine mean differences. This same procedure was used to examine the effect of SPB use on the association between drinking and ASV. Finally, each CRF was examined as a moderator of the associations between drinking and ASV, DPB use and ASV, and SPB use and ASV, respectively.

Aim 2: To examine the relationship between AViC in the first semester of college and within- and between-person patterns of alcohol use, DPB, SPB, CRF. The second aim was to predict AViC occurring in the first semester of college (sexual victimization and consequences assessed at 3-month follow-up), using event-level measures of drinking, protective behavior use, and CRF exposure (assessed in EMA daily waking recalls). Zero-order correlations were computed between AViC outcomes and hypothesized predictors, revealing significant associations for both sexual victimization and sexual consequences. Thus, separate

analyses were used to predict sexual victimization and sexual consequences, respectively.

Preliminary analysis of the daily outcome measures revealed insufficient endorsement and variability for use in analyses, thus, only follow-up outcome measures of AViC were used. Because predictors were assessed at a lower level than the outcomes, daily measures of drinking, protective behavior use, and CRF were aggregated across drinking occasions to create person-level means and standard deviations for each variable. Because individuals drank a different number of times across the study period (range: 1-7 occasions), the person-level mean was used to estimate, for example, an individual's average eBAC across her measured drinking occasions. Person-level standard deviations (SD) were used to estimate the degree to which an individual varied around her mean across drinking occasions. Thus, although person-level SD was used as a proxy for within-person variability in a given outcome, only between-person associations were assessed. Within the analyses, these are referred to as aggregated event-level effects.

To examine Aim 2 hypotheses, path models were estimated using the Mplus-based methods described above in Aim 1. First, AViC was regressed onto person-level means for drinking, DPB use, SPB use, and CRF exposure, respectively (hypothesis 2a). Next, AViC was regressed onto person-level SD for drinking, DPB use, SPB use, and CRF exposure, respectively (hypothesis 2b). Finally, cross-level (two-way) interaction effects (hypothesis 2c) were examined by regressing AViC onto the person-level mean, the person-level SD, and the mean X SD interaction term, respectively, for each predictor (drinking, DPB, SPB, and CRF). All significant

interactions were graphed, using means and values +/- 1SD from the mean, and followed-up with Tukey's HSD post-hoc tests to examine mean differences.

These same procedures were followed to examine additional exploratory two-way interactions between behaviors. Given the multitude of potential interaction combinations that could be explored, a systematic approach was used to mirror the interactions examined in Aim 1. First, mean DPB and SPB use were examined as moderators of the associations between person-level mean eBAC and AViC and between person-level SD eBAC and AViC. Next, CRF (mean number of drinking contexts and sex after drinking) were examined as moderators of the associations between person-level eBAC mean and AViC and between person-level SD eBAC and AViC. Finally, CRF means were examined as moderators of the association between person-level mean DPB/SPB use and AViC and between person-level SD DPB/SPB use and AViC.

Aim 3: To examine the event-level relationships between behavioral outcomes associated with AViC (e.g., drinking, DPB, SPB, CRF) and decision-making constructs (intentions and willingness) using an EMA design. The current study aimed to predict an individual's level of intoxication (eBAC), the number of DPB and SPB used, and CRF (number of unique contexts; engaging in sexual behavior) on a given day from within-day repeated measures of behavior-specific intentions and willingness (measured three times daily via EMA assessments). For example, an individual's level of intoxication on a given day (calculated based on reported drinking the following morning) was predicted by the number of drinks she was intending and willing to have, reported earlier that day. To do this, waking recall

assessments were lagged by one day and merged to match with the previous day's momentary assessments.

Because predictor variables were assessed at a lower level (within-day) than the outcome variables (between-day/within-person), the lower-level data (repeated assessments within a day) were again aggregated for analytical purposes. For Aim 3, within-day data were aggregated in two ways to answer unique hypotheses. First, momentary assessments were averaged to create a day-level mean for intentions and willingness for drinking, DPB, SPB, and CRF, respectively, that could be used to examine between-day/within-person effects (hypothesis 3b). The second aggregation method created behavior-specific change scores by subtracting intention and willingness values reported at the third assessment within a day from the value reported at the first assessment within each study day. Intention and willingness change scores could then be used to examine the effects of increasing or decreasing within a day on an individual's decision to drink, use protective behaviors, or engage in CRF on that day (hypothesis 3c).

To examine Aim 3 hypotheses, a series of two-level hierarchical linear models (HLM) were estimated using a maximum likelihood approach in SAS (v. 9.4) proc mixed (or proc glimmix for dichotomous outcomes). For each outcome (drinking, DPB, SPB, and CRF), a step-wise approach was used to fit the best model. First, to determine if an HLM was appropriate, unconditional means models were estimated for each variable within the model, including both dependent (e.g., drinking) and independent (e.g., intentions and willingness to drink) variables. Intraclass correlations (ICC) were calculated to determine the proportion of variability at each

level for each variable. Next, individual model components (e.g., Level 1 fixed effects, Level 1 random effects, Level 2 fixed effects, cross-level interaction effects) were added iteratively until the best fitting model was achieved. Model fit was determined using the -2 Log Likelihood (-2LL) values, where lower values indicated better fit. As each model component (k) was added, the -2LL was compared to that from the previously tested model (k-1 components). The difference between the values was then multiplied by two and evaluated using a chi-square distribution with one degree of freedom. If the -2LL for the model with k components was significantly lower than that of the model with k-1 components ($p < .05$), the added component was determined to significantly improve the overall model fit and was subsequently included in the estimated HLM. This process was followed to define the best fitting intentions-only model, willingness-only model, and combined model, for each outcome.

The best fitting model across all behavioral outcomes typically indicated the inclusion of both fixed effects (Level 1 and 2 predictors) and random effects (intercept and slope for Level 1 predictors). To examine hypotheses 3a and 3b, each behavioral outcome was regressed onto behavior-specific day-level means of intentions and willingness. In order to separate within- and between-person effects on each outcome, continuous predictors were group mean centered at Level 1 and grand mean centered at Level 2. Models with dichotomous predictors only examined Level 1 effects (e.g., whether one was willing or intending to engage in sexual behavior; 1=yes; 0=no). Using the number of drinks an individual was willing to

consume and her eBAC achieved within a drinking occasion as an example, the resulting HLM is described below:

Level 1 Model (Within-person effects):

$$eBAC_{ti} = \beta_{0i} + \beta_{1i}(Willingness)_{ti} + e_{ti,}$$

Level 2 Model (Between-person effects):

$$\beta_{0i} = \gamma_{00} + \gamma_{01}(Willingness\_M_i) + u_{0i,}$$

$$\beta_{1i} = \gamma_{10} + \gamma_{11}(Willingness\_M_i) + u_{1i}$$

Given this framework, Level 1 drinking (eBAC) on a given occasion was modeled as a function of an intercept (β_{0i}), a slope describing how drinking changes on days when an individual reports greater willingness, relative to her average across days (β_{1i}), and a within-person residual (e_{ti}). Level 2 outcomes (the average across people) included both the eBAC intercept and the within-person slopes describing the association between willingness and eBAC. The eBAC intercept (β_{0i}) was modeled as a function of the average eBAC for the sample when all other predictors were equal to zero, or their mean level given variable centering (γ_{00}), the effect of between-person differences in willingness to drink (averaged across the measured drinking occasions; γ_{01}), and between-person residuals (u_{0i}). The within-person willingness slopes (β_{1i}) were modeled as a function of the average associations of daily willingness to drink and eBAC across all individuals (γ_{10}), and variability in the association across individuals (u_{1i}). Where model fit indicated it acceptable to do so, the effect of grand mean willingness on this association (γ_{11}) was also estimated (i.e., the between- X within-person willingness cross-level interaction).

To examine the effects of within-day change on behavioral outcomes (hypothesis 3c), a second set of models was estimated following the same procedure described above, except day-level means (i.e., Level 1 predictors) were replaced with within-day change scores. All other model components remained the same.

Additional Analytical Considerations

Missing data. For Aims 1 and 2, missing data were handled using full information maximum likelihood (FIML), the most appropriate method for Mplus-based path models. For Aim 3, HLM analyses utilized a maximum likelihood estimation method via Proc Mixed in SAS, which accounts for unbalanced data, where individuals in the sample have varying numbers of observations.

Outliers. Preliminary examination of variable distributions revealed drinking and AViC were positively skewed. Appropriate outlier adjustments (using ± 3.29 * SD) were made before hypotheses were tested (Tabachnick and Fidell, 2001). To further account for non-normally distributed data, all regression analyses (Aims 1 & 2) were examined using bootstrapped asymmetric confidence intervals. For Aim 3, all predictors were normally distributed, and model estimation was adjusted for dichotomous and non-normally distributed outcomes (e.g., Logistic models were estimated for dichotomous outcomes).

Experiment-Wise Error. The current study examined numerous hypotheses within the proposed models, raising the potential for experiment-wise error. For Aims 1 and 2, given effect sizes for moderation analyses are typically quite small, even the most liberal adjustment methods would have made it difficult to explore patterns

of findings in the current data. Because interaction analyses were fairly exploratory, especially in Aim 1, no adjustments were made. Regarding Aim 3, HLM is a robust method of analysis that allows for the testing of multiple fixed and random effects within a single model. However, Quené and Van den Bergh (2004) suggest traditional Bonferroni methods can be used to control for experiment-wise error when comparing nested models. As few additional recommendations exist within the literature, there were no adjustments made in the current analyses. For all aims, I was sensitive to the number of models tested, and any findings that appeared to be inconsistent with theoretical rationale were probed further to rule out error.

Statistical Power. **Aims 1 and 2:** A rough approximation of the necessary sample size was obtained by applying power analyses for a regression coefficient in multiple regression analyses in the context of limited information estimation of path models. As an example, for a multiple regression analysis with three predictors, where the squared multiple correlation is 0.25 and where one wants to detect a predictor that accounts for at least 5% unique variance in the outcome, the required sample size to achieve power of 0.80 is approximately 100. Aim 1 included a sample of 235, which exceeds this threshold, resulting in sufficient power for all moderated regression analyses. After reducing the sample for Aim 2 to include only individuals who participated in EMA and reported at least one drinking occasion, the sample was reduced to 69, providing sufficient power for moderate and large effect sizes. However, smaller effect sizes may be more difficult to detect, especially when examining moderation. **Aim 3:** Estimations of statistical power for EMA can be complicated by level of assessment and the effect being estimated (e.g., fixed,

random, cross-level interaction) (Snijders, 2005). Multilevel power simulation studies suggest following the “50/20 rule,” particularly when cross-level interactions are of interest (Kreft, 1996). Assuming a standard 0.05 alpha, 50 participants with at least 20 observations each will consistently provide ample power to detect small and medium-sized effects. The EMA sample of drinkers (n = 69) reported between one and seven drinking occasions each throughout the study period. Within each day, participants completed up to three assessments, resulting in the use of 3-21 assessments per participant. Small effect sizes (e.g., moderation effects) may be difficult to detect.

CHAPTER FOUR: RESULTS

Preliminary Analyses

Attrition Bias. Differential retention rates were observed between the Reactivity (72.2%) and EMA (96.4%) groups. As such, attrition bias was examined separately by group. Individuals with complete baseline and follow-up data did not statistically differ from individuals with baseline-only data on demographic or baseline characteristics (all *p*s > .05), providing no evidence of attrition bias within either group.

Reactivity to EMA Participation. Preliminary examination revealed significant differences between EMA participants and reactivity participants at baseline. Individuals in the EMA group endorsed a later age of drinking onset, t (161) = 2.81, p = .01, and less frequent high school binge drinking, t (161) = -2.13, p = .04, relative to individuals randomized to the reactivity control group. These pre-college behaviors were included as covariates in all subsequent reactivity analyses.

The current study found no significant differences between groups on measures of drinking, SPB use, CRF exposure, or AViC across the semester (all *p*s > .05). However, there was a significant group X time interaction effect for DPB use, F (1, 133) = 7.06, p = 0.01, *partial* η^2 = 0.05. Within the control group, DPB use remained stable from baseline (M = 20.60, SE = 1.65) to follow-up (M = 19.08, SE = 1.52), whereas EMA participants reported significant increases in DPB use from baseline (M = 19.63, SE = 1.36) to follow-up (M = 23.24, SE = 1.52).

Cohort Effects. There were no significant differences between cohorts on measures of drinking, protective behavior use, CRF exposure, or AViC at baseline or at the event-level (all *p*s > .05).

In summary, there was no evidence for bias in the data due to attrition or cohort effects. The potential reactivity to EMA, as evidenced by increased DPB use, was controlled for by adding group membership (EMA vs. reactivity) as a covariate in subsequent analyses.

Aim 1: Examining relationships between alcohol-related sexual victimization (ASV) and alcohol use, DPB, SPB, and CRF exposure, using a prospective longitudinal design

Descriptive Statistics

At baseline, students reported consuming 7.00 drinks (*SD* = 4.35) in a typical weekend. Baseline protective behavior use was also endorsed with variability for both DPBs (*M* = 20.37, *SD* = 12.52; Range: 0-48) and SPBs (*M* = 29.31, *SD* = 15.91; Range: 0-56). In terms of context, participants most frequently endorsed drinking with friends (*M* = 5.22, *SD* = 2.30; Range: 0-8) and at parties (*M* = 4.86, *SD* = 2.48; Range: 0-8). They least frequently endorsed drinking in a bar or other public place (*M* = 1.69, *SD* = 2.20; Range: 0-8) and engaging in sex after drinking (*M* = 1.89, *SD* = 2.17; Range: 0-8). Finally, 31.6% (n = 74) of participants reported at least one ASV in the year prior to entering college (*M* = 1.11, *SD* = 2.29; Range: 0-12), and 28.5% (n = 39) experienced at least one ASV in their first semester (*M* = 0.82, *SD* = 1.78; Range: 0-12). Nearly 50% (n = 19) of participants reporting ASV in

college also reported at least one ASV in the year prior to college. A summary of outcome frequencies can be found in Appendix C.

Examination of Main Effects

To address Aim 1 hypotheses, alcohol-related sexual victimization (assessed at follow-up) was regressed onto typical weekend drinking, DPB, SPB, and CRF, respectively (assessed at baseline). Given the significant reactivity effect observed for DPB use, all analyses were examined with and without group membership (EMA vs. Reactivity) as a covariate. Results remained consistent across models; therefore, results from the more parsimonious models without the covariate are presented by hypothesis.

Hypothesis 1a: Alcohol use would be positively associated with ASV. Typical weekend drinking was positively associated with ASV (B = 0.08, SE = 0.03, p = 0.03, CI95%: 0.02; 0.15; R^2 = 0.04), such that individuals who engaged in heavier weekend drinking at baseline reported more ASV experiences across their first semester of college.

Hypothesis 1b: DPB use would not be associated with ASV. Consistent with previous literature (Mallett et al., 2015), DPB use was not significantly associated with ASV (p > .05).

Hypothesis 1c: SPB use would be negatively associated with ASV. Results failed to support this hypothesis, as baseline SPB use did not significantly predict experiencing ASV in the first semester of college (p > .05).

Hypothesis 1d. CRF would be positively associated with ASV. Drinking with a romantic partner was significantly associated with AVIC (B = -.11, SE = .05, p = .03,

R^2 = .04), but not in the expected direction. The more frequently an individual drank with a romantic partner, the less likely she was to experience ASV in her first semester of college. None of the other CRF significantly predicted AViC (all *p*s > .05).

Exploratory Moderation Effects

The next set of analyses explored the effects of DPB, SPB and CRF on the association between typical weekend drinking and alcohol-related victimization, and the effects of CRF on the associations between DPB/SPB and victimization. Although 32 interactions were examined (see Appendix C for all main and interaction effects), only significant results are presented below.

Examining Effects of Protective Behavior Use on the Association between Drinking and AViC. Both DPB use (*B* = -0.01, *SE* = 0.004, *p* = 0.02, CI95%: -0.02; -0.002) and SPB use (*B* = -0.01, *SE* = 0.003, *p* = 0.02, CI95%: -0.01; -0.001) significantly moderated the effects of typical weekend drinking on AViC. Drinking, protective behavior use, and the combined interaction term collectively accounted for 11% (DPB) and 12% (SPB) of the variance in AViC. For both DPB and SPB, the pattern was the same (see Figures 4a and 4b). As would be expected, for people who used a below average amount of protective behaviors (thick black line below), the more they drank the more they experienced victimization. Among individuals who used an average number of protective behaviors (dotted line below), there was still a positive association between drinking and AViC, but that association was weaker, relative to the group who used fewer protective behaviors. Meanwhile, for people who used the most protective behaviors (dashed line below), the more they

drank the less they experienced AViC. Collectively, this suggests protective behaviors weaken the well-established association between drinking and AViC; however, even light drinkers who used an above average amount of protective behaviors remained at some risk.

Figure 4a. The effects of drinking on ASV at below average (BA), average (Avg), and above average (AA) levels of DPB use

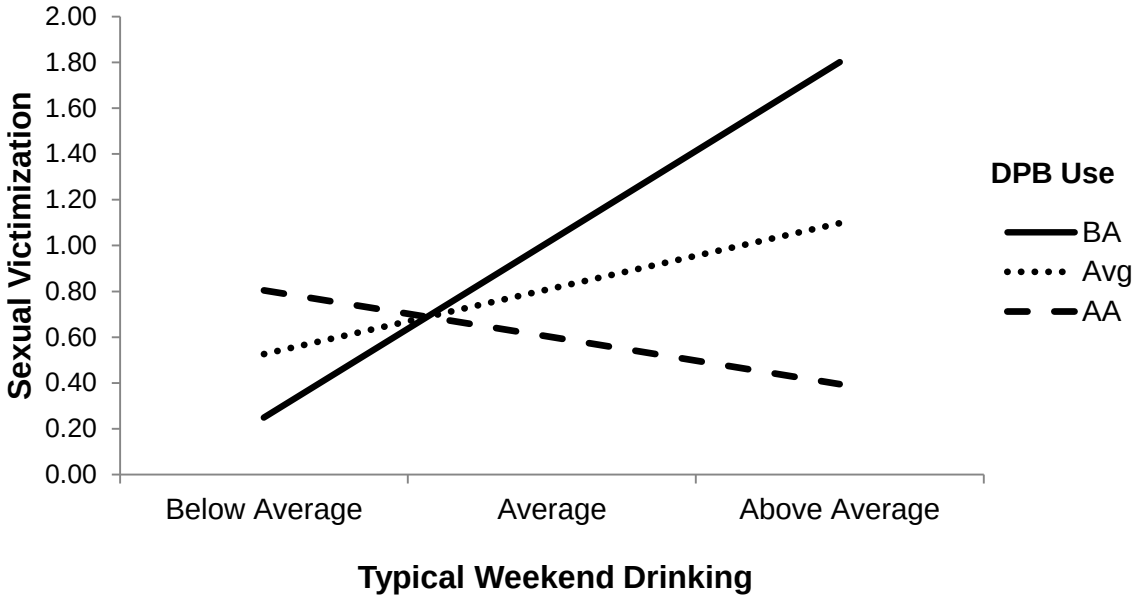
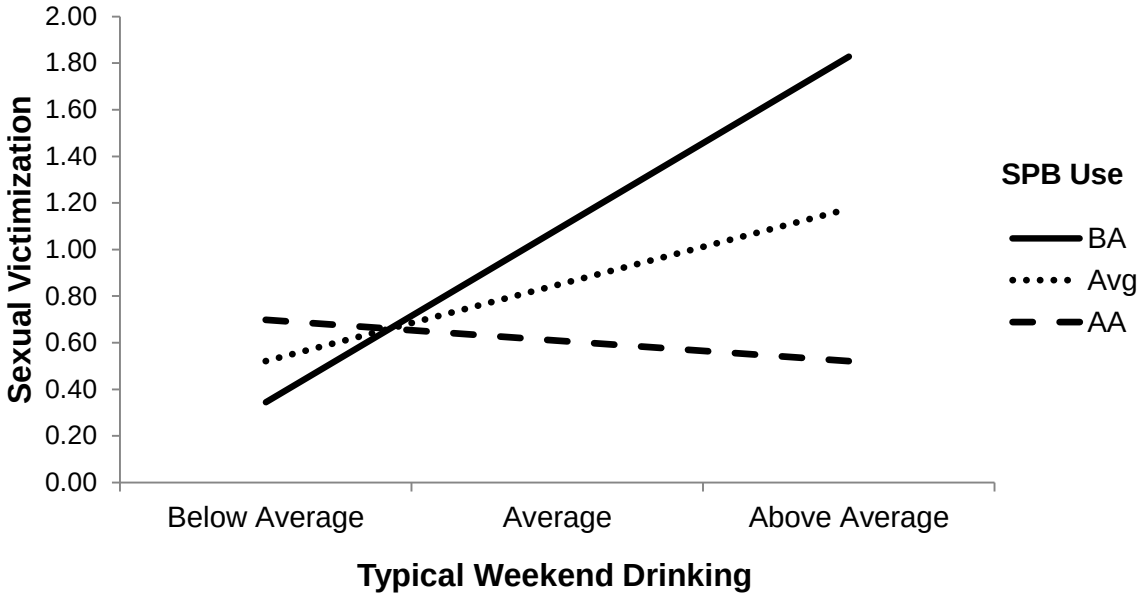


Figure 4b. The effects of drinking on ASV at below average (BA), average (Avg), and above average (AA) levels of SPB use



Examining Effects of CRF on the Association between Drinking and ASV. The following contexts significantly moderated the effects of typical weekend drinking on experiencing ASV in the first semester of college: drinking at parties (B = -0.04, SE = 0.02, p = 0.01, CI95%: -0.07; -0.01, R^2 = 0.13) and tailgates (B = -0.03, SE = 0.02, p = 0.05, CI95%: -0.06; -0.001, R^2 = 0.08); drinking with friends (B = -0.04, SE = 0.02, p = 0.01, CI95%: -0.08; -0.01, R^2 = 0.11), romantic partners (B = -0.04, SE = 0.01, p = 0.01, CI95%: -0.06; -0.01, R^2 = 0.17), and potential hook-up partners (B = -0.04, SE = 0.02, p = 0.02, CI95%: -0.07; -0.01, R^2 = 0.11); and engaging in sex after drinking (B = -0.04, SE = 0.02, p = 0.04, CI95%: -0.07; -0.01, R^2 = 0.11). The nature of the relationship was consistent across all contexts. Figure 5, using drinking at parties as an example, shows that as the frequency with which individuals engaged in each context increased, the strength of the association between drinking and ASV

decreased, suggesting that consistently drinking in a given context may be protective.

