# EFFECTS OF ALCOHOL EXPECTANCIES, DRINKING BEHAVIORS, AND ECOLOGICAL CONTEXTS ON NEGATIVE ALCOHOL-RELATED CONSEQUENCES AMONG UNIVERSITY FRESHMEN

by

DAVID F. BRULE

A DISSERTATION

Presented to the Department of Counseling Psychology
and Human Services
and the Graduate School of the University of Oregon
in partial fulfillment of the requirements
for the degree of
Doctor of Philosophy

December 2016

DISSERTATION APPROVAL PAGE

Student: David F. Brule

Title: Effects of Alcohol Expectancies, Drinking Behaviors, and Ecological Contexts on Negative Alcohol-Related Consequences among University Freshmen

This dissertation has been accepted and approved in partial fulfillment of the requirements for the Doctor of Philosophy degree in the Department of Counseling Psychology and Human Services by:

| | |
|---|---|
| Dr. Benedict McWhirter | Chairperson |
| Dr. Krista Chronister | Core Member |
| Dr. Atika Khurana | Core Member |
| Dr. Kent McIntosh | Institutional Representative |

and

| | |
|---|---|
| Scott L. Pratt | Dean of the Graduate School |

Original approval signatures are on file with the University of Oregon Graduate School.

Degree awarded December 2016

DISSERTATION ABSTRACT

David F. Brule

Doctor of Philosophy

Department of Counseling Psychology and Human Services

December 2016

Title: Effects of Alcohol Expectancies, Drinking Behaviors and Ecological Contexts on Negative Alcohol-Related Consequences among University Freshmen

The purpose of this study is to assess a hypothesized model of the influences of alcohol-related expectations, drinking behaviors, and ecological contexts, on first-year college students' experience of negative, alcohol-related consequences. Growing concern about college student alcohol abuse and its critical consequences has elicited extensive research, prevention, and intervention efforts by academic institutions. Understanding the impacts and interactions of the cognitive, behavioral, and contextual influences associated with college student alcohol abuse is crucial to developing prevention and intervention efforts that effectively mitigate these issues.

This investigation analyzed data gathered through the University of Oregon's AlcoholEdu program to assess the influences and interactions of alcohol expectancies, specific drinking behaviors, and ecological contexts on the development of negative alcohol-related consequences among 3,240 first year university students. The model proposed in this study assessed the influences and interactions of students' (a) positive and negative alcohol expectancies, (b) engagement in high-risk drinking, (c) use of protective behavioral strategies, and (d) exposure to ecological risk and protective

contexts, on their experience of negative alcohol-related consequences. Implications for further research, intervention and prevention efforts are discussed.

CURRICULUM VITAE

NAME OF AUTHOR: David F. Brule

GRADUATE AND UNDERGRADUATE SCHOOLS ATTENDED:

University of Oregon, Eugene, OR
University of California, Berkeley, CA

DEGREES AWARDED:

Doctor of Philosophy, Counseling Psychology, 2016, University of Oregon
Master of Science, Counseling, Family, and Human Services, 2012, University of Oregon
Bachelor of Arts, Psychology, 2002, University of California, Berkeley

AREAS OF SPECIAL INTEREST:

College Student Alcohol Use, Career Development and Self-Efficacy

PROFESSIONAL EXPERIENCE:

Pre-doctoral Clinical Intern, Oregon State University, 2013-2014

Alcohol & Other Drug Intervention Specialist, University of Oregon Counseling Center, 2011-2012

Clinical Extern, University of Oregon Counseling Center, 2010-2011

Career Counselor, University of Oregon Career Center, 2009-2011

Instructor, University of Oregon Career Center, 2007-2010

GRANTS, AWARDS, AND HONORS:

FHS Graduate Teaching Fellowship, University of Oregon, 2014-15

FHS Graduate Teaching Fellowship, University of Oregon, 2013-14

FHS Graduate Teaching Fellowship, University of Oregon, 2012-13

UCTC Graduate Teaching Fellowship, University of Oregon, 2011-12

Career Center Graduate Teaching Fellowship, University of Oregon, 2009-11

Career Center Graduate Teaching Fellowship, University of Oregon, 2008-09

Promising Scholar Award, University of Oregon Graduate School, 2007-08

CDI Program, Graduate Teaching Fellowship, University of Oregon, 2007-08

ACKNOWLEDGMENTS

This dissertation was made possible through the contribution of many individuals who generously offered their time, knowledge, and guidance. First, I wish to express my sincere thanks to my advisor, Dr. Benedict McWhirter, for his ongoing support and guidance throughout this project. I am also grateful to Jennifer Summers, Director of Substance Abuse Prevention & Student Success in the Office of the Dean of Students, for her ongoing support with utilizing data from the AlcoholEdu program, and her insights during conceptualization and development of this study. Additionally, I am appreciative of Drs. Elizabeth Stormshak, Akihito Kamata, Krista Chronister, Atika Khurana and Kent McIntosh for serving on my dissertation committee and providing valuable feedback.

This study would not have been possible without the students of the University of Oregon who participated in the AlcoholEdu program. I am grateful to the Office of the Dean of Students and all those involved in the AlcoholEdu program for their help throughout this project. I also want to acknowledge Drs. Nathan Dieckmann and David DeGarmo for their invaluable consultation support. Finally and most importantly, I dedicate this dissertation to my wife Nicole in thanks for her unwavering love, encouragement, and support, and to my son Eli, for keeping me motivated and grounded throughout this process.

TABLE OF CONTENTS


| Chapter | Page |
|---|---|
| I. INTRODUCTION | 1 |
| Rationale | 1 |
| Student Alcohol Abuse and Negative Consequences | 5 |
| Criteria and Prevalence of Abuse Behaviors | 5 |
| Negative Alcohol-Related Consequences | 6 |
| Alcohol Expectancies | 8 |
| Positive and Negative Expectancies | 8 |
| Drinking Behaviors | 9 |
| Protective Behavioral Strategies | 9 |
| High-Risk Drinking | 10 |
| Ecological Risk and Protective Factors | 11 |
| Greek Life Affiliations | 13 |
| Intercollegiate Athletics | 14 |
| College Residence Halls | 14 |
| Volunteer/Community Service and Social Action Groups | 15 |
| Student Religious Groups | 16 |
| AlcoholEdu for College | 16 |
| Study Purpose | 18 |
| Study Hypotheses | 20 |
| Research Questions | 22 |
| II. METHODOLOGY | 24 |
| Participants | 24 |
| Procedures | 25 |