Examining Effects of CRF on the Association between DPB Use and ASV. Drinking with family members significantly moderated the association between baseline DPB use and experiencing ASV in the first semester of college (*B* = -0.01, *SE* = 0.01, *p* = 0.01, CI95%: -0.02; -0.003, R^2 = 0.05). Among individuals who most frequently drank with family members, risk for ASV decreased as DPB use increased. This association persisted for individuals who drank with family an average amount, but to a lesser extent. Among individuals who least frequently drank with family, risk for victimization did not significantly change across levels of DPB use (see Figure 6).

Figure 5. The effects of drinking on ASV at below average (BA), average (Avg), and above average (AA) levels of drinking at parties

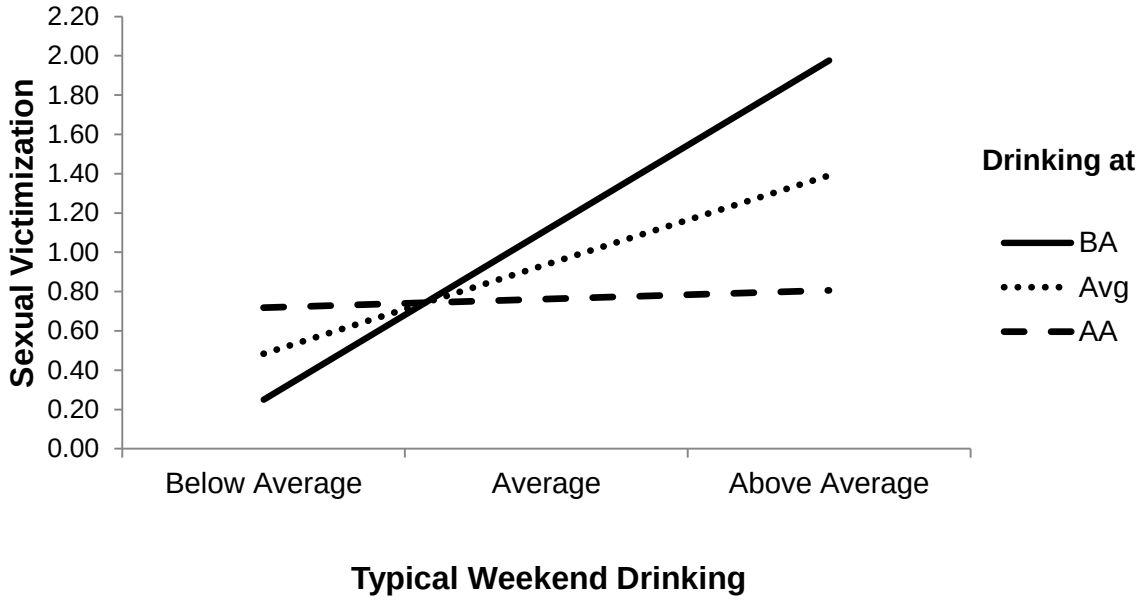
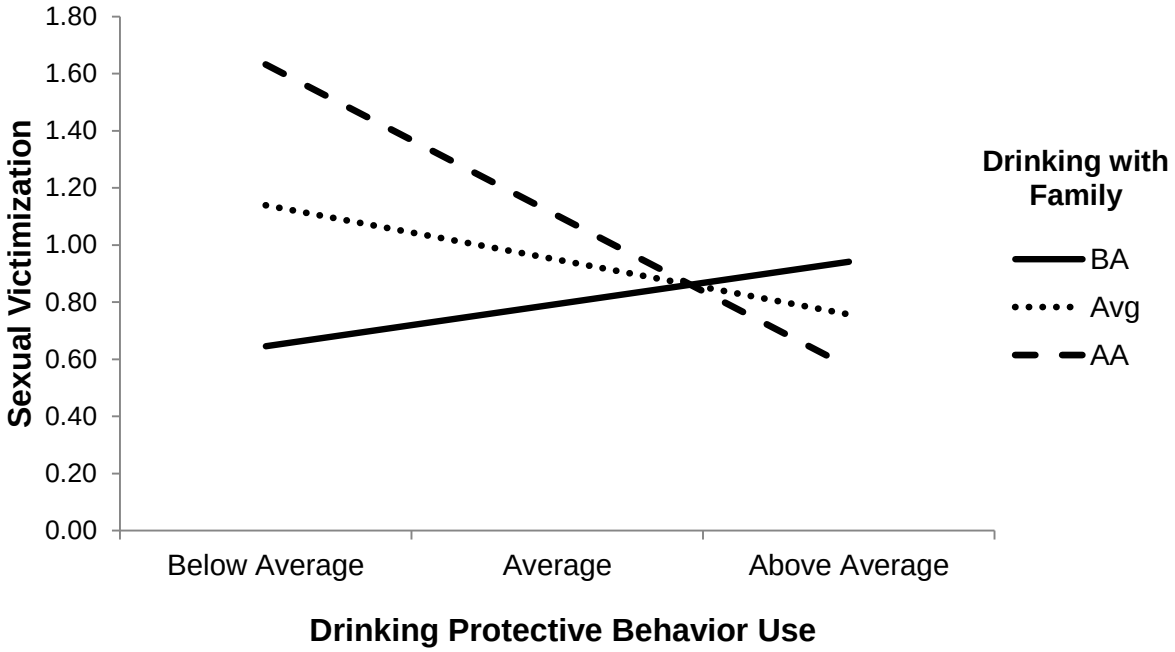


Figure 6. The effects of DPB use on ASV at below average (BA), average (Avg), and above average (AA) levels of drinking with family



Examining Effects of CRF on the Association between SPB Use and ASV. None of the contexts examined significantly moderated the association between baseline SPB use and experiencing ASV in the first semester of college (all *p*s > .05).

Summary of Aim 1 Findings

In sum, baseline typical weekend drinking was positively associated with ASV at follow-up. This association was significantly moderated by protective behavior use and context, such that the association between drinking and ASV weakened as individuals used more protective behaviors and more frequently drank in a given context (e.g., at parties; with friends). The association between DPB use and AViC was also moderated by the frequency with which an individual drank with family members.

Aim 2: Examining relationships between AViC and aggregated patterns of event-level alcohol use, DPB, SPB, CRF exposure

Descriptive Statistics

Participants completed EMA training and protocols with good compliance, completing over 88% of all possible waking recall assessments. Over 80% of participants (n = 69) reported drinking at least once (*M* = 3.13, *SD* = 1.59) during their 14-day assessment period, resulting in a total of 216 measured drinking occasions. Approximately 60% of drinkers (n = 41) reported drinking on at least three occasions during the study period. Participants consumed 4.98 (*SD* = 1.95) drinks per occasion, achieving average eBACs of 0.12 g/dL (*SD* = 0.07). On average, participants endorsed using two or three protective behaviors and encountered 1.57 (*SD* = 0.24) different contexts per drinking occasion. Nearly 25% of drinking occasions (n = 52) also included a hook up or consensual sexual behavior. Approximately 6% (1/16) of drinking occasions included sexual victimization (n = 7) or sexual consequences (n = 6). A full presentation of descriptive statistics and correlations between person-level predictors and prospective AViC outcomes for the drinking sample (n = 69) can be found in Table 4.

Table 4. Descriptive statistics (M/SD) and correlations between person-level means and standard deviations for Aim 2 predictors and prospective (T2) outcomes

	M (SD)	Range of Scores	1	2	3	4	5	6	7	8
1. T2 Sexual Victimization	0.79 (1.71)	0 – 7	1.00	.290*	.334*	.362*	.096	.025	.086	--
2. T2 Sexual Consequences	2.43 (2.24)	0 – 15	.290*	1.00	.258*	.142	.114	.024	.359*	--
3. Number of drinks per occasion	4.98 (1.95)	1 – 11	.424*	.394*	1.00	.808*	.327*	.045	.367*	--
4. Estimated BAC (eBAC)	0.12 (0.07)	.01 - .36	.432*	.357*	.894*	1.00	.267*	-.051	.326*	--
5. Number of DPBs used	2.69 (1.67)	0 – 6	-.322*	-.278*	-.364*	-.389*	1.00	.112	.080	--
6. Number of SPBs used	2.57 (1.53)	0 – 6	-.024	-.016	-.098	-.167	.724*	1.00	.233	--
7. Number of contexts encountered/drinking occasion	1.57 (0.24)	1 – 4	.046	.360*	.304*	.290*	.307*	.095	1.00	--
8. Frequency of engaging in sex after drinking	0.75 (1.02)	0 – 5	.409*	.335*	.304*	.422*	-.138	.055	.088	1.00

Note 1. * $p < 0.05$ level; M = mean; SD = Standard Deviation; T2 variables were assessed at the 3-month follow-up.
Note 2. Correlations between person-means (across all drinking events) are located below the diagonal; Correlations between person-standard deviations are located above the diagonal.
Note 3. Frequency of engaging in sex after drinking has no standard deviation because it is a count variable summed across drinking occasions.

Examination of Aggregated Event-Level Main Effects

The analyses were conducted using the sample of 69 women who had drinking events. To examine the aggregated event-level effects of drinking on AViC, the analyses regressed sexual victimization onto person-level eBAC means (e.g., the effect of average drinking), eBAC SD (e.g., the effect of average variability in drinking), and the Mean X SD interaction terms (e.g., the effect of average drinking on the association between drinking variability and AViC). This same procedure was used to examine the aggregated event-level effects of drinking on sexual consequences. Finally, models predicting victimization and consequences were also estimated to examine aggregated event-level effects of DPB use, SPB use, and CRF (number of unique contexts encountered, engaging in sex during/after drinking). Path estimates, asymmetric bootstrapped confidence intervals, and R^2 values for all tested main effects can be found in Table 5.

Hypothesis 2a: Individuals who consumed more alcohol on average (across events) would experience more AViC in their first semester of college, relative to individuals who typically consumed less. This hypothesis was supported for both sexual victimization and sexual consequences. Estimated BAC was positively associated with AViC, such that individuals who achieved higher eBACs on average (across drinking occasions) experienced more victimization and consequences in their first semester of college.

Similar hypotheses were tested for effects of average DPB, SPB, and CRF exposure on AViC. Average DPB use was negatively associated with experiencing AViC, such that individuals who used a greater number of DPB (averaged across

drinking occasions) experienced less victimization and fewer consequences in their first semester. Average SPB use did not significantly predict victimization or consequences across the first semester.

Regarding CRF, the mean number of contexts encountered across drinking occasions was positively associated with sexual consequences but not sexual victimization. Individuals who typically moved between several contexts within their drinking occasions experienced more consequences. Additionally, the frequency with which participants engaged in sex during or after drinking was positively associated with both sexual victimization and sexual consequences.

Hypothesis 2b: Individuals with greater variability in drinking across occasions would be at greater risk for experiencing AViC. Individuals' average variability in eBAC was significantly associated with victimization, but not consequences. Individuals who exhibited greater variability in eBAC across drinking occasions experienced more sexual victimization in their first semester of college. For example, if two women both had a mean eBAC of 0.06 across three drinking occasions, the one who achieved eBACs of .06, .02, and .10 across the occasions, would be at increased risk for victimization relative to an individual who achieved an eBAC of .06 on each occasion. An effect of average variability in the number of drinking contexts encountered across drinking occasions on sexual consequences was also observed. Individuals experienced more consequences when they reported greater variability in the number of contexts they encountered while drinking. There were no significant main effects of average variability in protective behavior use (DPB or SPB) on either measure of AViC.

Table 5. Path estimates, asymmetric bootstrapped confidence intervals, and R^2 values for person-level mean and SD main effects on AViC across the first semester of college

Predictor		Sexual Victimization			Sexual Consequences		
		B(SE)	CI95%	R^2	B(SE)	CI95%	R^2
Estimated BAC	M	10.91 (3.92)*	2.46; 17.91	0.19	17.08 (6.07)*	7.67; 30.76	0.13
	SD	21.74 (8.76)*	5.76; 40.47	0.13	15.02 (13.34)	-7.91; 44.08	0.02
DPB Use	M	-0.33 (0.10)*	-0.56; -0.16	0.10	-0.53 (0.19)*	-0.93; -0.21	0.08
	SD	0.28 (0.38)	-0.41; 1.10	0.01	0.58 (0.77)	-0.67; 2.40	0.01
SPB Use	M	-0.03 (0.11)	-0.21; 0.23	< 0.01	-0.03 (0.28)	-0.49 ;0.60	< 0.01
	SD	0.08 (0.43)	-0.73; 0.95	< 0.01	0.14 (0.68)	-1.11; 1.56	< 0.01
Number of Contexts Encountered/Drinking Occasion	M	0.14 (0.31)	-0.37; 0.86	< 0.01	2.05 (0.78)*	0.92; 4.06	0.14
	SD	0.32 (0.36)	-0.22; 1.20	0.01	2.38 (0.98)*	0.84; 4.67	0.12
Frequency of engaging in sex after drinking^	M	0.66 (0.26)*	0.11; 1.10	0.17	0.96 (0.53)*	0.18; 2.23	0.14
	SD	Not Estimated; No variation at person-level			Not Estimated; No variation at person-level		

Note. * $p < .05$.

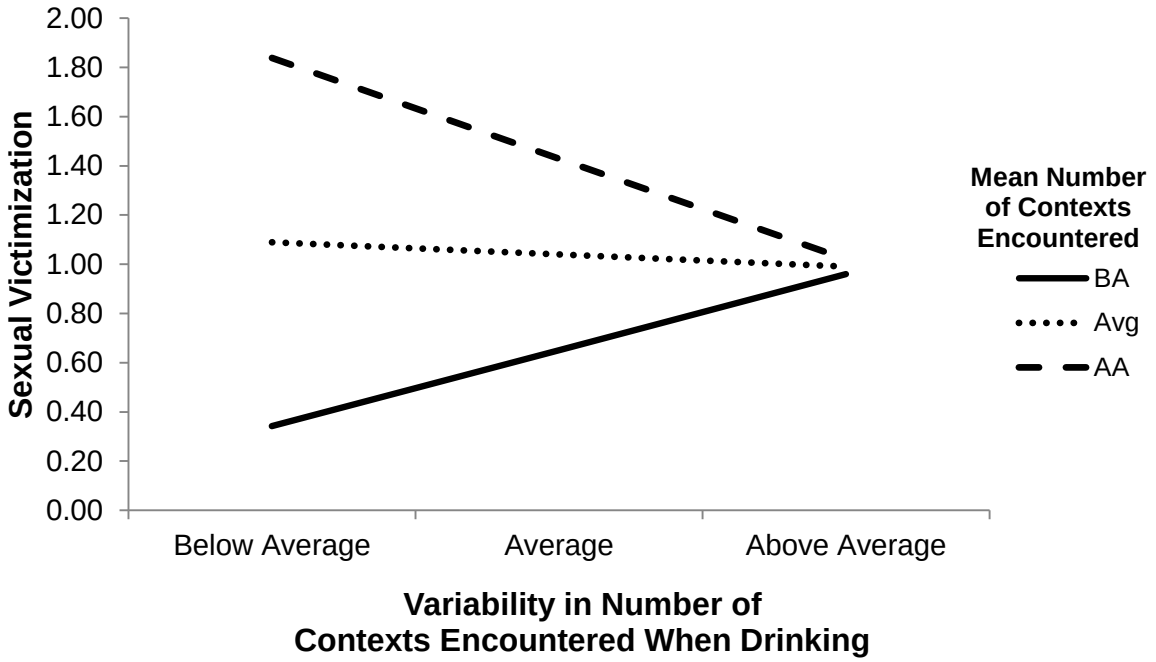
^ All analyses (main effects and interactions) examining sex after drinking include relationship status as a covariate.

Examination of Cross-Level Interaction Effects

Hypothesis 2c. The association between person-level SD for drinking (average variability in drinking) and AViC would be stronger among individuals who consumed less alcohol on average (interaction effects). Between-person average eBAC did not moderate the association between average variability in drinking and AViC ($p > .05$). However, when a similar association was examined for CRF, the mean number of contexts encountered across drinking occasions significantly moderated the association between average variability in number of contexts and sexual victimization ($B = -1.30$, $SE = 0.62$, $p = 0.04$, CI95%: -2.59; -0.25, $R^2 = 0.07$). Among individuals who typically encountered an above average number of contexts while drinking, greater context variability was associated with *decreased* risk for victimization. For this group, it is possible "greater variability" is defined by a decrease in the number of contexts encountered. Meanwhile, greater context variability was associated with *increased* risk for victimization among individuals who typically encountered a below average number of contexts while drinking. For these individuals, "greater variability" may mean an increase in the number of contexts encountered. Increased variability did not affect AViC for individuals who typically encountered an average number of contexts while drinking (See Figure 7).

Neither mean DPB nor mean SPB moderated the associations between average variability in DPB and AViC or SPB and AViC, respectively (all *p*s > .05).

Figure 7. The effects of variability in drinking context on sexual victimization at below average (BA), average (Avg), and above average (AA) numbers of drinking contexts encountered

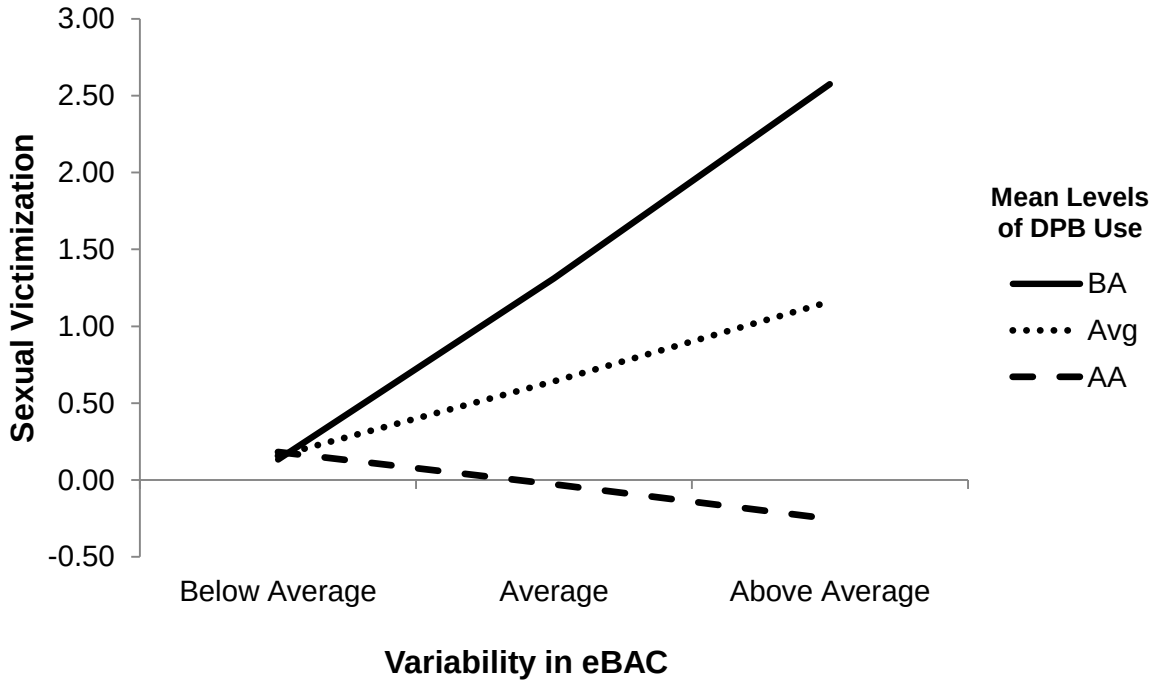


Exploratory Cross-Level Interaction Effects

Hypothesis 2d: The strength of the association between person-level drinking SD (average variability in drinking) and AViC would be stronger among individuals who typically use fewer SPBs. This hypothesis was not supported for SPB use. However, DPB use significantly moderated the association between average variability in eBAC and sexual victimization (B = -15.07, SE = 4.00, $p < 0.001$, CI95%: -22.98; -7.46, R^2 = 0.34). Collectively, average DPB use, average variability in eBAC, and their interaction term accounted for 34% of the variance in sexual victimization experienced in the first semester of college. Post-hoc examination of

this interaction effect revealed findings consistent with those in Aim 1. Among individuals who used a below average number of DPB (averaged across drinking occasions), the more they varied in their drinking, the more victimization they experienced. This association was weaker, but still significant among individuals who used an average number of DPB. Among individuals who used an above average number of DPB, victimization risk decreased as one's average variability in drinking increased. Notably, victimization risk was low across all levels of DPB use at low levels of variability in one's drinking (see Figure 8). The effect of average DPB use on the association between person-level mean eBAC and sexual victimization followed the same pattern (*B* = -4.10, *SE* = 2.14, *p* = 0.06, CI95%: -7.88; 0.66, R^2 = 0.26).

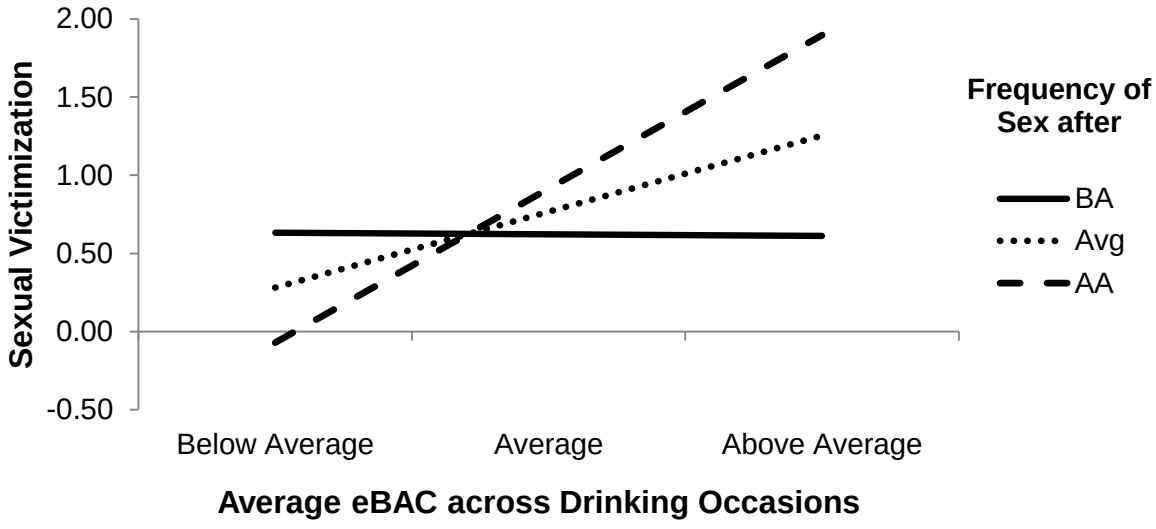
Figure 8. Effects of variability in eBAC on sexual victimization at below average (BA), average (Avg), and above average (AA) mean levels of DPB use



Hypothesis 2e: The association between mean eBAC (average drinking) and AViC would be stronger among individuals who engage in more frequent sex after drinking. This hypothesis was supported. Frequency of engaging in sex during or after a drinking occasion significantly moderated the effects of average drinking on sexual victimization (*B* = 7.20, *SE* = 2.73, *p* = 0.01, CI95%: 1.95; 12.53, R^2 = 0.35). Among individuals who *infrequently* engaged in sex after drinking, the association between mean eBAC and sexual victimization was not significant. As frequency of sex after drinking increased, the association between eBAC and victimization became stronger (see Figure 9). Frequency of sex also moderated the association between average variability in drinking and sexual victimization (*B* = 18.04, *SE* = 5.11, *p* < 0.001, CI95%: 9.64; 30.42, R^2 = 0.40), with effects following the same pattern. Nothing else moderated the effects of drinking on AViC (all *p*s > .05).

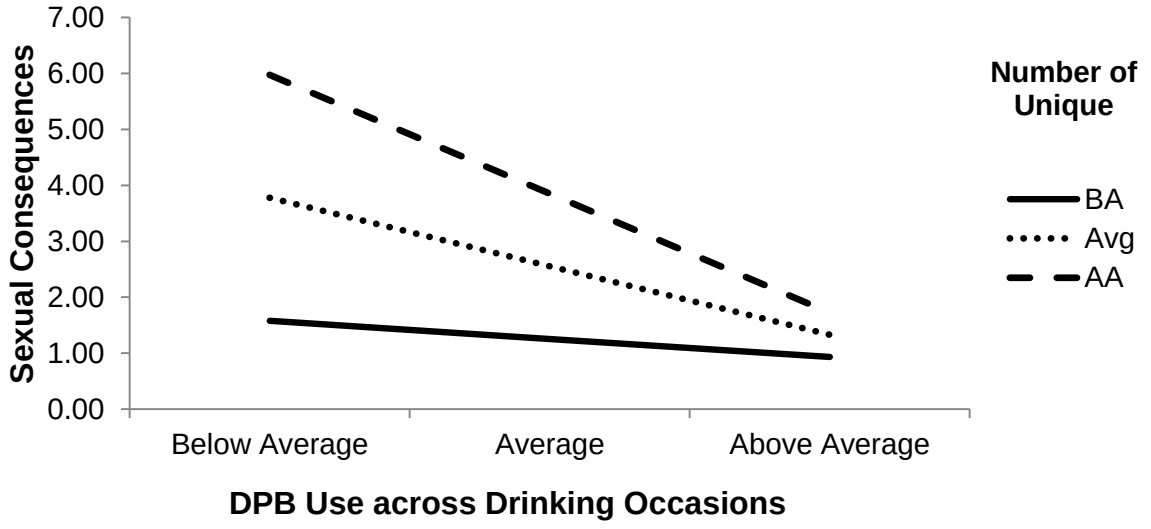
Number of unique contexts encountered did not moderate the effects of average drinking or average variability in drinking on AViC.

Figure 9. Effects of average eBAC on sexual victimization at below average (BA), average (Avg), and above average (AA) levels of engaging in sex after drinking



Hypothesis 2f: The association between mean DPB use and AViC would be stronger among individuals who typically encountered an above average number of unique contexts while drinking. The mean number of contexts encountered across drinking occasions significantly moderated the association between average DPB use and sexual consequences (*B* = -0.93, *SE* = 0.45, *p* = 0.04, CI95%: -1.98; -0.19, R^2 = 0.29). The negative association between average DPB use and experiencing sexual consequences was strongest among those who encountered the highest number of contexts while drinking, relative to individuals who encountered an average or below average number of contexts (See Figure 10). Notably, risk for sexual consequences was low for all context groups when individuals used an above average number of DPB across drinking occasions. There were no other significant context X protective behavior interactions for average use or average variability in use (all *p*s > .05).

Figure 10. Effects of average DPB use on sexual consequences at below average (BA), average (Avg), and above average (AA) numbers of drinking contexts encountered



Summary of Aim 2 Findings

AViC in the first semester of college was significantly associated with average levels of drinking, DPB use, context exposure, and frequency of sex during/after drinking. Average variability in drinking and context exposure was also associated with increased AViC. Average number of contexts encountered across drinking occasions significantly moderated the association between average variability in number of contexts and sexual victimization. Consistent with the Aim 1 examination of global effects, DPB use moderated the mean effects and the average variability effects of drinking on sexual victimization, and context moderated the effect of average DPB use on sexual consequences.

Aim 3: Examining event-level relationships between behavioral outcomes associated with AViC (e.g., drinking, DPB, SPB, CRF) and decision-making constructs (intentions and willingness), using an EMA design

Preliminary Analyses

Data for Aim 3 analyses were provided by 59 participants who reported at least one drinking event with matching momentary data from the previous day, resulting in 371 total assessments (M = 6.29 /person). Variability for each outcome is presented by level of assessment in Table 6, and variability for each predictor can be found in Table 7.

Results from the best fitting models for each behavior provided evidence for the inclusion of random intercepts and random slopes across all models. Thus, the average of each outcome variable when all predictors were set to zero (intercept) and the association between the predictor(s) and the outcome averaged across days (slope) were allowed to vary across individuals. Interaction terms were only explored in models where their addition resulted in improved model fit. Hypothesized between- and within-person (fixed) effects are discussed by outcome below (See Table 8).

Table 6. Estimated variability for outcomes at each level of assessment

Outcome (Assessed the morning after drinking)	Between-Person Variability	Within-Person Variability
Number of drinks consumed	.6334	.3666
Estimated BAC	.6901	.3099
Drinking Protective Behavior (DPB) use	.7799	.2201
Social Protective Behavior (SPB) use	.8469	.1531
Number of contexts encountered	.3735	.6265
Sex occasion (1 = yes)	.5651	.4349

Table 7. Estimated variability for predictors at each level of assessment

Predictor (Assessed three times daily)	Between-Person Variability	Between-Day Variability	Within-Day Variability
Intentions:			
Number of drinks	.2714	.3502	.3784
DPB Use	.5009	.1586	.3405
SPB Use	.4863	.2089	.3048
Engaging in sex during/after drinking	.1774	.4756	.3740
Willingness:			
Number of drinks	.3118	.3836	.3046
DPB Use	.5366	.1634	.3000
SPB Use	.6138	.1059	.2803
Engaging in sex during/after drinking	.3210	.3868	.2922

Drinking/Level of Intoxication (eBAC)

Hypothesis 3a. At Level 3 (Between-person effects), individuals would consume more alcohol if they had intentions and willingness to consume a higher number of drinks, on average. Results from the *intentions-only model* predicting drinking revealed an intercept significantly different from zero, and a significant between-person effect of intentions on drinking. Thus, at average levels of intentions (because predictors are mean-centered), the mean eBAC across individuals was 0.11 g/dL. Each additional drink individuals intended to consume, on average, was associated with a 0.01 g/dL increase in eBAC.

Hypothesis 3b. At Level 2 (between-day/within-person effects), individuals would consume significantly more alcohol on days when they had intentions and willingness to consume a higher number of drinks. The within-person effect of intentions on drinking was not significant, and model fit estimations did not support examination of the cross-level interaction effect.

Willingness-Only Model. At average levels of willingness (i.e., when willingness = 0), the mean eBAC across individuals was 0.11 g/dL (intercept). There was a significant between-person effect on willingness, such that for each additional drink individuals were willing to consume, eBAC increased by 0.02 g/dL. The within-person effect of willingness on drinking was not significant, and model fit estimations did not support examination of the cross-level interaction effect.

Combined Intentions & Willingness Model. At average levels of willingness and intentions, the mean eBAC across individuals was 0.11 g/dL (intercept). There was a significant between-person effect for willingness, such that eBAC increased by 0.02 g/dL with each additional drink individuals were willing to consume (holding intentions constant at zero). The between-person effect of intention was not significant. Neither intentions nor willingness were significant at the within-person level, and cross-level interactions were not examined.

Table 8. Between- and within-person fixed effects of behavior-specific intentions and willingness by outcome

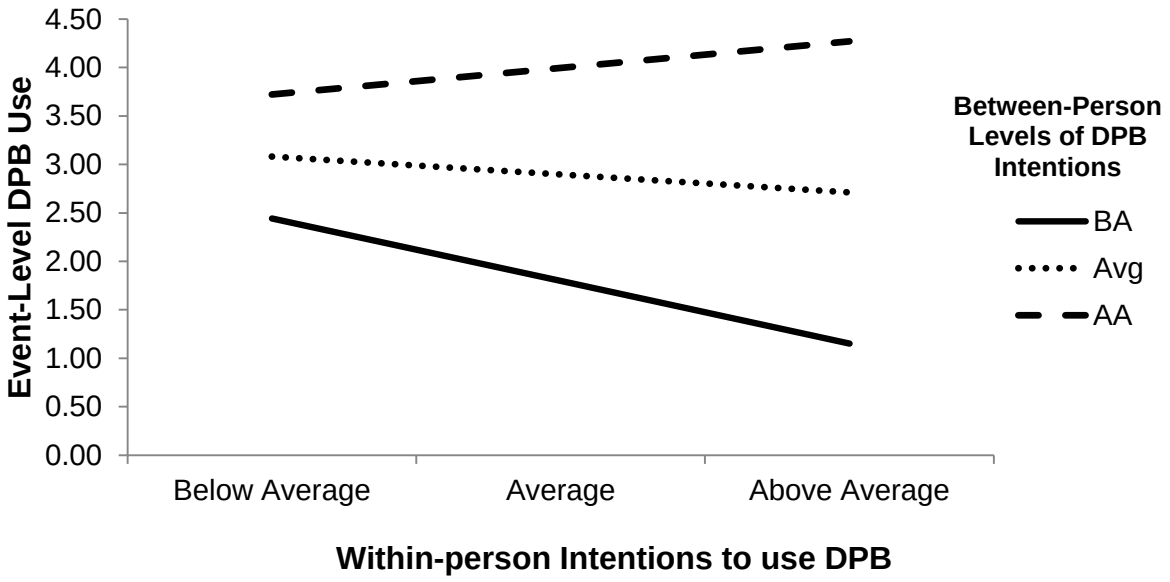
Between- and within-person measures of outcome-specific willingness and intentions	**Coefficient (SE)/Odds Ratio[a] for each Outcome**				
	Estimated BAC	**Number of DPB Used**	**Number of SPB Used**	**Number of Drinking Contexts**	**Likelihood of Having Sex**
Intention-Only Model					
Intercept, γ_{00}	**0.11 (0.01)**	**2.90 (0.18)**	**2.81 (0.14)**	**1.53 (0.07)**	**-1.59 (1.22)**
Average intention (Between-person association), γ_{01}	**0.01 (0.003)**	**0.62 (0.10)**	**0.70 (0.08)**	**0.11 (0.04)**	**1.03 (0.42) OR: 2.80**
Daily fluctuation in intention (Within-person association), γ_{10}	0.01 (0.004)	-0.20 (0.17)	0.04 (0.10)	0.00 (0.09)	3.14 (1.52) OR: 23.14
Average X Daily Interaction, γ_{11}	N/A	**0.28 (0.10)**	N/A	N/A	N/A
Willingness-Only Model					
Intercept, γ_{00}	**0.11 (0.01)**	**2.88 (0.18)**	**2.72 (0.13)**	**1.52 (0.07)**	**-1.84 (0.71)**
Average willingness (Between-person association), γ_{01}	**0.02 (0.003)**	**0.61 (0.09)**	**0.82 (0.08)**	0.06 (0.04)	**0.36 (0.18) OR: 1.43**
Daily fluctuation in willingness (Within-person association), γ_{10}	0.004 (0.004)	0.01 (0.15)	-0.08 (0.22)	-0.07 (0.08)	**1.58 (0.73) OR: 4.84**
Average X Daily Interaction, γ_{11}	N/A[c]	N/A	N/A	N/A	N/A
Intention & Willingness Combined Model					
Intercept, γ_{00}	**0.11 (0.01)**	**2.91 (0.17)**	**2.76 (0.12)**	**1.52 (0.07)**	**-1.89 (0.62)**
Average willingness (Between-person association), γ_{01}	**0.02 (0.01)**	**0.41 (0.43)**	**0.50 (0.13)**	-0.02 (0.05)	N/A
Average intention (Between-person association), γ_{02}	-0.001 (0.01)	0.29 (0.16)[t]	**0.34 (0.12)**	**0.12 (0.06)**	**0.95 (0.40) OR: 2.60**
Daily fluctuation in willingness (Within-person association), γ_{10}	-0.01 (0.01)	-0.74 (0.59)	**-0.18 (0.08)**	-0.11 (0.12)	**0.86 (0.45) OR: 2.36**
Daily fluctuation in intention (Within-person association), γ_{20}	0.01 (0.01)	0.20 (0.27)	0.11 (0.09)	0.04 (0.13)	2.67 (1.48) OR: 14.37
Average X Daily Interaction, γ_{11}	N/A	0.22 (0.13)	N/A	N/A	***

Note. [a] Odds ratios were calculated for predictors within logistic models; [b] Likelihood of drinking and likelihood of having sex were both dichotomous variables, resulting in logistic models with no residual variance estimates; [c] N/A indicates addition of that parameter did not improve the overall model fit and, thus, was not estimated; **bolded** estimates $p < .05$.

Drinking Protective Behavior Use

Intentions-Only Model. At average levels of intentions, the mean number of DPB used across individuals was 2.90. There was a significant between-person effect, such that each additional DPB individuals intended to use, on average, was associated with a 0.62 increase in DPB use. The within-person effect of intentions on DPB use was not significant. However, the cross-level interaction revealed individuals with above average DPB intentions (relative to the sample) used more DPB on days when they had intentions higher than their own mean. Meanwhile, individuals with average and below average DPB intentions used fewer DPB on days when they had higher DPB intentions (See Figure 11).

Figure 11. Effects of within-person DPB intentions on DPB use at below average (BA), average (Avg), and above average (AA) between-person levels of DPB intentions



Willingness-Only Model. At mean levels of willingness, the average number of DPB used across individuals was 2.88. There was a significant between-person effect of willingness, such that each additional DPB individuals were willing to use, on average, was associated with a 0.61 increase in DPB use. The within-person effect of willingness on DPB use was not significant, and cross-level interaction effects were not examined.

Combined Intention & Willingness Model. At mean levels of intentions and willingness, the average number of DPB used across individuals was 2.91. The between-person effect of DPB intention was not significant. However, the between-person effect of willingness was significant, such that each additional DPB individuals were willing to use, on average, was associated with a 0.41 increase in DPB use. Neither intentions nor willingness were significant at the within-person level. Examination of interaction terms revealed the addition of a between-person willingness X within-person intention effect would significantly improve model fit; however, the effect was not significant (p = .06).

Social Protective Behaviors

Intentions-Only Model. At average levels of intention, the mean number of SPB used across individuals was 2.81. There was a significant between-person effect of intentions, such that each additional SPB individuals were willing to use, on average, was associated with a 0.70 increase in SPB use. The within-person effect of intentions on SPB use was not significant, and model fit estimations did not support examination of the cross-level interaction effect.

Willingness-Only Model. At average levels of willingness, participants used an average of 2.72 SPB. There was a significant between-person effect of willingness, such that each additional SPB individuals were willing to use, on average, was associated with a 0.82 increase in SPB use. The within-person effect of willingness on SPB use was not significant, and cross-level interaction effects were not estimated.