Chapter Page


Data Collection ..... 26

Measures ..... 27

Expectancies of Alcohol Use ..... 28

Protective Behaviors ..... 28

Risk Behaviors ..... 29

Negative Consequences ..... 29

Personal Characteristics ..... 29

Analytic Strategy ..... 30

III. RESULTS ..... 32

Data Screening and Missing Data ..... 32

Missing Values Analysis ..... 33

Personal Characteristics ..... 34

Exploratory Factor Analyses ..... 36

Negative Alcohol Expectancy ..... 37

Positive Alcohol Expectancies ..... 39

High-Risk Drinking ..... 39

Protective Behavioral Strategies ..... 40

Negative Alcohol-Related Consequences ..... 41

Parceling of Latent Construct Variable Items ..... 42

Latent Constructs ..... 43

Measured Variables ..... 45

Bivariate Correlations ..... 45

Direct Effects of Alcohol Expectancies ..... 47

Effect of Positive Expectancies on Negative Consequences ..... 47

Chapter Page


Effect of Negative Expectancies on Negative Consequences ..... 47

Relationships between Positive and Negative Expectancies ..... 48

Effects of Positive Expectancies on Risk and Protective Behaviors ..... 50

Effects of Negative Expectancies on Risk and Protective Behaviors ..... 51

Mediation and Indirect Effects ..... 52

Mediation of Positive Expectancies' Effect ..... 53

Mediation of Negative Expectancies' Effects ..... 54

Moderate Negative Expectancies ..... 54

Severe Negative Expectancies ..... 54

Moderating Effects of Ecological Risk and Protective Contexts ..... 57

Ecological Risk Contexts ..... 57

Greek Life Affiliation ..... 57

Intercollegiate Athletics Participation ..... 57

Residence Hall Housing ..... 58

Ecological Protective Contexts ..... 58

Volunteering/Community Service ..... 58

Political/Social Action Group Participation ..... 59

Student Religious Group Participation ..... 59

IV. DISCUSSION ..... 60

Direct Effects of Alcohol Expectancies ..... 63

Positive Expectancies ..... 63

Moderate Negative Expectancies ..... 64

Chapter Page


Severe Negative Expectancies ..... 65

Mediation of Alcohol Expectancies' Effects ..... 68

Positive Expectancies ..... 68

Moderate Negative Expectancies ..... 69

Severe Negative Expectancies ..... 71

Ecological Risk Contexts as Moderating Variables ..... 72

Ecological Risk Contexts ..... 72

Greek Life Affiliation ..... 73

Residence Hall Housing ..... 74

Ecological Protective Contexts as Moderating Variables ..... 75

Ecological Protective Contexts ..... 75

Volunteering/Community Service ..... 76

Strengths and Limitations of Study ..... 77

Strengths ..... 77

Limitations ..... 79

Implications for Practice and Research ..... 81

Practice ..... 81

Research ..... 82

Conclusion ..... 84

APPENDICES ..... 86

A. UO INSTITUTIONAL REVIEW BOARD APPROVAL ..... 86

B. MEASURES ..... 87

REFERENCES CITED ..... 97

LIST OF FIGURES

Figure Page

1. Theoretical Model of Relationships between Alcohol Expectancies, Drinking Behaviors, Ecological Factors, and Negative Alcohol-Related Consequences ..... 19

2. Model of Main Effects of Positive and Negative Alcohol Expectancies on Negative Consequences ..... 50

3. Model of Mediation Effects of High-Risk Drinking and Protective Behavioral Strategies ..... 56

LIST OF TABLES


| Table | | Page |
|---|---|---|
| 1. | Summary of Variables of Interest and AlcoholEdu Survey Subscales | 28 |
| 2. | Ecological Context Item Endorsement for Females and Males | 35 |
| 3. | Mean and Standard Deviations of Latent Constructs for Females and Males | 35 |
| 4. | Rotated Factor Loadings for the Negative Expectancies Items | 38 |
| 5. | Factor Loadings for the Positive Expectancies Items | 39 |
| 6. | Factor Loadings for the High-Risk Drinking Items | 40 |
| 7. | Factor Loadings for the Protective Behavioral Strategies Items | 41 |
| 8. | Factor Loadings for the Negative Consequences Items | 42 |
| 9. | Parceling of Latent Construct Variables | 44 |
| 10. | Means, Standard Deviations and Bivariate Correlations among Study Latent Construct Variables | 46 |
| 11. | Direct effects of Positive Expectancies, Negative Expectancies (moderate and severe), on Negative Consequences | 49 |
| 12. | High-Risk Drinking Regressed on Alcohol Expectancies, and Protective Behavioral Strategies Regressed on Alcohol Expectancies. | 51 |
| 13. | Indirect Effects from Positive Expectancies to Negative Consequences | 53 |
| 14. | Indirect Effects from Negative Expectancies (moderate and severe) to Negative Consequences | 55 |

# CHAPTER I

# INTRODUCTION

## Rationale

Alcohol misuse by college students, especially among first-year students, is an issue of intense concern at colleges and universities throughout the United States. The pervasive nature and serious negative consequences of excessive alcohol use by students have elicited extensive research, prevention, and intervention efforts by institutions and governmental agencies in the hopes of curtailing alcohol abuse behaviors (e.g., Terlecki, Larimer, & Copeland, 2010). Unfortunately, extant interventions show limited efficacy in reducing alcohol misuse and related problems (Scott-Sheldon, Carey, Kaiser, Knight, & Carey, 2016). The U.S. Surgeon General and Department of Health and Human Services [USDHHS] describe the current patterns of heavy episodic drinking by college students as a "major national health problem (USDHHS, 2007)," and the federal government identified college student alcohol abuse as a critical priority in the findings of its 2014 National Survey on Drug Use and Health (Center for Behavioral Health Statistics and Quality, 2015). Understanding and effectively addressing the etiology and impacts of college student alcohol abuse are crucial tasks confronting not just colleges and academic researchers, but governmental agencies and the public at large.