Combined Intention & Willingness Model. On average, at mean levels of intentions and willingness, participants used 2.76 SPB. The between-person effect of SPB intention was significant, such that at average levels of willingness, each additional SPB individuals intended to use, on average, was associated with a 0.34 increase in SPB use. The between-person effect of willingness was similar, revealing that at average levels of intention, individuals used more SPB if they were more willing to do so on average. Within-individuals, participants used fewer SPB on days when they were willing to use more (relative to their individual mean across days; within-person effect). The within-person effect for intention was not significant, and cross-level interactions were not examined.

Contextual Risk Factors—Number of Drinking Contexts Encountered

Intentions-Only Model. At average levels of intention, participants encountered an average of 1.53 contexts when they drank. There was a significant between-person effect of intentions, such that the number of drinking contexts increased by 0.11 with each additional context individuals intended to encounter, on average (across people). The within-person effect of intentions on context was not

significant, and model fit estimations did not support examination of the cross-level interaction effect.

Willingness-Only Model. Neither the between- nor the within-person willingness effects predicted the number of contexts in which an individual drank.

Combined Intention & Willingness Model. At mean levels of intentions and willingness, participants encountered an average of 1.52 contexts when they drank. The between-person effect of intention was significant, such that at average levels of willingness, the number of contexts encountered was higher among individuals who intended to drink in a wider variety of contexts on average. The between-person effect of willingness was not significant. Neither within-person effect was significant, and cross-level interactions were not examined.

Contextual Risk Factors—Engaging in Sex during/after Drinking

Intentions-Only Model. On average, participants were unlikely to engage in sexual behavior during or after drinking. There was a significant between-person effect of intentions, such that as the number of days on which an individual intended to have sex increased (averaged across people), the more likely it was that any given drinking occasion would also include sexual behavior. The within-person effect of intentions on engaging in sexual behavior was not significant. The cross-level interaction was not examined.

Willingness-Only Model. On average, participants were unlikely to engage in sexual behavior during or after any given drinking occasion. There was a significant between-person effect of willingness, such that as the number of days on which an individual was willing to have sex increased (averaged across people), the more

likely it was that any given drinking occasion would also include sexual behavior. The effect of willingness was also significant at the within-person level, such that individuals were more likely to engage in sexual behavior on days when they were willing to. The cross-level interaction was not examined.

Combined Intention & Willingness Model. Accounting for mean levels of intentions and willingness, participants were unlikely to engage in sexual behavior on any given drinking occasion. The between-person effect of intention was significant, such that at average levels of willingness, as the number of days on which an individual intended to have sex increased (averaged across people), the more likely it was that any given drinking occasion would also include sexual behavior. The between-person effect of willingness was not included in the model due to significant reduction in model fit when that component was added. However, the within-person effect of willingness was significant, suggesting that even after accounting for an individual's average intentions, she was more likely to engage in sexual behavior during/after drinking occasions on days when she was willing to do so. The within-person effect of intention was not significant, and no cross-level interactions were examined.

Hypothesis 3c. At Level 1 (within-day/within-person effects), individuals would consume significantly more alcohol on days when their intentions and willingness to drink increased throughout that day. The final set of models examined in the current study replaced within-person means (Level 1 predictors) in the previously discussed HLMs with change scores, representing whether an individual's behavior-specific intentions/willingness increased or decreased within a given day. Toward this end, all intercepts and between-person effects (Level 2 predictors) remained consistent with the descriptions presented above and will not be presented again here. Again, estimated random effects were significant across all models. Thus, the intercepts (average of each outcome) and slopes (average association between within-day change and outcome across days) were allowed to vary across individuals. Hypothesized fixed effects for within-day change are discussed by outcome below and estimates for all hypothesized fixed effects are presented in Table 9.

Drinking/Level of Intoxication (eBAC)

Across all models. Neither intentions nor willingness had significant within-day effects on drinking. Collectively, eBAC does not appear to change as a function of within-day increases or decreases in intentions or willingness to drink.

Drinking Protective Behaviors

Across all models. Neither intentions nor willingness had significant within-day effects on DPB use. DPB use does not appear to change as a function of within-day increases or decreases in intentions or willingness to use DPB.

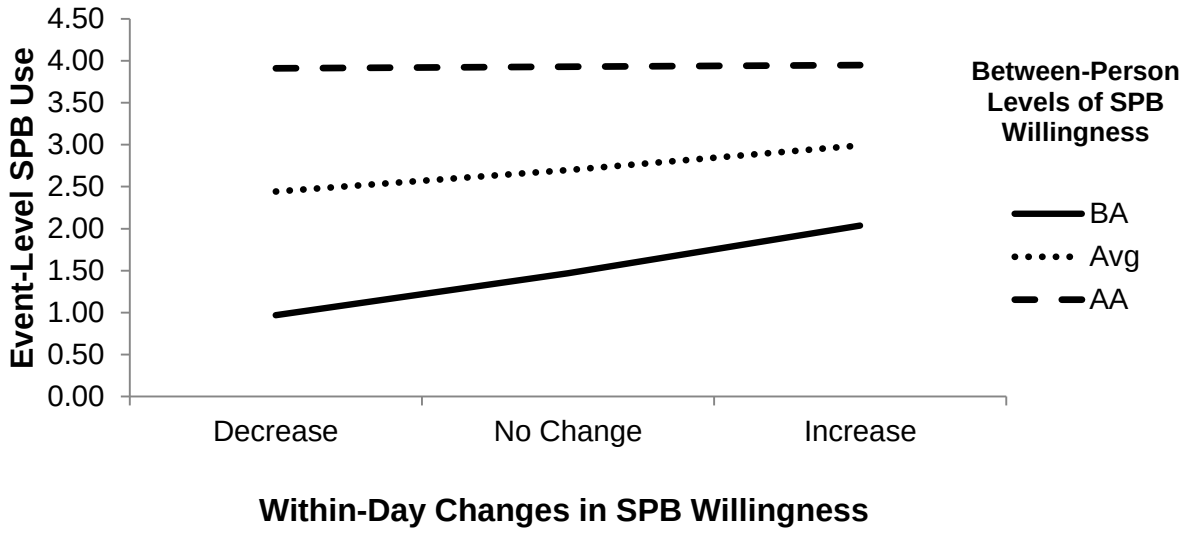
Social Protective Behaviors

Intentions-Only Model. The within-day effect of intentions was not significant.

Willingness-Only Model. Within-day change in SPB willingness was significantly associated with SPB use, such that individuals used more SPB on days when their willingness to do so increased throughout the day. The between-person X within-day change interaction was also significant. Individuals who typically endorsed average or below average SPB willingness increased their SPB use on days when their willingness increased throughout the day. Meanwhile, individuals who typically endorsed above average willingness to use SPB employed a consistently high number of SPB regardless of how their willingness changed within a day (See Figure 12).

Combined Intentions & Willingness Model. The within-day effects of willingness on SPB (and the interaction) described in the willingness-only model followed the same pattern, even after controlling for average levels and average changes in intentions.

Figure 12. Effects of within-day change in SPB willingness on event-level SPB use at below average (BA), average (Avg), and above average (AA) between-person levels of SPB willingness



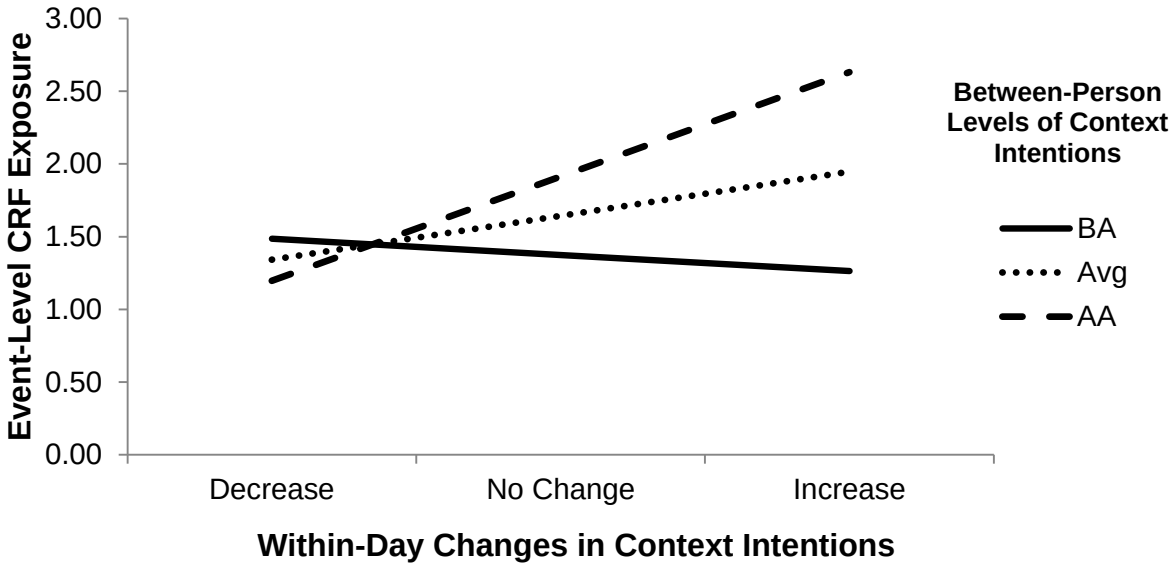
Contextual Risk Factors—Number of Drinking Contexts Encountered

Intentions-Only Model. Within-day change (increase) in the number of contexts in which an individual was intending to drink was positively associated with the number of contexts in which an individual drank on that day.

Willingness-Only Model. The within-day change effect of willingness on the number of contexts in which an individual drank on that day was not significant.

Combined Intentions & Willingness Model. Neither intentions nor willingness had significant within-day change effects on the number of contexts in which an individual drank on that day. However, controlling for average levels of willingness, the between-person intention X within-day change intention interaction effect was significant. For individuals who typically endorsed intentions to encounter a below average number of drinking contexts, the association between within-day change in intentions and the number of drinking contexts encountered on that day was not significant. Meanwhile, individuals who typically endorsed intentions to engage in an average or above average number of drinking contexts encountered more drinking contexts on days when their intended number of drinking contexts increased throughout the day (See Figure 13).

Figure 13. Effects of within-day change in context intentions on event-level context exposure at below average (BA), average (Avg), and above average (AA) between-person levels of context intentions



Contextual Risk Factors—Engaging in Sex during/after Drinking

Across All Models. Despite the significantly increased odds ratios, within-day changes in intentions and willingness were not significantly associated with the likelihood of engaging in sex during/after a drinking event.

Table 9. Fixed effects of between-person means and within-day change in intentions and willingness by outcome

Between-person averages and within-day changes in outcome-specific willingness and intentions	**Coefficient (SE)/Odds Ratio[a] for each Outcome**				
	Estimated BAC	**Number of DPB Used**	**Number of SPB Used**	**Number of Drinking Contexts**	**Likelihood of Having Sex**
Intention-Only Model					
Intercept, γ_{00}	**0.11 (0.01)**	**2.78 (0.20)**	**2.78 (0.14)**	**1.54 (0.07)**	**-1.70 (0.71)**
Average intention (Between-person association), γ_{01}	0.01 (0.004)	**0.60 (0.11)**	**0.72 (0.08)**	**0.10 (0.04)**	**1.49 (0.47) OR: 4.44**
Within-day change in intention (Within-person association), γ_{10}	0.01 (0.01)	0.10 (0.08)	-0.01 (0.06)	**0.07 (0.02)**	3.51 (2.15) OR: 33.55
Average X Daily Change Interaction, γ_{11}	N/A	-0.06 (0.05)	N/A	N/A	N/A
Willingness-Only Model					
Intercept, γ_{00}	**0.10 (0.01)**	**2.79 (0.18)**	**2.70 (0.13)**	**1.55 (0.08)**	**-1.78 (0.86)**
Average willingness (Between-person association), γ_{01}	**0.02 (0.003)**	**0.61 (0.09)**	**0.81 (0.09)**	0.06 (0.04)	**0.61 (0.23) OR: 1.85**
Within-day change in willingness (Within-person association), γ_{10}	0.01 (0.01)	-0.08 (0.07)	**0.18 (0.06)**	0.03 (0.04)	4.55 (2.82) OR: 95.09
Average X Daily Change Interaction, γ_{11}	N/A	N/A	**-0.11 (0.05)**	N/A	N/A
Intention & Willingness Combined Model					
Intercept, γ_{00}	**0.10 (0.01)**	**2.73 (0.19)**	**2.76 (0.13)**	**1.62 (0.09)**	**-1.94 (0.88)**
Average willingness (Between-person association), γ_{01}	**0.02 (0.01)**	**0.40 (0.16)**	**0.47 (0.14)**	0.01 (0.06)	0.32 (0.24) OR: 1.38
Average intention (Between-person association), γ_{02}	0.001 (0.01)	0.25 (0.17)	**0.38 (0.13)**	**0.16 (0.06)**	**1.24 (0.57) OR: 3.47**
Within-day change in willingness (Within-person association), γ_{10}	0.01 (0.01)	0.002 (0.12)	**0.16 (0.05)**	-0.02 (0.08)	3.74 (2.32) OR: 41.96
Within-day change in intention (Within-person association), γ_{20}	0.002 (0.001)	0.10 (0.11)	-0.07 (0.06)	0.16 (0.10)	2.28 (1.95) OR: 9.74
Average X Daily Change Interaction, γ_{11}	N/A	-0.02 (0.06)	**-0.11 (0.05)[b]**	**0.15 (0.06)[c]**	N/A

Note. [a] Odds ratios (OR) were calculated for predictors within logistic models; [b] represents the average willingness X daily change in willingness interaction; [c] represents the average intention X daily change in intention interaction; **bolded** estimates $p < .05$; [t] $p < .08$.

Summary of Aim 3 Findings

Across all models and behaviors, between-person effects of behavioral intentions and willingness were positively associated with the examined outcomes. In other words, individuals achieved higher eBACs, used more protective behaviors and engaged in greater contextual risk when they, on average, had greater intentions and were more willing to do so.

Significant between-day effects were found for intentions and willingness to engage in sexual behavior during or after drinking. Women were more likely to engage in sexual behavior on days when they were intending and willing to do so. A between-day effect of willingness was also found for SPB use, but in an unexpected direction. Women reported using fewer SPB on days when they were willing to use more than their typical amount.

At the within-day level, women used more SPB on days when their willingness to do so increased throughout the day. The cross-level interaction revealed this positive association was particularly strong among individuals who were typically willing to use an average or below average number of SPB. Event-level SPB use was consistently high among individuals with typically high willingness to use SPB. There was also a significant within-day effect of intentions on the number of contexts in which participants drank. Individuals drank in a wider variety of contexts on days when the number of contexts in which they intended to drink increased throughout the day. The cross-level interaction suggested the strength of this association increased as individuals intended to drink in a greater number of contexts.

CHAPTER FIVE: DISCUSSION

The current study used a multidimensional framework to examine factors associated with alcohol-related sexual victimization and consequences (AViC) in a sample of first-year college women. It was expected drinking and contextual risk factors would increase risk, while protective behavior use would decrease risk, both globally (Aim 1) and at the event-level (Aim 2). Operating under the assumption these factors tend to occur simultaneously, it was also expected there would be significant interactions between behaviors. Aim 3 explored momentary processes (via intentions and willingness) that influence decisions to drink, use protective behaviors, or engage in contextual risk on a given day. The present study is among the first to examine whether intentions and willingness fluctuate within and across days, and whether those fluctuations differentially influence decisions to drink, use protective behaviors, or engage in contextual risk on a given day.

Tables 10a, 10b, and 10c provide summaries of original hypotheses and findings by aim. Although each aim included a number of hypotheses, I will highlight select findings with particular relevance to prevention implications. Toward that end, the discussion is organized to present findings that 1) supported what was expected; 2) did not support what was expected; and 3) were unexpected. Findings will then be collectively discussed in terms of their implications for AViC prevention and how future work might build upon limitations from the current study.

Aim 1: Examining relationships between AViC and alcohol use, DPB, SPB, and CRF exposure, using a prospective longitudinal design

Table 10a. Summary of support for Aim 1 hypotheses

Main Effect Hypotheses	Results
1a. Alcohol use would be positively associated with AViC	Supported
1b. DPB use would not be significantly associated with AViC	Supported
1c. SPB use would be negatively associated with AViC	Not supported
1d. CRF would be positively associated with AViC	Partially Supported—only drinking with a romantic partner was associated with AViC
1e. Examination of 2-way interactions was exploratory	DPB, SPB, & CRF moderated the association between drinking and AViC

Supported Findings. As expected, typical weekend drinking emerged as the strongest predictor of sexual victimization across the first semester of college. This is consistent with a large literature highlighting the influence of alcohol on sexual assault in the college population (for reviews see Abbey, 2002; Testa & Livingston, 2009; Ullman, 2003). Also consistent with hypotheses, based on previous work suggesting DPB impact sexual risk indirectly through reductions in drinking (Mallett et al., 2015), DPB was not directly associated with AViC.

Unsupported Findings. Contrary to what was expected, SPB use and CRF (except drinking with a romantic partner) were not significantly associated with AViC. There are several possible explanations for these discrepancies. First, regarding SPB use, Aim 1 of the current study only examined sexual victimization and used a protective behavior measure specific to the sexual and interpersonal elements of the drinking environment (see Moore & Waterman, 1999). Meanwhile, previous research examined broader consequence-based outcomes and a more general measure of

non-drinking protective behaviors (e.g., Mallett et al., 2015; Ray et al., 2009). Fishbein and Ajzen (2010) would argue the current study's measurement specificity should yield greater effects. However, it is possible some of the more general protective behaviors used previously (e.g., going home early the night before a test) might also reduce sexual risk by removing individuals from the risky environment or by restricting the time they have to drink. Finally, in order to assess behavior when college women are most at risk for AViC (early in their first semester), the baseline assessment occurred at the beginning of the school year and asked students to report on their DPB use, SPB use, and CRF exposure that occurred in the year prior to college.

Although the association between drinking with a romantic partner (CRF) and sexual victimization was significant, the direction of the relationship was inconsistent with the hypothesis. Frequent drinking with a romantic partner was associated with decreased sexual victimization in the first semester of college. While being female is generally protective against heavy drinking (Lange et al., 2002), women tend to increase their drinking when in groups of predominantly males, which would support the original hypothesis. It is plausible, however, that individuals who frequently drink with romantic partners are not drinking with others who would put them at risk. It is also possible that because context was reported for the year prior to college, these students are either no longer in relationships or are in long-distance relationships and have adjusted their social behaviors (e.g., they drink and socialize less with other males) to prioritize the relationship. Another possible explanation relies on a biopsychosocial aspect of stress. Taylor and colleagues' (2011; 2006) tend-and-

befriend model suggests healthy social relationships can buffer the effects of stress. In the context of romantic relationships, it is possible a healthy relationship can reduce stress, and ultimately drinking and victimization risk. Future work should further explore relationship quality, duration, and stress before prevention implications can be made.

Unexpected Findings. Both DPB and SPB significantly moderated the association between drinking and AViC. Although it has been posited that protective behaviors decrease consequences through reductions in drinking (i.e., a mediational effect; Lewis et al., 2010; Mallett et al., 2015), their ability to weaken the association between drinking and AViC (i.e., a moderation effect) has not previously been tested. These findings support the inclusion of DPB and SPB within harm-reduction alcohol interventions.

Context also moderated the effect of drinking on AViC in an unexpected way. Results suggested frequent drinking in risky contexts might be more protective than infrequently drinking in those contexts. Although such findings could be useful for enhancing intervention efforts, more work is needed to understand the potential protective element of frequently drinking in certain contexts. First, future work should examine mediational mechanisms of this association to determine if, perhaps, the context includes a protective group of peers, or if certain protective behavior patterns are employed to reduce environmental risk. Second, future work should also examine the three-way interactions between context, protective behavior use and drinking to see if DPB and SPB are equally effective at weakening the association between drinking and AViC across contexts. Third, future work should explore

alternate methods of context measurement. Due to the way context was measured (e.g., “How frequently do you drink in each context…”), it is possible the variables were confounded by drinking. Although event-level analysis parsed some of this out in Aim 2, this remains an important issue for global research. Relatedly, contexts have typically been studied in isolation, despite the fact they are not mutually exclusive. For example, when individuals are at parties, they are typically also with friends, and they may or may not be drinking. Future work would benefit from further exploring how to obtain a multi-dimensional measure of context that is not confounded by drinking.