While adults under 30 years old account for over 60% of the heaviest drinkers in the United States, *college students* in particular are at the highest risk for heavy drinking, binge-drinking and negative alcohol-related consequences (Carey, Scott-Sheldon, Garey, Elliott, & Carey, 2016). Compared to their same-age peers who do not attend college, college students experience significantly greater increases in at-risk alcohol use through

age 24 (White & Hingson, 2013). Alcohol use by college students has become the norm in the United States, with the National Institute of Health's recent administration of the Monitoring the Future (MTF) survey finding that over 85% of college students engage in alcohol use, and over 40% report consistent engagement in binge drinking behaviors (Johnston, O'Malley, Bachman, & Schulenberg, 2013). These statistics reveal college campuses to be breeding grounds for high-risk drinking, alcohol abuse, and potentially long-term alcohol-related problems for young adults. The negative impacts of this pattern of use on students, institutions and communities are alarming, accounting for 1,700 deaths and more than half a million injuries annually (Hingson, Heeren, Winter, & Wechsler, 2005) as well as significant increases in rates of academic failure, vandalism, theft, interpersonal violence and sexual assault (e.g., Harford, Yi, & Hilton, 2006; Ickes, Haider, & Sharma, 2015).

Among college students, *first-year students* in particular are confronted by an array of unfamiliar contextual influences that make them especially vulnerable to the development of high-risk alcohol use patterns and negative alcohol-related consequences (Borsari, Murphy & Barnett, 2007). Although their drinking patterns are still influenced by their parents (White et al., 2006), their burgeoning freedom from day-to-day parental control is demonstrated by high rates of illegal (underage) alcohol use and abuse (Foster, Dukes, & Sartor, 2016). First-year students' increased independent living, intensified exposure to peer influences (Borsari, et al., 2007; Chapman, Buckley, Reveruzzi, & Sheehan, 2014), greater access to alcohol and heightened desire to establish and test their new identities as college students (Gates, Corbin, & Fromme, 2016) all contribute to significant increases in their rates of alcohol use and abuse. More than students in any

other year in college, first-year students tend to socialize in drinking contexts (White, Kraus, & Swartzwelder, 2006), and as a group they make up the largest percentage of attendees of parties located in college residence halls and fraternities (Nichter, Nichter, Carkoglu, & Lloyd-Richardson, 2010). Furthermore, when first-year students drink, they exhibit a more frequent tendency to engage in heavy episodic drinking, with research indicating that approximately half of first-year students who drink during any specific week engage in heavy episodic drinking (Carey et al., 2016).

In addition to these influences, first-year students demonstrate significantly inflated positive alcohol expectancies (i.e., positive expectations about what will happen as a result of drinking) and more frequent engagement in hazardous alcohol use (e.g., taking shots, playing drinking games, "pre-gaming"), both of which further exacerbate their risk for developing chronic hazardous use patterns and experiencing negative alcohol-related consequences (Zamboanga, Schwartz, Ham, Borsari, & Van Tyne, 2010). The critical impacts of this heightened vulnerability are well illustrated by one investigation of 620 alcohol-related deaths that occurred at 4-year colleges between 2000-2005, which revealed that first-year students account for more than a third of the deaths while representing only a quarter of the student body (Davis & De Barros, 2006). First-year students are also over-represented in alcohol-related disruptive behaviors, such as property damage, injuries, and getting in trouble with the police (Grossbard et al., 2016) and emergency room visits (Borsari et al., 2007). The early adoption of heavy, episodic drinking during the first year of college has longer-term implications, as many students establish a pattern of heavy drinking that often continues throughout college and

young adulthood (Del Boca, F. K., Darkes, J., Greenbaum, P. E., & Goldman, M. S., 2004).

Research on factors that significantly influence college students' alcohol use and experience of negative alcohol-related consequences has been robust, and numerous important factors have been identified (e.g., Ickes et al., 2015). Examination of research trends over the last decade suggests a steady increase in the development and testing of path models and latent constructs in order to better understand *the relationships* among risk and protective factors. More specifically, efforts to increase the effectiveness of campus-based prevention programs have spurred investigation of *the mechanisms* by which expectations, motives, perceived norms and similar constructs exert influence on negative alcohol-related behaviors and outcomes (e.g., Clarke et al., 2016; D'Lima, Pearson, & Kelley, 2012; Scott-Sheldon et al., 2012). Results of this research reveal the crucial importance of clarifying the complex interactions among risk and protective factors for the development of more effective interventions (Carey et al., 2016).

This investigation represents a direct effort to clarify the relationships among critical risk and protective factors associated with negative alcohol-related outcomes. The proposed model for this investigation accounts for the impacts and interactions of cognitive, behavioral, and contextual influences salient to college students' experience of negative alcohol-related consequences. The theoretical foundations for the proposed model and associated hypotheses stem from examination of the literature on expectancy theory (Jones, Corbin, & Fromme, 2001) and current research on college student alcohol use. Examination of the research on student alcohol use focused on the influences of alcohol expectancies, high-risk and protective drinking behaviors, and ecological risk and

protective contexts (e.g., Borsari et al., 2007; Grazioli et al.,2015; Madson et al., 2013; Scott-Sheldon, Terry, Carey, Garey, & Carey, 2012).

In addition to a review of the relevant literature on college student alcohol use, this investigation examines the presented hypotheses and proposed model of factor relationships, the data and analytic strategies used in model testing, results of the analysis, and a discussion of the findings. The hypotheses and proposed model for this study were designed to assess the direct, mediating and moderating influences of (a) positive and negative alcohol expectancies, (b) high-risk and protective drinking behaviors, and (c) ecological risk and protective contexts, on students' experience of negative alcohol-related consequences. Regarding the assessed ecological contexts, risk factors included: (a) Greek Life affiliations, (b) intercollegiate athletics participation, and (c) residence hall housing; and protective factors included participation in: (a) volunteer/ community service, (b) political action groups, and (c) student religious groups.

## Student Alcohol Abuse and Negative Consequences

### Criteria and Prevalence

High-risk drinking behaviors, such as pre-gaming (i.e., drinking heavily over a short period prior to a social event), drinking games, binge drinking, and heavy drinking have become part of the culture of alcohol use for many college students (Scott-Sheldon et al., 2016). Large percentages of students report recent participation (i.e., at least once in the last month) in pre-gaming (64%) and drinking games (50-64% of students), which have been consistently associated with alcohol-related problems (e.g., Ickes et al., 2015, Pedersen & LaBrie, 2008; Zamboanga et al., 2010). Binge drinking (i.e., consuming 5 or more drinks for males and 4 or more drinks for females in a two hour period) is also

associated with numerous alcohol-related problems (Bhochhibhoya, Hayes, Branscum, & Taylor, 2015), and recent research indicates that over a third of U.S. college students engaged in binge drinking in the 2 weeks prior to assessment (Martinez, Sher, & Wood, 2016). In addition, the 2014 national survey by the Substance Abuse and Mental Health Services Administration (SAMHSA, 2015) found that 12% of college students were engaged in "heavy drinking" (i.e., drinking 5 or more drinks on 5 or more days in the past month), which was significantly higher than the 9.5% reported by their non-college peers.

Over time, binge drinking, heavy drinking, and other high-risk drinking behaviors can lead to more serious alcohol use disorders. The diagnostic criteria for alcohol use disorders set thresholds for alcohol-related problems and recurrent, maladaptive use that results in significant impairment or distress, such as work and interpersonal problems, use in physically hazardous situations, and failure to fulfill major role obligations (American Psychiatric Association, 2013). SAMHSA's (2015) recent national survey found that roughly 20% of college students meet diagnostic criteria for an alcohol use disorder.