Aim 2: Examining relationships between AViC and within- and between-person patterns of alcohol use, DPB, SPB, CRF Exposure

Table 10b. Summary of support for Aim 2 hypotheses

Hypothesis	Result
2a. There would be significant between-person effects of (average) drinking, DPB use, SPB use, and CRF exposure on AViC, respectively.	Partially supported—significant effects were found for mean levels of drinking, DPB use, and CRF in their expected directions.
2b. There would be significant within-person effects of (average variability in) drinking, DPB use, SPB use, and CRF exposure on AViC, respectively.	Partially supported—significant effects were found for drinking and CRF, such that greater within-person variability was associated with more AViC.
2c. There would be significant cross-level interaction effects, such that within-person effects would vary at different levels of between-person drinking, DPB use, SPB use, and CRF exposure, respectively.	Partially supported—CRF moderated its within-person effect on AViC.
2d. Within-person effects of drinking on AViC would vary at different between-person levels of DPB use and SPB use, respectively.	Partially supported—DPB use moderated the within-person effect of drinking on sexual victimization.
2e. Within-person effects of drinking on AViC would vary at different between-person levels of CRF.	Partially supported—Frequency of sex after drinking moderated the within-person effect of drinking on victimization.
2f. Within-person effects of DPB use and SPB use on AViC, respectively, would vary at different between-person levels of CRF.	Partially supported—Number of drinking contexts moderated within-person effects of DPB use on sexual consequences.

Aim 2 used aggregated daily diary data to provide a more nuanced examination of AViC's association with drinking, protective behavior use, and contextual risk by accounting for both average behavior and average variability in behavior.

Supported Findings. As expected, average DPB use was associated with decreased AViC, and average drinking and CRF (both number of drinking contexts and frequency of sex after drinking) were associated with increased AViC. With the exception of average drinking, these findings contradict what was found in Aim 1. It

is plausible these discrepancies could be accounted for by increased measurement specificity and proximity of assessment to behavior afforded by event-level data collection, relative to the Aim 1 global associations (Neal & Carey, 2007). Previous studies suggest a primary advantage to event-level data is the ability to capture a more detailed description of behaviors that happen within a specific drinking occasion (e.g., Weinhardt & Carey, 2000).

Regarding number of drinking contexts, both average number and average variability in the number of contexts were positively associated with sexual consequences specifically. Combined with findings from Aim 1, which suggested frequent drinking in certain contexts could be protective, it seems this may only be the case if relatively few contexts are encountered within a drinking occasion. Interpretation of the effect of average context on the association between context variability and AViC may further support this hypothesis. For example, among individuals who typically encountered an above average number of drinking contexts, AViC risk decreased as variability in drinking context increased. It is plausible the observed increase in variability was actually a decrease from one's normative number of drinking contexts. It is also plausible moving from context to context increases risk by increasing the likelihood of encountering a potential perpetrator. This information could provide a novel component to prevention efforts and possibly enhance available protective behaviors. For example, staying/walking home with one's friends is a commonly endorsed protective behavior (e.g., Moore & Waterman, 1999). However, staying with one group of friends while party hopping may not actually be protective. The present findings would suggest that not only

should individuals stay with trusted friends, but also they should stay with the same group of trusted friends in one location, thus limiting the number of contexts to which they are exposed.

Finally, based on previous event-level work showing individuals also experienced increased sexual risk on days when they consumed more than their typical amount of alcohol (Scaglione et al., 2014), it was expected average variability in drinking would be associated with AViC. This hypothesis was supported, providing further evidence that discussions of event-level variability in drinking behavior should be incorporated into alcohol interventions aimed at reducing AViC. Such messages might be particularly important for lighter drinkers who may not feel messages to reduce overall drinking apply to them. Also consistent with hypotheses and findings from Aim 1, DPB significantly moderated the effects of drinking (both average levels and average variability across drinking occasions) on AViC, providing further evidence for the utility of DPB in efforts to reduce AViC. Before implementing such recommendations, however, it should be noted that additional work is needed to replicate these findings using non-aggregated event-level data. Although the current study is supported by previous research (e.g., Neal & Carey, 2007; Scaglione et al., 2014), the aggregation of variability results in an absolute value, disregarding whether variability describes an increase or decrease in behavior, and making findings a challenge to interpret.

Unsupported Findings. Contrary to my hypotheses, neither mean nor variability in SPB use were associated with AViC. SPB use also did not moderate the association between average variability in drinking and AViC, contradicting

findings from the global associations in Aim 1. However, this should not be interpreted as a lack of within-person association between SPB use and AViC. As mentioned in the above discussion of drinking variability, aggregation of daily variability could plausibly mask findings and challenge interpretation. Data for two individuals may look completely different but yield the same variability estimate. For example, if one student used the same number of SPB on two separate drinking occasions, she would receive a mean of two, and her variability would be zero. If a different student used two SPB on one occasion and six on another, she would have a mean of four, but her average variability would be zero because her two measured events varied equally, but in opposite directions, around her mean. To examine these associations more accurately, data could be re-coded to represent days when an individual used fewer SPB than her mean amount and days when she used more. Other re-coding options might also include using extreme variables (highest and lowest occasions) or coding in a way that accounts for the distribution in variability.

Unexpected Findings. Although a significant context X DPB interaction effect was hypothesized, it was expected the risk associated with context would counter-balance the protective effect of DPB use. However, results revealed that for individuals who used an above average number of DPB across drinking occasions, their risk for AViC was low, even when they encountered a wide variety of contexts. This suggests that, in addition to reducing drinking itself, DPB could also be useful in reducing the contextual risk associated with drinking. In the current study, context included locations where students frequently drink, and individuals/peers who might

encourage more or less drinking. The number of other people who are drinking, or perceived to be drinking might also influence drinking within a context. Given the complexity associated with measuring context, finding a protective mechanism that could reduce the risk associated with the drinking environment adds a novel component to intervention.

Additional unexpected findings were methodological in nature. For example, event-level measures, even when aggregated, accounted for much larger proportions of variance relative to global measures observed in Aim 1, despite using the same AViC outcome measures in both sets of analyses. For example, the combination of average drinking, DPB use, and the drinking X DPB interaction term accounted for 26% of the variance in AViC, whereas global measures (baseline/Aim 1) of these behaviors accounted for about 11% of the variance in AViC. When event-level average drinking was replaced with a measure of average variability in drinking, the proportion of variance accounted for increased to 34%. These findings are consistent with previous literature that favors the use of prospective event-level assessments (e.g., daily diary) over past-month recall assessments (e.g., the Daily Drinking Questionnaire), as they are assumed to reduce recall bias and provide more accurate assessments of behavior (Del Boca & Darkes, 2003; Neal & Carey, 2007; Sobell & Sobell, 1995). Additionally, the incorporation of an aggregated variance component seems to provide an added benefit to event-level measures.

In the case of predicting AViC, it would seem event-level measures provide a more complete picture than do global measures. This is particularly important for assessing intervention efficacy, which traditionally relies on global assessments of

behavior change in the context of randomized controlled trials (e.g., Larimer et al., 2001; Neighbors et al., 2004; Turrisi et al., 2013). However, the use of event-level data may provide a more nuanced description of behavior change and increase estimated effect sizes.

Aim 3: Examining event-level relationships between behavioral outcomes associated with AViC (e.g., drinking, DPB, SPB, CRF) and decision-making constructs (intentions and willingness), using an EMA design

Table 10c. Summary of support for Aim 3 hypotheses

Hypothesis	Result
3a. There would be significant between-person effects of intentions and willingness on drinking, DPB use, SPB use, and CRF exposure.	Supported
3b. There would be significant between-day effects of intentions and willingness on drinking, DPB use, SPB use, and CRF exposure.	Partially supported—within-day effects of willingness on having sex after drinking were observed. Effect of willingness on SPB was negative (unexpected).
3c. There would be significant within-day effects of intentions and willingness on drinking, DPB use, SPB use, and CRF exposure.	Partially supported—within-day change effects were only observed for willingness and SPB use.
3d. Examination of cross-level interactions was exploratory	Significant between-person X within-day change interactions were observed for SPB and CRF

Aim 3 utilized EMA data to examine how intentions and willingness influence behavior at the person-level, at the day-level (e.g., between-days/within-people), and within a day.

Supported Findings. Consistent with theories of behavior change (e.g., Theory of Reasoned Action; Prototype-Willingness Model), which assume intentions and willingness affect behavior at the global level (see Ajzen & Fishbein, 1980; Gerrard et al., 2008), individuals drank more, used more protective behaviors, and engaged in greater contextual risk when they were generally more willing or had greater intentions to do so. Findings from the combined intentions and willingness model were consistent with previous work showing both intentions and willingness can account for unique variance in SPB use (Scaglione et al., 2015). Collectively,

findings suggest both planned and reactive pathways can be used in prevention efforts to decrease drinking and CRF or to increase DPB or SPB use.

Also not surprisingly, the odds of engaging in sexual behavior were higher on days when women were willing to have sex. However, what remains unclear is whether women had the sex they were willing to have. Future work could compare the details of the sex students are willing to have (e.g., potential partner and action) with the sex students report having, as inconsistencies might be particularly helpful for shaping intervention efforts. In addition, future work might also benefit from exploration of assessment timing. It remains unclear what the best times of day to assess sexual willingness might be, or whether assessments occurring early in the day were influenced by activities from the night before.

At an even more micro level, individuals reported more SPB use on days when their willingness to use SPB increased within a day. Meanwhile, intentions did not predict within-person or within-day behavioral outcomes, suggesting that, depending on the behavior, intentions and willingness may influence decision-making at different levels. This is important from an intervention perspective, as messages that aim to change global willingness may not effectively impact willingness at the day-level when the decision to engage in a behavior is made. To the contrary, it may not be time or cost effective to develop intervention efforts aimed at increasing or decreasing one's intentions within a day, when traditional global methods achieve the largest effect. Based on the published literature, this is the first study examining decision-making at the within-person or within-day level, but findings provide initial evidence to suggest momentary interventions (e.g., Ecological

momentary intervention; EMI) may be of utility in targeting the socially-driven, reactive decision-making path.

Unsupported Findings. Despite the within-person effects described above, a majority of the hypothesized within-person and within-day effects were not supported by the data. This was particularly surprising given the amount of within-person variability detected in the outcome variables (drinking, DPB, SPB, CRF) and the between- and within-day variability detected in the predictors (behavior-specific intentions and willingness). The ability to predict between-day/within-person variability could be limited by power (too few observed drinking occasions). It is also possible the within-person association between the predictors (e.g., willingness) and the outcomes (e.g., drinking) varied significantly across individuals, effectively cancelling each other out (e.g., one person has a positive association and one person has a negative association). Post-hoc examination of models where the random slope effect was removed support this notion, suggesting willingness and intentions may function in different ways for different people or on different days, challenging traditional global assumptions of decision-making that willingness and intention to engage in a behavior increase behavior. Before prevention implications can be implemented, more work is needed to better understand *how* decision-making processes function from day to day.

Unexpected Findings. Across most of the models, model fit indices did not support the examination of cross-level interaction effects. This is likely due to insufficient power, as interaction effects, on average, have very small effect sizes (Jaccard & Turrisi, 2003). When data in the current study were reduced to include

only women with drinking occasions, the “50/20” rule (50 participants with at least 20 observations each) for examining multi-level interactions was violated (Kreft, 1996). Thus it should be noted that just because the interactions could not be estimated in the current study does not mean they fail to exist.

Of the interaction analyses that were supported, findings were interesting. For example, for people who had above average intentions to use DPB, their DPB use increased on days when their intentions to use DPB also increased. However, for people who had average or below average intentions to use DPB, their DPB use decreased on days when they had higher DPB intentions. It is possible this pattern of behavior could reflect days where plans to go out fell through, or perhaps the drinking context changed to a situation where DPB were not needed. Alternatively, it is possible DPB use dropped, despite DPB intentions, because drinking increased and the individual was too intoxicated to use DPB. Examining DPB use, DPB willingness and intentions, and intoxication within specific drinking occasions might provide more insight into the nature of this relationship. This would also have implications for EMI, as momentary efforts to increase protective behavior use within a drinking occasion could prove difficult to implement on heavy drinking days when students have strong intentions to get drunk.

Implications for Prevention

Taken together, findings provide several implications for prevention. First, consistent with existing literature (Clinton-Sherrod et al., 2011; Testa & Livingston, 2009; Testa et al., 2010), findings suggest reducing alcohol consumption may lead to reductions in victimization. Event-level data provides evidence to support the inclusion of variability in drinking to further enhance the efficacy of harm-reduction intervention approaches. Most existing approaches include messages that encourage women to drink less in order to reduce overall consumption and lower their risk of victimization and consequences (Dimeff, 1999; Marlatt & Witkiewitz, 2002). While harm-reduction may be more efficacious than abstinence-based approaches, particularly in the college population (Larimer et al., 1998), these messages could be missing certain types of drinkers. Scaglione and colleagues (2014) suggest individuals who are lighter drinkers may benefit from interventions that help students identify their "typical" level of drinking and then provide them with skills (e.g., protective behaviors) to prevent deviation from that mean. Findings from the current study provide further support for this approach.

The current study provides new evidence for the utility of both DPB and SPB within existing harm-reduction intervention frameworks. For example, motivational interviewing (MI; Dimeff, 1999), personalized feedback (Larimer et al., 2007; Neighbors et al., 2004), and parent-based interventions (PBI; Turrisi et al., 2001; 2013) include protective behavior components; however, these interventions might be enhanced by differentiating between DPB and SPB, or by overtly discussing the impact protective behavior use could have on reducing victimization.

Prior to developing protective behavior-based intervention components, additional etiological work might first explore patterns of protective behavior use and psychosocial predictors of use. Although DPB X SPB interactions were not examined in the current study, it is likely these behaviors are used in combination. However, what combinations are common, whether certain combinations are more efficacious at preventing risk, and whether those combinations are tailored to each drinking context remains unknown. Answers to these questions could impact what recommendations should be made within interventions. Additionally, examination of more distal psychosocial predictors would help intervention specialists identify the best way to motivate individuals to use protective behaviors. Previous work has examined attitudes, expectancies, normative beliefs, and self-concept as predictors of SPB use (Scaglione et al., 2015); however, more work is needed to identify psychosocial predictors of a comprehensive set of DPB.

Findings regarding drinking context might also enhance intervention efforts, particularly those aimed at reducing sexual consequences. Existing intervention frameworks (e.g., MI, personalized feedback, PBI) could be used to encourage students to stay in one setting with one group of peers, as their risk seems to increase the more they move between contexts. More research is needed, however, to determine which contexts are risky and which are protective and how they occur in combination.

Finally, although more work is needed to understand within-person effects of intentions and willingness on behavioral decision-making, there is preliminary evidence to suggest both the planned (intentional) and reactive (willingness)

pathways should be utilized in intervention efforts. Given, within-day changes in willingness were associated with increased SPB use, cell phone-based participation was high, and that participation in EMA may encourage increased protective behavior use, the current study provides preliminary support for the use of interactive, phone-based momentary interventions (e.g., EMI) to promote the use of DPB and SPB, or to deliver contextual safety tips before or during drinking occasions. EMI has been used successfully to assist with smoking cessation, weight loss, and even reductions in alcohol use (for review see Heron & Smyth, 2010), but feasibility and efficacy have not been assessed for reductions in AViC within a college population.

Limitations & Future Directions

Although the current study provides theoretical and methodological insight to the study of AViC, and the findings have unique implications for AViC prevention, it is not without limitations. First, hypotheses for Aims 2 and 3 would be better served if within-person effects were examined in combination with within-person outcomes. The aggregation of data at the lowest level (e.g., across drinking occasions or across assessments within a day) made it challenging to determine *how* people vary from one drinking day to the next. One way to improve variability estimates within the current aggregated framework would be to reduce the sample for analyses, including only individuals with *more than one* drinking occasion. Individuals who only have one drinking occasion could bias estimated associations using aggregated means and standard deviations. For example, if an individual's single assessment was a heavy drinking occasion, it may not represent her typical behavior.

Furthermore, there would be no variability score, as a standard deviation cannot be calculated from one value. Given the low drinking rates, reducing the sample within the current study would result in too little power to detect small and moderate effects. As such, results from the current study should be interpreted cautiously and replicated in a larger sample prior to informing intervention. Future work should replicate the current study with a larger, heavier drinking sample, or collect daily/EMA data over a longer period of time to capture more drinking days per person.

A second possibility for using aggregated data is to use a person-centered approach. Analysis of Aim 2 data was unique in that it accounted for contributions of both mean levels and variability around mean levels of drinking, DPB, SPB and CRF; however, findings are limited in scope and interpretability. For example, the current study found that individuals who consumed more alcohol, drank in a wider variety of contexts, and more frequently engaged in sex after drinking (averaged across individual drinking occasions) reported more sexual consequences at the end of their first semester. However, from the current analyses it is unclear whether each of these associations was observed within one person, ultimately increasing her risk in three ways, or if these associations were experienced by three separate people. Future work should examine these associations using a person-centered approach such as Latent Class or Latent Profile Analysis (LCA/LPA; Collins & Lanza, 2010).

A factor limiting the current analyses, and potential for alternate person-centered analysis, is the number of observed drinking occasions within the present sample. Although the sample was a sufficient size for examining Aim 1 hypotheses,

the reduction of data to only use drinking occasions may have reduced power to detect significant findings. Given the majority of participant drinking occurred on Thursday, Friday, or Saturday, future work may benefit from collecting data over a larger number of weekends.

As with any longitudinal study, the timing of assessments is critical. The design of the current study was based on rigorous pilot testing and grounded in best practices identified in previous research (e.g., Muraven et al., 2005). However, several questions remain. First, the optimal timing for assessing within-day intentions and willingness is unclear. Within the current study, especially in the case of sexual behavior and drinking, it is possible one day's willingness was influenced by what happened the previous night. Finally, thinking beyond the first year of college, it would be prudent to explore how drinking, DPB and SPB use, and CRF differ throughout the college experience. Intervention messages based on data from first year students may not be applicable to older students if their drinking changes, or if they use different protective behaviors. Future work would benefit from assessing developmental trajectories of drinking, protective behavior use, and contextual risk.

Finally, the current study tested a large number of effects without adjusting for Type I error. Several adjustment methods were explored; however, given the anticipated small effect size for interactions, even the most liberal adjustment methods would be too conservative (Jaccard & Turrisi, 2003). As such, findings should be interpreted with caution and replicated in a larger, more diverse sample prior to making intervention recommendations.

Conclusions

The current study was the first to examine AViC predictors using global, diary, and EMA data all within the same sample. Taken together, findings provided a novel examination of behaviors and decision-making processes that influence AViC among first-year college women. The present study extended theoretical understanding of AViC predictors by examining drinking, DPB use, SPB use and context simultaneously. Second, the use of multiple methods provided valuable insight into the strengths and weaknesses associated with both global and event-level assessment of AViC and its behavioral predictors. Finally, findings have the potential to make a significant public health impact through the enhancement of existing harm-reduction interventions and the development of new interventions that could influence decision-making within and across drinking events.

REFERENCES

Abbey, A. (2002). Alcohol-related sexual assault: A common problem among college students. *Journal of Studies on Alcohol, Supplement, 14,* 118-128.

Abbey, A., McAuslan, P., Zawacki, T., Clinton, A. M., & Buck, P. O. (2001). Attitudinal, experiential, and situational predictors of sexual assault perpetration. *Journal of interpersonal violence*, *16*(8), 784-807.

Abbey, A., Ross, L. T., McDuffie, D., & McAuslan, P. (1996). Alcohol and dating risk factors for sexual assault among college women. *Psychology of Women Quarterly, 20***,** 147-169.

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

Baer, J. S. (2002). Student factors: Understanding individual variation in college drinking. *Journal of Studies on Alcohol, 14,* 40-53.

Baer, J. S., Kivlihan, D. R., & Marlatt, G. A. (1995). High-risk drinking across the transition from high school to college. *Alcoholism: Clinical and Experimental Research, 19*(1), 54-58.

Benton, S. L., Downey, R. G., Glider, P. S., Benton, S. A., Shin, K., Newton, D. W. … Price, A. (2006). Predicting negative drinking consequences: Examining descriptive norm prediction. *Journal of Studies on Alcohol, 67*, 399-405.

Borsari, B., & Carey, K. B. (2001). Peer influences on college drinking: A review of the research. *Journal of substance abuse*, *13*(4), 391-424.