**Negative Alcohol-Related Consequences**

Although most college students who drink do not meet criteria for an alcohol use disorder, approximately 1 in 4 experience significant negative consequences related to recurrent alcohol misuse (SAMHSA, 2015). Heavy, episodic alcohol use (i.e., binge drinking) among college students is associated with increased physical illness, academic problems, traffic accidents, unintentional injuries, DUIs, interpersonal violence, sexually transmitted diseases, sexual assaults, and accidental deaths (e.g., Barnett & Read, 2005; USDHHS, 2007). These consequences have marked detrimental impacts on students' physical health, psychological well-being, and academic outcomes, and illustrate the

critical need for ongoing development of research based preventive interventions (Carey, 2016). It is clear that by the time students come to the attention of institutions due to alcohol-related policy violations or police citations, they are already at significantly increased risk of alcohol-related problems and poor academic outcomes, in part because these students include a disproportionately high percentage of students who engage in high-risk drinking (Crawford & Novak, 2010).

In addition to the direct consequences for students engaged in excessive alcohol use, alcohol misuse also negatively impacts their student peers and members of the campus community as a whole. Numerous large scale studies and meta-analyses of existing research illustrate the pervasive nature of indirect or "secondhand" impacts of college student alcohol abuse on campus communities, including increased rates of vandalism, property damage, theft, drunk driving, traffic accidents, physical assaults, unwanted sexual advances, and sexual assaults (e.g., Hingson et al., 2005; White & Hingson, 2013). One study encompassing 194 colleges and universities found that institutional administrators cited student alcohol use as a contributing factor in 60% of violent behavior, 40% of physical injuries, and 55% of vandalism damage on their campuses (Anderson & Gadaleto, 2001).

Alcohol abuse by college students also places heavy burdens on academic institutions themselves, including serious financial costs, ethical responsibilities and legal accountability. Institutions bear a great deal of the responsible for developing programs and policies that protect students from the risks of alcohol misuse and its associated negative consequences (Carey et al., 2016). As a result, over the past two decades institutional responses to student alcohol use have intensified, and the proportions of

students receiving institutional and legal consequences for alcohol-related behaviors have significantly increased. Analysis of student surveys from 120 colleges between 1993 and 2001 found consistent increases in the proportion of students receiving mandatory alcohol interventions, community service, and other disciplinary actions for their alcohol use (Wechsler, Lee, Nelson, & Kuo, 2002). Alcohol-related issues have become the primary source of college and university policy violations (Anderson & Gadaleto, 2001), most frequent referral reason for disciplinary counseling (White & Hingson, 2013), and most common cause of disciplinary cases (Garey, Prince, & Carey, 2011). However, addressing the etiological underpinnings of the choices that lead to these negative consequences has proven difficult, and greater understanding is needed of the relationships and interactions between the motivations, behavioral patterns and environmental influences that contribute to these outcomes.

## Alcohol Expectancies

The theoretical framework underlying alcohol expectancies as a construct was derived from expectancy theory, which proposes that the choice to engage in a specific behavior is explained by an individual's expectations of particular reinforcing effects as a result of performing that behavior (Jones et al., 2001). Expectancy theory developed out of Albert Bandura's social learning theory (1977), and like social learning theory, posits that the particular outcome expectations held by an individual are the result of both their direct and indirect experiences of a behavior and its related effects (White, Bates & Johnson, 1990). According to these theories, whether these expectations are accurate or based on experiences is insignificant; to have an impact on behavior all that matters is that they are held and have reinforcing value (Jones et al., 2001).