Breitenbecher, K. H. (2008). The convergent validities of two measures of dating behaviors related to risk for sexual victimization. *Journal of Interpersonal Violence, 23*(8), 1095-1107.

Buddie, A. M. & Parks, K. A. (2003). The role of the bar context and social behaviors on women's risk for aggression. *Journal of Interpersonal Violence, 18*(12), 1378-1393.

Burger, B. D. (2014). *Identification of college students' recreational networks and the temporal association with drinking and hooking-up* (Unpublished doctoral dissertation). The Pennsylvania State University, University Park, PA.

Clapp, J. D., Reed, M. B., Holmes, M. R., Lange, J. E., & Voas, R. B. (2006). Drunk in public, drunk in private: The relationship between college students, drinking environments and alcohol consumption. *The American Journal of Drug and Alcohol Abuse*, *32*(2), 275-285.

Cleveland, M. J., Mallett, K. A., White, H. R., Turrisi, R., & Favero, S. (2013). Patterns of alcohol use and related consequences in non-college-attending emerging adults. *Journal of Studies on Alcohol and Drugs, 74*(1), 84-93.

Clinton-Sherrod, M., Morgan-Lopez, A. A., Brown, J. M., McMillen, B. A., & Crowells, A. (2011). Incapacitated sexual violence involving alcohol among college women: The impact of a brief drinking intervention. *Violence Against Women, 17* (1), 135-154.

Collins, R. L., Kashdan, T. B., & Gollnisch, G. (2003). The feasibility of using cellular phones to collect ecological momentary assessment data: Application to

alcohol consumption. *Experimental and Clinical Psychopharmacology, 11*, 73-78.

Collins, L. M. & Lanza, S. T. (2010). *Latent class and latent transition analysis: With applications in the social, behavioral, and health sciences.* Hoboken, NJ: Wiley.

Collins, R. L., Parks, G. A., & Marlatt, G. A. (1985). Social determinants of alcohol consumption: The effects of social interaction and model status on the self-administration of alcohol. *Journal of Consulting and Clinical Psychology, 53,*189−200.

Cooper, M. L. (1994). Motivations for alcohol use among adolescents: Development and validation of a four-factor-model. *Psychological Assessment, 6*(2), 117–128.

CORE Institute (2010). Executive summary of the Core Alcohol and Drug Survey-Long Form: 2008 Annual Data.

Cue, K. L., George, W. H., & Norris, J. (1996). Women's appraisals of sexual-assault risk in dating situations. *Psychology of Women Quarterly*, *20*(4), 487-504.

Davis, K. C., Hendershot, C. S., George, W. H., Norris, J., & Heiman, J. R. (2007). Alcohol's effects on sexual decision-making: an integration of alcohol myopia and individual differences. *Journal of Studies on Alcohol and Drugs*, *68*(6), 843-851.

Del Boca, F. K. & Darkes, J. (2003). The validity of self-reports of alcohol consumption: State of the science and challenges for research. *Addiction, 98*(s2), 1-12.

Delva, J., Smith, M. P., Howell, R. L., Harrison, D. F., Wilke, D., & Jackson, D. L. (2004). A study of the relationship between protective behaviors and drinking consequences among undergraduate college students. *Journal of American College Health*, *53*(1), 19-27.

Dimeff, L. A., Baer, J. S., Kivlahan, D. R., & Marlatt, G. A. (1999). *Brief alcohol screening and intervention for college students (BASICS): A harm reduction approach.* New York, NY: The Guilford Press.

Engs, R. C., & Hanson, D. J. (1990). Gender differences in drinking patterns and problems among college students: A review of the literature. *Journal of Alcohol and Drug Education*, *35*(2), 36-47.

Fishbein, M. & Ajzen, I. (2010). *Predicting and changing behavior: The reasoned action approach.* New York: Psychology Press (Taylor & Francis).

Flack, W. F., Caron, M. L., Leinen, S. J., Breitenbach, K. G., Barber, A. M., Brown, E. N., … Stein, H. C. (2008). The red zone: Temporal risk for unwanted sex among college students. *Journal of Interpersonal Violence, 23,* 1177-1196.

Flack, W. F., Daubman, K. A., Caron, M. L., Asadorian, J. A., D'Aureli, N. R., Gigliotti, S. N., ... & Stine, E. R. (2007). Risk factors and consequences of unwanted sex among university students hooking up, alcohol, and stress response. *Journal of Interpersonal Violence*, *22*(2), 139-157.

Gerrard, M., Gibbons, F. X., Houlihan, A. E., Stock, M. L., & Pomery, E. A. (2008). A dual-process approach to health risk decision-making: The prototype willingness model. *Developmental Review*, *28*(1), 29-61.

Guilamo-Ramos, V., Jaccard, J., Dittus, P., Gonzalez, B., & Bouris, A. (2008). A conceptual framework for the analysis of risk and problem behaviors: The case of adolescent sexual behavior. *Social Work Research, 32*(1), 29-45.

Heron, K. E. & Smyth, J. M. (2010). Ecological momentary interventions: Incorporating mobile technology into psychosocial and health behaviour treatments. *British Journal of Health Psychology, 15,* 1-39.

Hingson, R., Heeren, T. Winter, M., & Wechsler, H. (2005). Magnitude of alcohol-related mortality and morbidity among U.S. college students ages 18-24: Changes from 1998 to 2001. *Annual Review of Public Health, 26,* 259-279.

Humphrey, J. A. & White, J. W. (2000). Women's vulnerability to sexual assault from adolescence to young adulthood. *Journal of Adolescent Health, 27(6),* 419-424.

Hurlburt, S. C., & Sher, K. J. (1992). Assessing alcohol problems in college students. *Journal of American College Health, 41,* 49−58.

Jaccard, J. & Turrisi, R. (2003). *Interaction effects in multiple regression* (2nd Ed.). Thousand Oaks, CA: Sage.

Janz, N. K. & Becker, M. H. (1984). The health belief model – a decade later. *Health Education Quarterly*, *11*, 1-47.

Johnston, L. D., O'Malley, P. M., Bachman, J. G., & Schulenberg, J. E. (2007). *Monitoring the Future national survey results on drug use, 1975–2006: Volume II, College students and adults ages 19–45 (NIH Publication No. 07-6206).* Bethesda, MD: National Institute on Drug Abuse.

Keyes, K. M., Grant, B. F., & Hasin, D. S. (2008). Evidence for a closing gender gap in alcohol use, abuse, and dependence in the United States population. *Drug and Alcohol Dependence*, *93*(1), 21-29.

Kilpatrick, D. G., Ruggiero, K. J., Acierno, R., Saunders, B. E., Resnick, H. S., & Best, C. L. (2003). Violence and risk of PTSD, major depression, substance abuse/dependence, and comorbidity: Results from the National Survey of Adolescents. *Journal of Consulting and Clinical Psychology*, *71*(4), 692-700.

Koss, M. P., Gidycz, C. A., & Wisniewski, N. (1987). The scope of rape: Incidence and prevalence of sexual aggression and victimization in a national sample of higher education students. *Journal of Consulting and Clinical Psychology*, *55*, 162-170.

Kreft, I. G. (1996). *Are multilevel techniques necessary? An overview, including simulation studies.* California State University, LA.

LaBrie, J. W., & Pedersen, E. R. (2008). Pre-partying promotes heightened risk in the college environment: An event-level report. *Addictive Behaviors*, *33*(7), 955-959.

Lange, J. E., Clapp, J. D., Turrisi, R., Reavy, R., Jaccard, J., Johnson, M. B.,… & Larimer, M. E. (2002). College binge drinking: What is it? Who does it? *Alcoholism: Clinical and Experimental Research, 26,* 723-730.

Larimer, M. E. & Cronce, J. M. (2007). Identification, prevention, and treatment revisited: Individual-focused college drinking prevention strategies 1999-2006. *Addictive Behaviors, 32,* 2439-2468.

Larimer, M. E., Lee, C. M., Kilmer, J. R., Fabiano, P. M., Stark, C. B., Geisner, I. M., ... & Neighbors, C. (2007). Personalized mailed feedback for college drinking prevention: A randomized clinical trial. *Journal of Consulting and Clinical Psychology*, *75*(2), 285-293.

Larimer, M. E., Marlatt, G. A., Baer, J. S., Quigley, L. A., Blume, A. W., & Hawkins, E. H. (1998). Harm reduction for alcohol problems: Expanding access to and acceptability of prevention and treatment services. In G. A. Marlatt (Ed.) *Harm Reduction: Pragmatic Approaches to Managing High-Risk Behaviors* (pp. 69-121). New York, NY: Guilford Press.

Lewis, M. A., Rees, M., Logan, D. E., Kaysen, D. L., & Kilmer, J. R. (2010). Use of drinking protective behavioral strategies in association to sex-related alcohol negative consequences: the mediating role of alcohol consumption. *Psychology of Addictive Behaviors*, *24*(2), 229-238.

Litt, M. D., Cooney, N. L., & Morse, P. (1998). Ecological momentary assessment (EMA) with treated alcoholics: Methodological problems and potential solutions. *Health Psychology, 17*, 48-52.

Livingston, J. A., Hequembourg, A., Testa, M., & VanZile-Tamsen, C. (2007). Unique aspects of adolescent sexual victimization experiences. *Psychology of Women Quarterly, 31*, 331-343.

Mallett, K. A., Marzell, M., & Turrisi, R. (2011). Is reducing drinking always the answer to reducing consequences in first-year college students? *Journal of Studies on Alcohol and Drugs*, *72*(2), 240-246.

Mallett, K. A., Turrisi, R., Cleveland, M. J., Scaglione, N. M., Reavy, R., & Varvil-Weld, L. (2015). Using a unified theory of behavior to predict alcohol-related consequences in first-year college students. *Psychology of Addictive Behaviors.* Under Review/Invited Revise and Resubmit.

Mallett, K.A., Varvil-Weld, L., Turrisi, R., & Read, A. (2011). An examination of college students' willingness to experience consequences as a unique predictor of alcohol problems. *Psychology of Addictive Behaviors*, *25*, 41-47.

Mallett, K. A., Marzell, M., Scaglione, N. M., Hultgren, B., & Turrisi, R. (2014). Are all alcohol and energy drink users the same? Examining individual variation in relation to alcohol mixed with energy drink use, risky drinking and consequences. *Psychology of Addictive Behaviors, 28*(1), 97-104.

Marlatt, G. A. & Witkiewitz, K. (2002). Harm reduction approaches to alcohol use: Health promotion, prevention, and treatment. *Addictive Behaviors, 27*(6), 867-886.

Martens, M. P., Taylor, K. K., Damann, K. M., Page, J. C., Mowry, E. S., & Cimini, M. D. (2004). Protective behavioral strategies when drinking alcohol and their relationship to negative alcohol-related consequences in college students. *Psychology of Addictive Behaviors, 18*, 390−393.

Modi, M. N., Palmer, S., & Armstrong, A. (2013). The role of Violence Against Women Act in addressing intimate partner violence: A public health issue. *Journal of Women's Health*. In Press.

Moore, C. D., & Waterman, C. K. (1999). Predicting self-protection against sexual assault in dating relationships among heterosexual men and women, gay

men, lesbians, and bisexuals. *Journal of College Student Development*, *40*, 132-140.

Muraven, M., Collins, R. L., Morsheimer, E. T., Shiffman, S., & Paty, J. A. (2005). The morning after: Limit violations and the self-regulation of alcohol consumption. *Psychology of Addictive Behaviors, 19*(3), 253-262.

Muthén, L. K., & Muthén, B. O. (2010). *Mplus: Statistical analysis with latent variables: User's guide*. Muthén & Muthén: Los Angeles.

Muthén, L. K., & Muthén, L. (1998). *Mplus* [computer software]. Muthén & Muthén, Los Angeles.

Neal, D & Carey, K. (2007). Association between alcohol intoxication and alcohol-related problems: An event-level analysis. *Psychology of Addictive Behaviors, 21*(2), 194-204.

Neighbors, C., Larimer, M. E., & Lewis, M. A. (2004). Targeting misperceptions of descriptive drinking norms: Efficacy of a computer-delivered personalized normative feedback intervention. *Journal of Consulting and Clinical Psychology, 72*(3), 434-447.

NIAAA (2000). *Tenth special report to the U.S. Congress on alcohol and health.* National Institutes of Health, Washington, DC (NIH Publication No. 00-1583).

Nicholson, M. E., Maney, D. W., Blair, K., Wamboldt, P. M., Mahoney, B. S., & Yuan, J. (1998). Trends in alcohol-related campus violence: Implications for prevention. *Journal of Alcohol and Drug Education, 43*, 34-52.

Noel, N. E., Maisto, S. A., Johnson, J. D., & Jackson Jr, L. A. (2009). The effects of alcohol and cue salience on young men's acceptance of sexual aggression. *Addictive Behaviors*, *34*(4), 386-394.

Parks, K. A., & Fals- Stewart, W. (2004). The temporal relationship between college women's alcohol consumption and victimization experiences. *Alcoholism: Clinical and Experimental Research*, *28*(4), 625-629.

Parks, K. A., & Miller, B. A. (1997). Bar victimization of women. *Psychology of Women Quarterly*, *21*(4), 509-525.

Parks, K. A., & Scheidt, D. M. (2000). Male bar drinkers' perspective on female bar drinkers. *Sex Roles*, *43*(11-12), 927-941.

Parks, K. A., Romosz, A. M., Bradizza, C. M., & Hsieh, Y. P. (2008). A dangerous transition: Women's drinking and related victimization from high school to the first year at college. *Journal of Studies on Alcohol and Drugs, 69*(1), 65-74.

Parks, K. A., Hsieh, Y., Collins, L., Levonyan-Radloff, K., & King, L. P. (2009). Predictors of risky sexual behavior with new and regular partners in a sample of women bar drinkers. *Journal of Studies on Alcohol and Drugs, 70*(2), 197-205.

Patrick, M. E., & Maggs, J. L. (2009). Does drinking lead to sex? Daily alcohol-sex behaviors and expectancies among college students. *Psychology of Addictive Behaviors, 23*(3), 472-481.

Piasecki, T. M., Alley, K. J., Slutske, W. S., Wood, P. K., Sher, K. J., Shiffman, S., & Heath, A. C. (2012). Low sensitivity to alcohol: relations with hangover

occurrence and susceptibility in an ecological momentary assessment investigation. *Journal of Studies on Alcohol and Drugs*, *73*(6), 925.

Piasecki, T. M., Cooper, M. L., Wood, P. K., Sher, K. J., Shiffman, S., & Heath, A. C. (2013). Dispositional Drinking Motives: Associations With Appraised Alcohol Effects and Alcohol Consumption in an Ecological Momentary Assessment Investigation. *Psychological Assessment.* In Press.

Piasecki, T. M., Hufford, . R., Solhan, M., & Trull, T. J. (2007). Assessing clients in their natural environments with electronic diaries: Rationale, benefits, limitations, and barriers. *Psychological Assessment, 19*(1), 25-43.

Piasecki, T. M., Jahng, S., Wood, P. K., Robertson, B. M., Epler, A. J., Cronk, N. J., ... & Sher, K. J. (2011). The subjective effects of alcohol–tobacco co-use: An ecological momentary assessment investigation. *Journal of abnormal psychology*, *120*(3), 557-571.

Quené, H., & Van den Bergh, H. (2004). On multi-level modeling of data from repeated measures designs: A tutorial. *Speech Communication*, *43*(1), 103-121.

Ray, A. E., Stapleton, J. L., Turrisi, R., & Philion, E. (2012). Patterns of drinking-related protective and risk behaviors in college student drinkers. *Addictive Behaviors, 37,* 449-455.

Ray, A. E., Turrisi, R., Abar, B., & Peters, K. E. (2009). Social-cognitive correlates of protective drinking behaviors and alcohol-related consequences in college students. *Addictive Behaviors, 34,* 911-917.

Read, J. P., Kahler, C. W., Strong, D. R., & Colder, C. R. (2006). Development and preliminary validation of the young adult alcohol consequences questionnaire. *Journal of Studies on Alcohol and Drugs*, *67*(1), 169-177.

Sas, S. A. S. (1985). User's guide: statistics. *SAS Institute Inc, Cary, NC*, 956.

Scaglione, N. M., Hultgren, B. A., Reavy, R., Mallett, K. A., Turrisi, R., … & Sell, N. (2015). A prospective examination of students' use of social protective behaviors to reduce alcohol-related sexual risk. *Psychology of Addictive Behaviors.* Under Review/Invited Revise and Resubmit.

Scaglione, N. M., Turrisi, R., Mallett, K. A., Ray, A. E., Hultgren, B., & Cleveland, M. (2014). How much does one more drink matter? Examining effects of event-level alcohol use and previous sexual victimization on sex-related consequences. *Journal of Studies on Alcohol and Drugs, 75*(2), 241-248.

Scollon, C. N., Kim-Prieto, C., & Diener, E. (2003). Experience sampling: Promises and pitfalls, strengths and weaknesses. *Journal of Happiness studies*, *4*(1), 5-34.

Senchak, M., Leonard, K. E., & Greene, B. W. (1998). Alcohol use among college students as a function of their typical social drinking context. *Psychology of Addictive Behaviors*, *12*(1), 62-70.

Shiffman, S. & Stone, A. A. (1998). Introduction to the special section: Ecological Momentary Assessment in health psychology. *Health Psychology, 17*(1), 3-5.

Shiffman, S., Stone, A. A., & Hufford, M. R. (2008). Ecological Momentary Assessment. *Annual Review of Clinical Psychology, 4*, 1-32.

Smith, S. W., LaPlante, C., Wibert, W. N., Mayer, A., Atkin, C. K., Klein, K., . . . Martell, D. (2011). Student-generated protective behaviors to avert severe harm due to high-risk alcohol consumption. *Journal of College Student Development, 52*(1), 101-114.

Smyth, J. M. & Heron, K. E. (2011). Health psychology. In M. Mehl & T. Conner (Eds.), *Handbook of Research Methods for Studying Daily Life* (pp. 569-584). New York, NY: Guilford.

Snijders, T. A. B. (2005). Power and sample size in multilevel modeling. In B. S. Everitt and D.C. Howell (Eds.), *Encyclopedia of Statistics in Behavioral Science*, *Volume 3* (1570-1573). Chicester (etc.): Wiley.

Sobell, L. C. & Sobell, M. B. (1995). Alcohol consumption measures. In J. P. Allen & M. Columbus (Eds.), *Assessing alcohol problems* (pp. 55-74). Bethesda, MD: National Institute on Alcohol Abuse and Alcoholism.

Steele, C. M., & Josephs, R. A. (1990). Alcohol myopia: Its prized and dangerous effects. *American Psychologist*, *45*(8), 921-933.

Sugarman, D. E., & Carey, K. B. (2007). The relationship between drinking control strategies and college student alcohol use. *Psychology of Addictive Behaviors*, *21*(3), 338-345.

Tabachnick, B. G., & Fidell, L. S. (2001). *Using multivariate statistics (4th ed.).* Boston, MA: Allyn and Bacon.

Taylor, S. E., Gonzaga, G. C., Klein, L. C., Hu, P., Greendale, G. A., & Seeman, T. E. (2006). Relation of oxytocin to psychological stress responses and

hypothalamic-pituitary-adrenocortical axis activity in older women. *Psychosomatic Medicine, 68,* 238-245.

Taylor, S. E., & Master, S. L. (2011). Social responses to stress: The tend-and-befriend model. In R. J. Contrada and A. Baum (Eds.). *The Handbook of Stress Science: Biology, Psychology, and Health* (101-109). New York, NY: Springer.

Testa, M. & Collins, R. L. (1997). Alcohol and risky sexual behavior: Event-based analyses among a sample of high-risk women. *Psychology of Addictive Behaviors, 11*, 190-201.

Testa, M. & Hoffman, J. H. (2012). Naturally occurring changes in women's drinking from high school to college and implications for sexual victimization. *Journal of Studies on Alcohol and Drugs, 73*(1), 26-33.

Testa, M. & Livingston, J. A. (2009). Alcohol consumption and women's vulnerability to sexual victimization: Can reducing women's drinking prevent rape? *Substance Use & Misuse, 44*, 1349-1376.

Testa, M., Hoffman, J. H., Livingston, J. A., & Turrisi, R. (2010). Preventing college women's sexual victimization through parent based intervention: A randomized controlled trial. *Prevention Science, 11,* 308-318.

Testa, M., Hoffman, J. H., & Livingston, J. A. (2010). Alcohol and sexual risk behaviors as mediators of the sexual victimization-revictimization relationship. *Journal of Consulting and Clinical Psychology, 78*(2), 249-259.

Testa, M., Livingston, J. A., & Hoffman, J. H. (2007). Does sexual victimization predict subsequent alcohol consumption? A prospective study among a community sample of women. *Addictive Behaviors, 32*(12), 2926-2939.

Testa, M., VanZile-Tamsen, C., & Livingston, J. A. (2007). Prospective prediction of women's sexual victimization by intimate and non-intimate male perpetrators. *Journal of Consulting and Clinical Psychology, 75*, 52-60.

Testa, M., VanZile-Tamsen, C., Livingston, J. A. and Koss, M. P. (2004), Assessing women's experiences of sexual aggression using the sexual experiences survey: Evidence for validity and implications for research. *Psychology of Women Quarterly, 28,* 256–265.

Thornton, B., Gibbons, F. X., & Gerrard, M. (2002). Risk and prototype perceptions: Independent processes predicting risk behavior. *Personality and Social Psychology Bulletin, 28,* 986-999.

Turchik, J. A., &Gidycz, C. A. (2012). Prediction of sexual risk behaviors in college students using the theory of planned behavior: A prospective analysis. *Journal of Social and Clinical Psychology, 31*(1), 1-27.

Turrisi, R., Jaccard, J., Taki, R., Dunnam, H., & Grimes, J. (2001). Examination of the short-term efficacy of a parent intervention to reduce college drinking tendencies. *Psychology of Addictive Behaviors, 15*(4), 366-372.

Turrisi, R., Larimer, M. E., Mallett, K. A., Kilmer, J. R., Ray, A. E., Mastroleo, N. R., …. Montoya, H. (2009). A randomized clinical trial evaluating a combined alcohol intervention for high-risk college students. *Journal of Studies on Alcohol and Drugs, 70,* 555-567.

Turrisi, R., Mallett, K. A., Cleveland, M. J., Varvil-Weld, L., Abar, C., Scaglione, N., & Hultgren, B. (2013). A longitudinal evaluation of timing and dosage of a parent based intervention to minimize college students' alcohol consumption. *Journal of Studies on Alcohol and Drugs, 74,* 30-40.

Turrisi, R., Mallett, K. A., Mastroleo, N. R., & Larimer, M. E. (2006). Heavy drinking in college students: Who is at risk and what is being done about it? *Journal of General Psychology, 133*(4), 401-420.

Ullman, S. E. (2003). A critical review of field studies on the link of alcohol and adult sexual assault in women. *Aggression & Violent Behavior, 8,* 471-486.

Ullman, S. E., & Brecklin, L. R. (2003). Sexual assault history and health related outcomes in a national sample of women. *Psychology of Women Quarterly, 27*, 46-57.

Ullman, S. E., Karabatsos, G., & Koss, M. P. (1999). Alcohol and sexual assault in a national sample of college women. *Journal of Interpersonal Violence*, *14*(6), 603-625.

Vicary, J. R. & Karshin, C. M. (2002). College alcohol abuse: A review of the problems, issues, and prevention approaches. *The Journal of Primary Prevention, 22*(3), 299-331.

Wechsler, H., Dowdall, G. W., Davenport, A., & Rimm, E. B. (1995). A gender-specific measure of binge drinking among college students. *American Journal of Public Health, 85,* 982-985.

Wechsler, H., Lee, J. E., Kuo, M., Seibring, M., Nelson, T. F., & Lee, H. (2002). Trends in college binge drinking during a period of increased prevention efforts. *Journal of American College Health, 50,* 203−217.

Weinhardt, L. S., & Carey, M. P. (2000). Does alcohol lead to sexual risk behavior? Findings from event-level research. *Annual Review of Sex Research*, *11*(1), 125-157.

Werch, C. E., & Gorman, D. R. (1986). Factor analysis of internal and external self-control practices for alcohol consumption. *Psychological Reports*, *59*(3), 1207-1213.

Wilson, D. R. (2010). Health consequences of childhood sexual abuse. P*erspectives in Psychiatric Care*, *46*(1), 56-64.

Young, A., Grey, M., Abbey, A., Boyd, C. J., & McCabe, S. E. (2008). Alcohol-related sexual assault victimization among adolescents: prevalence, characteristics, and correlates. *Journal of Studies on Alcohol and Drugs*, *69*(1), 39-48.

APPENDIX A

Project IDEAS Pilot Study Methods & Recommendations

Project IDEAS Pilot Study

Participants. In Fall 2013, 24 first-year women from Penn State University completed the Project IDEAS pilot study. At baseline, participants were 18.17 (*SD* = .38) years old, and identified as Caucasian (70.8%) and heterosexual (91.7%). Most students were drinkers (87.5%; n = 21), reporting an average of 7.46 (*SD* = 7.37) drinks per week. Approximately two-thirds of drinkers had at least one heavy drinking episode (four or more drinks in a single occasion; Wechsler et al., 1995) in the month prior to the study. Furthermore, 45.2% and 32.3% reported a history of sexual consequences or victimization, respectively. Though the sample was small, it reflected the demographics typical of the larger Penn State population.

Recruitment Procedures & Retention. To achieve the sample described above, 120 women were randomly selected from the university registrar's database of first-year students. Selected students were emailed a description of the study with the URL and a PIN to access the survey. Upon logging in to the survey, participants were directed to the informed consent and subsequent baseline survey. The initial response rate was 27.5% (n = 33). Following baseline, participants were contacted by phone up to three times (and sent up to two emails) to schedule an in-person EMA training session. Of the 33 women who completed baseline, 24 (72%) successfully scheduled and attended training. All 24 of the EMA trainees were retained across the 12-day EMA protocol and at the follow-up assessment (2 months post-baseline; 1 month post-EMA). The follow-up mirrored the web-based survey procedures used at baseline. All assessments were designed to take place across the first semester of college, which has been identified as the highest risk period for

AViC. EMA spanned 12 days (two weekends and the week in between) to keep participant burden as low as possible, while also maximizing the amount of potential drinking days. Participants who completed all four components of the study (baseline, training, EMA, follow-up) were compensated $60, with the potential to earn a $10 bonus ($70 total) if they achieved 80% EMA compliance.

Baseline & Follow-Up Data Collection Procedures. The baseline survey, administered in September, took approximately 35 minutes to complete. It assessed participant demographics, drinking behaviors, protective behavior use, exposure to contextual risk factors, alcohol-related sexual consequences, and sexual victimization. All measures asked participants to report on behaviors they've engaged in since coming to school (i.e., in the month prior to the study). The follow-up survey, administered in December, took 10-15 minutes to complete and focused on behavioral outcomes (e.g., consequences and victimization) that occurred since beginning the study in September. Participants were also asked several questions to evaluate their experience as participants in the EMA study.

EMA Training & Data Collection Procedures. EMA training included an in-depth overview of study protocol (e.g., survey timing) and smart phone technology. Participants were instructed to respond to web-based surveys on their smartphones any time they received a text message signaling them to do so (i.e., signal-contingent assessments), and to self-initiate surveys at the beginning and end of each drinking event (i.e., event-contingent assessments). A "drinking event" included any social event where alcohol was present, and participants were instructed to

initiate a new drinking event log each time they changed drinking environments (e.g., tailgate, pre-party, social, party, late night) or peer groups.

During EMA, participants were texted at 9am daily to complete a waking recall assessment of their drinking, DPB, SPB, CRF, and AViC experiences from the night before. Signals were also sent randomly between the hours of 11am-1pm, 3-5pm, and 8-10pm to assess momentary intentions and willingness to drink, use DPB and SPB, and engage in CRF later that day. Non-responders received a reminder text one hour after the initial signal, and the waking recall survey was available until noon daily, while all other signal-contingent surveys closed after two hours. On days when participants drank, they also completed event-specific drinking logs (assessing in-the-moment drinking, DBP and SPB use, and CRF), which were available all day within a text message sent each morning at 8am.

Compliance rates varied across day and assessment type. One participant lost her phone on the second day of the study and has been removed from all subsequent compliance rates. On average, the 23 remaining participants completed 10 out of 12 (84.8%) waking recall assessments and 30 out of 36 (84.5%) momentary surveys, resulting in a total of 940 signal-contingent data points with very little missing data. In addition, the waking recall assessments captured 43 drinking events, suggesting participants should have completed at least 86 drinking logs if they reported at the beginning and end of each event. However, low drinking log compliance was observed, as only 13 participants completed a total of 51 drinking logs across the 12-day assessment. Survey response rates were also lower on holidays (e.g., Halloween) and weekend mornings.

Summary of Changes Made in Response to Pilot Findings:

1. The initial response rate of 27.5% was quite low relative to other web-based surveys using similar methods (e.g., Larimer et al., 2007). Review of "partial" baseline completions revealed low participation was due, in part, to having long recruitment and consent documents. Also, unlike previous work in the PRO Health Lab, this study did not use a pre-notification letter. By mailing pre-notification letters and shortening recruitment documents, response rates are expected to approach 50%.
2. Having more than 25% attrition from baseline to EMA training was surprising, though attributed to two factors: study timing and difficulty reaching students by phone. Participant phone calls and EMA training sessions overlapped with mid-term exams. The full study timeline was scheduled to avoid that two-week period within the semester. The scheduling protocol was also automated to allow participants to sign up for their training session at the end of the baseline survey.
3. The low compliance rates on the event-contingent drinking logs suggest data were not missing at random, which introduces potential bias. Follow-up process evaluation data and in-person participant interviews identified several reasons for non-compliance. First, several students indicated problems with Wi-Fi and cellular signal loss at tailgates and parties, which prevented them from completing surveys during these events. These problems seemed to occur less frequently among participants with 4G smart phones, thus, 4G access (or better) was added as an eligibility criterion for participants

entering the current study. Second, participants indicated frequently forgetting to fill out the drinking logs due to a lack of signal reminding them to do so. In response, the drinking logs were made more easily available (via an app icon on their smartphone home screens), and participants received 10pm reminders to initiate drinking logs on Thursday, Friday, and Saturday nights. Finally, within each drinking log, participants were reminded to continue filling out their logs throughout the night.

4. In exploring lower weekend response rates, participants indicated they simply did not wake up in time to complete the surveys. As such, the waking recall assessment remained open longer, with an additional reminder before it closed. Extending this assessment period would have overlapped with the first random momentary assessment, so in the current study, the first momentary assessment of intentions and willingness occurred at the end of the waking recall and the remaining momentary assessments were reduced to two daily (afternoon and evening). In addition, the assessment period was extended to 14 days to allow additional lead in time for participants to habituate to the signal schedule and response procedures prior to potential drinking days.
5. Finally, since the pilot study demonstrated both drinkers and non-drinkers complied with EMA protocol, and the study's main outcome was alcohol-based, the current study required participants to endorse at least moderate drinking behavior to be eligible for the study. Baseline drinking rates from the

pilot were used to inform expected eligibility and retention rates in the current study.

Taken together, these methodological modifications should improve initial response, retention, and compliance rates across the current study.

APPENDIX B

Study Measures by Aim and Assessment

AIM 1

BASELINE MEASURES

Screening Items

Do you use a smartphone as your primary cell phone?

1	0	2
Yes	No, my cell phone is not a smartphone	I do not have a cell phone

Does your smartphone operate on a 4G network?

1	0	2
Yes	No	I'm not sure

Age of Drinking Onset

At what age did you first try alcohol (more than a few sips)?

0	1	2	3	4	5	6	7	8	9
I have never tried alcohol	10 or under	11	12	13	14	15	16	17	18

Peak Drinking

Think of the occasion when you drank the most **in the past month**. How much did you drink? (Enter '0' if you have not drank in the past month) _____ drink(s)

Think of the occasion you drank the most **in the past month**. How many HOURS did you spend drinking on this occasion? (Enter '0' if you have not consumed alcohol in the past month) _____ hour(s)

Binge Drinking

Think back over the last month. How many times did you have 4 or more drinks in a row within 2 hours?

0	1	2	3	4	5
Never	1 to 2 times	3 to 4 times	5 to 6 times	7 to 8 times	9 or more times

Aim 1 Predictors

Typical Weekly Drinking

Consider a typical week **during the LAST MONTH.** How much alcohol, on average (measured in number of drinks), do you drink on each day of a typical week?

1. On a typical **MONDAY**, I have… _____ drink(s)
2. On a typical **TUESDAY**, I have … _____ drink(s)
3. On a typical **WEDNESDAY**, I have… _____ drink(s)
4. On a typical **THURSDAY**, I have… _____ drink(s)
5. On a typical **FRIDAY**, I have… _____ drink(s)
6. On a typical **SATURDAY**, I have… _____ drink(s)
7. On a typical **SUNDAY**, I have… _____ drink(s)

******The question stem and response options below apply to all of the following items.

In the year prior to college, how many times did you _____?

0	1	2	3	4	5	6	7	8
Never in the past year	1 time	2 times	3 times	4-6 times	7-11 times	12-20 times	21-39 times	40+ times

Drinking Protective Behaviors

The following questions ask about how frequently you use protective behaviors in order to limit or pace how much you drink.

1. Determine in advance not to exceed a set number of drinks
2. Alternate between alcoholic and nonalcoholic drinks
3. Stop drinking at a predetermined time
4. Avoid mixing different types of alcohol (e.g., shots and beer)
5. Avoid trying to “keep up with” or “out-drink” others
6. Know where your drink was at all times

Social Protective Behaviors

These questions ask about behaviors you might engage in to keep yourself safe in social situations where you, or others around you, may be drinking.
Note: You do not have to be the one drinking in order to use these behaviors.

1. Have a trusted friend(s) be with you or walk home with you
2. Let a friend or family member know where you were and whom you were with
3. Communicate your sexual intentions clearly to potential dating or sexual partners
4. Try not to be alone with someone you just met/didn’t know well

5. Talk to people who knew your potential dating or sexual partner to find out what he/she was like
6. Pay attention to your potential dating or sexual partner's alcohol/drug intake
7. Provide for your own transportation so you did not have to depend on someone else

Contextual Risk Factors

This next section asks about your typical surroundings and interactions while drinking.

1. Drink at a party
2. Drink in your dorm or home
3. Drink at a sporting event (or tailgate)
4. Drink at a bar or other public place
5. Drink with your friends
6. Drink with your romantic partner (if you have one)
7. Drink with a person you were interested in hooking up with
8. Drink with someone you just met/an acquaintance
9. Drink with family members
10. Have sexual intercourse after drinking

Alcohol-Related Sexual Consequences

Below is a list of sexual experiences that college students sometimes have after drinking.

1. Get into sexual situations which you later regretted because you had been drinking
2. Wake up in the morning after a good bit of drinking and find that you could not remember a part of the evening before
3. Neglect to use birth control or neglect to protect yourself from sexually transmitted infections because you had been drinking
4. Have sex when you didn't really want to because you had been drinking
5. Have sex with someone you wouldn't ordinarily have sex with because you had been drinking
6. Do something sexual that you normally wouldn't do because you had been drinking
7. Feel forced to have sex because you were too drunk to prevent it

Unwanted Sexual Advances

******The response options and question stems (1-4) below apply to all of the following items (a-f).

0	1	2	3
0 times	1 time	2 times	3+ times

1. Think back over the past year. **In the year prior to beginning college**, how many times has someone overwhelmed you with **arguments or continual pressure** in order to _____?
2. **In the year prior to beginning college**, how many times has someone **threatened** you in order to _____?
3. **In the year prior to beginning college**, how many times has someone **used physical force** in order to order to _____?
4. **In the year prior to beginning college**, when you were drinking, how many times did someone _____?
   a. Fondle, kiss, or touch you sexually when you indicated that you didn't want to
   b. Try to have sexual intercourse with you (but it did not happen) when you indicated that you didn't want to
   c. Succeed in making you have sexual intercourse when you indicated you didn't want to
   d. Make you do oral sex or have it done to you when you indicated that you didn't want to
   e. Make you have anal sex when you indicated that you didn't want to
   f. Penetrate you with a finger or objects when you indicated that you didn't want to

Unwanted Sexual Advances History

Did you have any of these experiences **between the ages of 14 and 18** (i.e., when you were in high school)?

1	0
Yes	No

Did you have any of these experiences prior to **the age of 14**?

1	0
Yes	No

Selected Demographics

Age: _____ years old

Height: _____Ft. _____In.

Weight: _____ pounds

Birth Sex:

1	2
Male	Female

Racial Background (Select one):

0	1	2	3	4	5	6
Caucasian/White	Asian	Black or African American	Native Hawaiian or other Pacific Islander	American Indian or Alaska Native	Multiracial	Other (please specify: _____)

Sexual Orientation:

0	1	2	3	4
Straight	Gay/Lesbian	Bisexual	Other	I prefer not to answer

Are you currently in a relationship?

1	0
Yes	No

How would you define your relationship status?

0	1	2	3	4	5	6
Single	Hooking up	Casually dating one person	Casually dating more than one person	In a committed relationship	Engaged	Married

When attending school this fall, where will/do you live?

0	1	2	3	4	5	6
On-campus residence hall	On-campus apartment	Off-campus apartment	Off campus house with friends	In fraternity/sorority housing	At home with my parents	Other (please specify: _____)

Sexual History

Have you ever had sexual intercourse?

1	0
Yes	No

How old were you the first time you had sexual intercourse?

0	1	2	3	4	5	6	7
I have never had sexual intercourse	Age 13 or younger	14	15	16	17	18	19

With how many partners have you had sexual intercourse in your life?

0	1	2	3	4	5	6	7	8
0	1	2	3	4	5	6-10	11-19	20 or more

With how many partners have you had sexual intercourse in the past year?

0	1	2	3	4	5	6	7	8
0	1	2	3	4	5	6-10	11-19	20 or more

Birth Control and Sexual Protection

Are you currently taking birth control pills for any reason?

1	0
Yes	No

FOLLOW-UP MEASURES

Aim 1 Outcome Measures

Alcohol-Related Sexual Consequences

Below is a list of sexual experiences college students sometimes have after drinking.

Since coming to school in August, how many times did you _____?

0	1	2	3	4	5	6	7	8
Never	1 time	2 times	3 times	4-6 times	7-11 times	12-20 times	21-39 times	40+ times

1. Get into sexual situations which you later regretted because you had been drinking
2. Wake up in the morning after a good bit of drinking and find that you could not remember a part of the evening before
3. Neglect to use birth control or neglect to protect yourself from sexually transmitted infections because you had been drinking
4. Have sex when you didn't really want to because you had been drinking
5. Have sex with someone you wouldn't ordinarily have sex with because you had been drinking
6. Do something sexual that you normally wouldn't do because you had been drinking
7. Feel forced to have sex because you were too drunk to prevent it

Unwanted Sexual Advances

Think back over the current semester. **Since coming to school in August**, when you were drinking, how many times did someone _____?

0	1	2	3
0 times	1 time	2 times	3+ times

1. Fondle, kiss, or touch you sexually when you indicated that you didn't want to
2. Try to have sexual intercourse with you (but it did not happen) when you indicated that you didn't want to
3. Succeed in making you have sexual intercourse when you indicated you didn't want to
4. Make you do oral sex or have it done to you when you indicated that you didn't want to
5. Make you have anal sex when you indicated that you didn't want to
6. Penetrate you with a finger or objects when you indicated that you didn't want to

AIM 2

MORNING RECALL

Affect

First, please tell us how you are feeling **right now**.

1	2	3	4	5	6	7
Not at all						A great deal

1. Happy
2. Energetic
3. Confident
4. Relaxed
5. Excited
6. Lonely
7. Sad
8. Irritable
9. Angry
10. Anxious

Alcohol Use

Now, please think about what you did **yesterday/last night**…

Did you consume any alcohol yesterday?

1	2
No	Yes

How many drinks did you have?

1	2	3	4	5	6	7	8	9	10	11
1	2	3	4	5	6	7	8	9	10	11+

How intoxicated would you say you were?

1	2	3	4	5	6	7
Completely Sober						Extremely drunk

Do you currently feel hungover?

1	2	3	4	5	6	7
Not at all						A great deal

How many hours did you spend drinking yesterday?

1	2	3	4	5	6	7	8	9	10	11
<1	1	2	3	4	5	6	7	8	9	10+

How many drinking events occurred during that time?

1	2	3	4
1	2	3	4+

Protective Behaviors

Yesterday, when you were around alcohol, did you do any of the following?

1	2
No	Yes

Drinking Protective Behaviors

1. Determined in advance not to exceed a set number of drinks
2. Alternated between alcoholic and nonalcoholic drinks
3. Planned to stop drinking at a predetermined time
4. Avoided mixing different types of alcohol (e.g., shots and beer)
5. Avoided trying to “keep up with” or “out-drink” others
6. Knew where my drink was at all times

Social Protective Behaviors

1. Planned to have a trusted friend walk home with me
2. Let a friend or family member know where I was
3. Talked to people who knew my potential hook-up/sexual partner to find out what he/she is like
4. Provided my own birth control/protection from STIs so I didn’t have to depend on my partner
5. Met others in a public place instead of a private place

Contextual Risk Factors

How many people (aside from you) were in the group that you hung out with when you were drinking?

1	2	3	4	5
I was alone	1-2	3-4	5-7	8+

How many of those individuals were male?

1	2	3	4	5
None	1-2	3-4	5-7	8+

How many of those individuals were female?

1	2	3	4	5
None	1-2	3-4	5-7	8+

On average, how intoxicated would you say they were? (**Repeated for both males and females)

1	2	3	4	5	6	7
Completely sober						Extremely drunk

Sexual Experiences

Sexual Activity

Did you "hook up" or engage in any sexual activity yesterday/last night?

1	2
No	Yes

Prior to engaging in sexual activity, did you communicate your sexual boundaries?

1	2
No	Yes

Unwanted Sexual Advances

At any point yesterday, if you indicated you didn't want to, did anyone _____?

1	2
No	Yes

1. Fondle, kiss or touch you sexually
2. Try to have sexual intercourse with you (but it did not happen)
3. Succeed in making you have sexual intercourse
4. Make you do oral sex or have it done to you
5. Make you have anal sex
6. Penetrate you with a finger or objects

Alcohol-Related Sexual Consequences

Did you have any of the following experiences during or after drinking yesterday?

1	2
No	Yes

1. I got into a sexual situation which I now regret
2. I neglected/forgot to use birth control/protect myself from sexually transmitted infections
3. I had sex when I didn't really want to
4. I did something sexual that I normally wouldn't do
5. I was forced to have sex because I was too drunk to prevent it

MOMENTARY ASSESSMENT

Affect

First, please tell us how you are feeling **right now!**

1	2	3	4	5	6	7
Not at all						A great deal

1. Happy
2. Energetic
3. Confident
4. Relaxed
5. Excited
6. Lonely
7. Sad
8. Irritable
9. Angry
10. Anxious

Behavior-Specific Willingness

Alcohol Use Willingness

Should the opportunity arise, how **willing** are you to drink today/tonight?

1	2	3	4	5
Not at all willing				Completely willing

How many drinks are you **willing** to have?

1	2	3	4	5	6	7	8	9	10	11
1	2	3	4	5	6	7	8	9	10	11+

If I go out and/or drink today/tonight, I would be **willing** to _____.

1	2
No	Yes

Drinking Protective Behavior Use Willingness

1. Determine in advance not to exceed a set number of drinks
2. Alternate between alcoholic and nonalcoholic drinks
3. Stop drinking at a predetermined time
4. Avoid mixing different types of alcohol (e.g., shots and beer)
5. Avoid trying to “keep up with” or “out-drink” others
6. Try to know where my drink is at all times

Social Protective Behavior Use Willingness

1. Have a trusted friend walk home with me
2. Let a friend or family member know where I am
3. Talk to people who know my potential partner to find out what he or she is like
4. Provide my own birth control/protection from STIs so I don’t have to depend on my partner
5. Meet others in a public place instead of a private place

Contextual Risk Factors Willingness

If you were to go out and/or drink today/tonight, where would you be **willing** to go?

1	2
No	Yes

1. Small house/apartment party
2. Large house/fraternity party
3. My dorm or home
4. Someone else’s dorm/home
5. Bar/club or other public place
6. Sporting event (or tailgate)
7. Other (Please specify: _____)

With whom would you be **willing** to drink?

1	2
No	Yes

1. Alone
2. Parent(s)/sibling(s)
3. Roommate(s)
4. Friend(s)
5. Classmate(s)
6. Friend(s) of a friend/acquaintance
7. Sorority sister(s)
8. Boyfriend/girlfriend
9. Someone else (Please describe: _____)

Are you **willing** to "hook up" or engage in any sexual activity today/tonight?

1	2
No	Yes

With whom would you be **willing** to "hook up"?

1	2
No	Yes

1. My romantic partner/significant other
2. A regular "hook up" partner
3. A friend
4. Someone I just met or don't know very well

Behavior-Specific Intentions

Alcohol Use Intentions

Do you have plans/**intend** to drink later?

1	2
No	Yes

How many drinks you **intend** to have?

1	2	3	4	5	6	7	8	9	10	11
1	2	3	4	5	6	7	8	9	10	11+

If I go out and/or drink today/tonight, I **intend** to _____.

1	2
No	Yes

Drinking Protective Behavior Use Intentions

1. Determine in advance not to exceed a set number of drinks
2. Alternate between alcoholic and nonalcoholic drinks
3. Stop drinking at a predetermined time
4. Avoid mixing different types of alcohol (e.g., shots and beer)
5. Avoid trying to “keep up with” or “out-drink” others
6. Try to know where my drink is at all times

Social Protective Behavior Use Intentions

1. Have a trusted friend walk home with me
2. Let a friend or family member know where I am
3. Talk to people who know my potential partner to find out what he or she is like
4. Provide my own birth control/protection from STIs so I don’t have to depend on my partner
5. Meet others in a public place instead of a private place

Contextual Risk Factors Intentions

If you were to go out and/or drink today/tonight, where would do you **intend** to go?

1	2
No	Yes

1. Small house/apartment party
2. Large house/fraternity party
3. My dorm or home
4. Someone else’s dorm/home
5. Bar/club or other public place
6. Sporting even (or tailgate)
7. Other (Please specify: _____)

With whom do you **intend** to drink today/tonight?

1	2
No	Yes

1. Alone
2. Parent(s)/sibling(s)
3. Roommate(s)
4. Friend(s)
5. Classmate(s)
6. Friend(s) of a friend/acquaintance
7. Sorority sister(s)
8. Boyfriend/girlfriend
9. Someone else (Please describe: _____)

Do you **intend** to “hook up” or engage in any sexual activity today/tonight?

1	2
No	Yes

With whom do you **intend** to “hook up”?

1. My romantic partner/significant other
2. A regular “hook up” partner
3. A friend
4. Someone I just met or don’t know very well

APPENDIX C

Table of Aim 1 Outcome Frequencies and Interaction Analyses

Aim 1 Percentage (n) of Participants Who Endorsed Each ASV and ASC Total at Baseline and Follow Up

	Baseline (n = 236)		**Follow Up (n = 137)**	
Total Number of Items Endorsed	**ASV** (M = 1.11; SD = 2.29) Range: 0-12	**ASC** (M = 3.14; SD = 5.23) Range: 0-30	**ASV** (M = 0.82; SD = 1.78) Range: 0-12	**ASC** (M = 2.98; SD = 4.32) Range: 0-18
0	68.6 (162)	46.6 (110)	71.5 (98)	45.3 (62)
1	9.3 (22)	8.9 (21)	10.2 (14)	8.7 (12)
2	6.4 (15)	7.2 (17)	5.8 (8)	8.0 (11)
3	4.2 (10)	6.8 (16)	3.6 (5)	6.6 (9)
4	2.5 (6)	6.4 (15)	3.6 (5)	7.3 (10)
5	1.7 (4)	4.7 (11)	1.5 (2)	2.9 (4)
6	2.5 (6)	6.4 (15)	2.2 (3)	5.1 (7)
7	0.8 (2)	1.3 (3)	0.7 (1)	5.8 (8)
8	0.8 (2)	1.3 (3)	0	1.5 (2)
9	1.3 (3)	1.7 (4)	0	1.5 (2)
10	0.8 (2)	1.7 (4)	0	1.5 (2)
11	0.4 (1)	0.4 (1)	0	0.7 (1)
12	0.4 (1)	1.7 (4)	0.7 (1)	0.7 (1)
13		0.4 (1)		1.5 (2)
14		0.4 (1)		0.7 (1)
15		0		0.7 (1)
16		0.8 (2)		0
17		0		0
18		0		1.5 (2)
19		0.4 (1)		
20		0		
21		0.4 (1)		
22		0.4 (1)		
23		0		
24		0.4 (1)		
25		0		
26		0.8 (2)		
27		0.4 (1)		
28		0		
29		0		
30		0.4 (1)		

Note. ASV = Alcohol-related sexual victimization as measured by the Incapacitated Rape items in the revised SES; ASC = Alcohol-related sexual consequences as measured by the YAAPST.

Aim 1 Endorsement of Individual ASV and ASC Items

	Baseline (n = 236)		**Follow Up (n = 137)**	
Alcohol-Related Item	% ASV Endorsed	% ASC Endorsed	% ASV Endorsed	% ASC Endorsed
Unwanted Contact	25.8	N/A	21.9	N/A
Attempted Rape	21.2		17.5	
Rape (Vaginal)	6.8		5.8	
Rape (Oral)	5.9		4.4	
Rape (Anal)	1.7		1.5	
Rape (Finger/Object)	7.6		6.6	
Regretted Sex	N/A	42.2	N/A	42.8
Unprotected Sex		15.6		20.3
Unwanted Sex		18.6		22.5
Unplanned Sex (Person)		21.1		26.8
Unplanned Sex (Activity)		38.4		39.1
Forced Sex		14.3		13.0

Note. ASV = Alcohol-related sexual victimization as measured by the Incapacitated Rape items in the revised SES; ASC = Alcohol-related sexual consequences as measured by the YAAPST.

Aim 1 Interaction Analyses

			Alc.-Related Sexual Victimization			
Drinking Context	**Predictor**	**Effect**	**B (SE)**	**P**	**CI**	**R^2**
Party	Typical Drinking	ME: DDQ	.084 (.041)	**.044**	**.009; .165**	.046*
		ME: Party	-.041 (.057)	.485	-.155; .066	
		DDQ X Party	-.038 (.015)	**.016**	**-.069; -.010**	.102*
	Alcohol PBs	ME: APB	-.013 (.013)	.337	-.042; .009	.007
		ME: Party	.046 (.064)	.479	-.067; .186	
		APB Use X Party	-.007 (.004)	*.062*	*-.015; .001*	.030
	Social PBs	ME: SPB	-.011 (.011)	.339	-.034; .009	.008
		ME: Party	.050 (.062)	.414	-.069; .177	
		SPB Use X Party	-.004 (.003)	.176	-.011; .003	.021
Dorm	Typical Drinking	ME: DDQ	.078 (.035)	**.031**	**.012; .149**	.043*
		ME: Dorm	-.019 (.048)	.688	-0.112; .078	
		DDQ X Dorm	.003 (.011)	.790	-.020; .024	.044
	Alcohol PBs	ME: APB	-.009 (.010)	.353	-.033; .010	.005
		ME: Dorm	.025 (.047)	.579	-.061; .121	
		APB Use X Dorm	-.001 (.004)	.800	-.009; .006	.005
	Social PBs	ME: SPB	-.007 (.008)	.401	-.025; .008	.005
		ME: Dorm	.024 (.046)	.615	-.070; .114	
		SPB Use X Dorm	.001 (.003)	.678	-.005; .008	.006
Bar	Typical Drinking	ME: DDQ	.072 (.036)	**.035**	**.009; .145**	.045*
		ME: Bar	.038 (.065)	.552	-.081; .172	
		DDQ X Bar	.001 (.015)	.948	-.030; .030	.045
	Alcohol PBs	ME: APB	-.012 (.011)	.267	-.035; .009	.017
		ME: Bar	.087 (.066)	.188	-.033; .234	
		APB Use X Bar	-.010 (.006)	*.081*	*-.022; 3.375E-005*	.044*
	Social PBs	ME: SPB	-.009 (.009)	.320	-.027; .007	.016
		ME: Bar	.082 (.066)	.195	-.035; .227	
		SPB Use X Bar	-.001 (.004)	.713	-.013; .006	.017

			Alc.-Related Sexual Victimization			
Drinking Context	**Predictor**	**Effect**	**B (SE)**	**P**	**CI**	**R^2**
Tailgate	Typical Drinking	ME: DDQ	.081 (.038)	**.039**	**.006; .157**	.045
		ME: Tailgate	-.033 (.058)	.594	-.144; .089	
		DDQ X Tailgate	-.032 (.016)	**.046**	**-.064; -.001**	.075*
	Alcohol PBs	ME: APB	-.010 (.011)	.359	-.033; .010	.005
		ME: Tailgate	.031 (.053)	.544	-.069; .144	
		APB Use X Tailgate	-.008 (.004)	*.077*	*-.018; .000*	.023
	Social PBs	ME: SPB	-.008 (.009)	.369	-.027; .009	.005
		ME: Tailgate	.033 (.054)	.565	-.069; .142	
		SPB Use X Tailgate	-.005 (.004)	.150	-.013; .002	.019
With Friends	Typical Drinking	ME: DDQ	.085 (.039)	**.033**	**.012; .163**	.050*
		ME: Friends	-.057 (.060)	.351	-.179; .052	
		DDQ X Friends	-.044 (.016)	**.010**	**-.076; -.015**	.117*
	Alcohol PBs	ME: APB	-.009 (.013)	.510	-.037; .015	.004
		ME: Friends	.014 (.075)	.863	-.129; .159	
		APB Use X Friends	-.007 (.004)	.135	-.015; .002	.019
	Social PBs	ME: SPB	-.007 (.011)	.488	-.030; .013	.004
		ME: Friends	.014 (.067)	.828	-.117; .154	
		SPB Use X Friends	-.003 (.003)	.320	-.010; .003	.011
With Significant Other/ Romantic Partner	Typical Drinking	ME: DDQ	.088 (.035)	**.016**	**.021; .163**	.092*
		ME: Partner	-.133 (.046)	**.006**	**-.221; -.041**	
		DDQ X Partner	-.036 (.013)	**.004**	**-.063; -.012**	.150*
	Alcohol PBs	ME: APB	.006 (.011)	.604	-.014; .027	.038
		ME: Partner	-.126 (.049)	**.011**	**-.230; -.029**	
		APB Use X Partner	-.003 (.004)	.356	-.011; .004	.042
	Social PBs	ME: SPB	.006 (.009)	.522	-.013; .025	.039
		ME: Partner	-.132 (.051)	**.015**	**-.243; -.037**	
		SPB Use X Partner	.000 (.003)	.896	-.005; .005	.039

Drinking Context	Predictor	Effect	Alc.-Related Sexual Victimization			
			B (SE)	P	CI	R^2
With a Hookup Buddy	Typical Drinking	ME: DDQ	.083 (.039)	**.036**	**.013; .162**	.049*
		ME: Hookup	-.055 (.061)	.391	-.175; .062	
		DDQ X Hookup	-.039 (.016)	**.017**	**-.068; -.007**	.110*
	Alcohol PBs	ME: APB	-.007 (.010)	.424	-.026; .013	.004
		ME: Hookup	.002 (.053)	.968	-.105; .096	
		APB Use X Hookup	-.002 (.004)	.615	-.009; .006	.005
	Social PBs	ME: SPB	-.006 (.009)	.498	-.024; .014	.004
		ME: Hookup	.006 (.058)	.929	-.111; .114	
		SPB Use X Hookup	-.002 (.003)	.442	-.009; .004	.007
With an Acquaintance (Someone you Just Met)	Typical Drinking	ME: DDQ	.074 (.036)	**.046**	**.006; .143**	.042*
		ME: Acquaintance	.009 (.056)	.876	-.099; .115	
		DDQ X Acquaintance	-.018 (.012)	.134	-.044; .003	.053
	Alcohol PBs	ME: APB	-.015 (.012)	.207	-.040; .008	.016
		ME: Acquaintance	.085 (.062)	.164	-.031; .209	
		APB Use X Acquaintance	-.007 (.005)	.126	-.017; .002	.033
	Social PBs	ME: SPB	-.013 (.011)	.251	-.036; .008	.018
		ME: Acquaintance	.091 (.065)	.162	-.037; .225	
		SPB Use X Acquaintance	-.006 (.004)	.140	-.014; .002	.036
With Family	Typical Drinking	ME: DDQ	.079 (.036)	**.029**	**.012; .152**	.045*
		ME: Family	-.039 (.054)	.469	-.151; .064	
		DDQ X Family	-.016 (.015)	.254	-.049; .005	.053
	Alcohol PBs	ME: APB	-.008 (.012)	.478	-.032; .014	.004
		ME: Family	.011 (.064)	.855	-.113, .134	
		APB Use X Family	-.012 (.000)	**.010**	**-.021; -.003**	.044*
	Social PBs	ME: SPB	-.006 (.009)	.471	-.026; .011	.004
		ME: Family	.007 (.058)	.908	-.110; .115	
		SPB Use X Family	-.006 (.004)	.150	-.014; .001	.019

			Alc.-Related Sexual Victimization			
Drinking Context	**Predictor**	**Effect**	**B (SE)**	**P**	**CI**	**R^2**
Sex after Drinking	Typical Drinking	ME: DDQ	.080 (.035)	**.025**	**.014; .155**	.055*
		ME: Sex	-.086 (.051)	.092	-.188; .015	
		DDQ X Sex	-.036 (.018)	**.043**	**-.074; -.004**	.090*
	Alcohol PBs	ME: APB	-.004 (.010)	.740	-.023; .016	.008
		ME: Sex	-.057 (.048)	.231	-.151; .038	
		APB Use X Sex	-.008 (.005)	*.074*	*-.020; .000*	.021*
	Social PBs	ME: SPB	-.003 (.009)	.739	-.021; .013	.008
		ME: Sex	.062 (.154)	.679	-.229; .394	
		SPB Use X Sex	-.003 (.004)	.365	-.011; .004	.012

Curriculum Vitae
NICHOLE M. SCAGLIONE

Education

2015	Ph.D.	Biobehavioral Health, The Pennsylvania State University
2008	M.S.	Exercise and Health Studies (Health Promotion), Miami University
2006	B.A.	Psychology (with Honors), Miami University

Professional Experience

2010 – 2015	Project Coordinator & Graduate Research Assistant, PRO Health Lab, Pennsylvania State University
2008 – 2010	Director of Campus Wellness Services, Division of Student Life, Department of Health & Counseling Services, Winthrop University
2007 – 2008	Program Evaluation Consultant, *Assessing the Effectiveness of Men Against Rape and Sexual Assault (MARS)***,** Miami University
2007 – 2008	Clinical Practicum Student, Student Counseling Services, Miami University

Selected Awards

2013 – 2015	NIH National Research Service Award (NRSA)
2014	Graduate Student Scientific Achievement Award
2012 – 2015	Research Society on Alcoholism Student Merit Award
2011 – 2015	Hintz Graduate Education Enhancement Fellowship
2010	Excellence in Graduate Recruitment Award
2010	American College Health Association New Professional Award

Selected Publications

Scaglione, N. M., Turrisi, R., Mallett, K. A., Ray, A. E., Hultgren, B., & Cleveland, M. (2014). How much does one more drink matter? Examining effects of event-level alcohol use and previous sexual victimization on sex-related consequences. *Journal of Studies on Alcohol and Drugs, 75*(2), 241-248.

Scaglione, N. M., Hultgren, B. A., Reavy, R., Mallett, K. A., Turrisi, R., Cleveland, M., & Sell, N. (2015). Do students use contextual protective behaviors to reduce alcohol-related sexual risk? Examination of a dual-process decision-making model. *Psychology of Addictive Behaviors, In Press*.

Scaglione, N. M., Mallett, K. A., Turrisi, R., Reavy, R., Cleveland, M. J., & Ackerman, A. (under review). Who will experience the most alcohol problems in college? A latent class analysis of middle and high school drinking tendencies. *Alcoholism: Clinical and Experimental Research.*

Scaglione, N. M., Turrisi, R., Cleveland, M., Mallett, K. A., & Comer, C. (2013). Identifying theoretical predictors of alcohol use among non-college emerging adults. *Journal of Studies on Alcohol and Drugs, 74*(5), 765-769.