Alcohol expectancies more specifically are beliefs held by individuals regarding the likely positive or negative consequences of consuming alcohol in a particular manner (Ham et al., 2016). The levels of both positive and negative alcohol expectancies have been found to differ between problem and non-problem drinkers (Nicolai, Demmel, & Moshagen, 2010). A strong augment can be made for distinguishing between positive and negative expectancies as separate constructs, as their influences on alcohol-related behaviors and outcomes are distinct and typically in opposition to each other (Foster et al., 2016). More specifically, a recent review of interventions focused on challenging expectancies found that positive expectations (e.g., "I would have more fun," "I would feel more relaxed") about the effects of alcohol facilitated increased use, whereas negative expectations (e.g., "I would feel nauseous or get sick," "I would get in trouble") reduced or limited use (Scott-Sheldon et al., 2012).

Numerous studies have found college students' expectancies to be one of the most robust predictors of drinking behaviors and related negative outcomes (e.g., Del Boca et al., 2004; Labbe & Maisto, 2011; Zamboanga et al., 2010). Situational expectations have been found to significantly influence the quantity and frequency of students' alcohol use (Foster et al., 2016). In addition to influencing specific instances of alcohol use, studies have shown that expectancies play a significant role in the initiation and maintenance of alcohol use, and are strong predictors of long-term use patterns (Foster et al., 2016; Scott-Sheldon et al., 2012). The powerful influence of alcohol expectancies is illustrated by evidence that the *mere belief* that alcohol has been consumed can significantly alter behaviors and perceptions (e.g., social interactions, perceived enjoyment), whether or not alcohol consumption has actually occurred (Nicolai et al., 2010).

The existing literature has found that both positive and negative expectancies can have a significant, *direct* influence on negative outcomes, without mediation by a separate intervening variable (Turrisi, Wiersma, & Hughes, 2000). However, ongoing research indicates positive and negative expectancies are more typically associated with *indirect* effects (e.g., mediated by motives or behaviors) on alcohol-related problems (e.g., Ham et al., 2016; Linden, Lau-Barraco, & Milletich, 2014). Despite this trend, there has been little research on the mediation of alcohol expectancies' effects on negative outcomes by high-risk drinking behaviors (e.g., binge drinking, playing drinking games), or protective behavioral strategies (e.g., pacing consumption, and setting a time limit (Linden et al., 2014; Pabst et al., 2014).

## Drinking Behaviors

### Protective Behavioral Strategies

Protective behavioral strategies are specific, alcohol-related behaviors utilized to minimize negative consequences, and include strategies such as eating a meal prior to drinking, alternating alcoholic and non-alcoholic drinks, tallying drink totals, and setting time or total-drink limits. Ongoing research has documented a consistent association between the use of protective behavioral strategies and reduced negative outcomes (e.g. Clarke et al., 2016; Grazioli et al., 2015). Specifically, studies have found that students who report significantly more protective behaviors also report fewer negative outcomes, such as injuries to self or others, interpersonal conflicts, behaviors they later regret, academic and legal problems, memory loss, sexual assaults, engaging in unprotected sex, as well as fewer reported long-term problems and alcohol use disorders (Frank, Thake, & Davis, 2012; Linden et al., 2014; Luebbe, Varvel, & Dude, 2009). In addition, research

findings indicate that students' use of protective strategies is inversely related to multiple alcohol-use indices, such as drinks per occasion, weekly and monthly drink totals, and engagement in heavy episodic drinking (Martens et al., 2010). While a recent peer-review of this literature identified strong support for a broad range of strategies, the study's findings also indicated a dearth of longitudinal research and inadequate consistency in how these behaviors are operationalized (Pearson, 2013).

### High-Risk Drinking

Research on students' high-risk drinking behaviors has found that certain alcohol use patterns significantly increase the risks of experiencing increased academic problems, health concerns, interpersonal issues, and other negative consequences (e.g., Clarke et al., 2016; Hingson, Edwards, Heeren, & Rosenbloom, 2009). In addition to binge drinking and heavy drinking, other high-risk drinking behaviors include pre-gaming, chugging alcohol, playing drinking games, and taking shots (Ray, Stapleton, Turrisi, & Mun, 2014). The literature on high-risk drinking behaviors indicates that individuals who engage in these behaviors while drinking significantly increase their risks of experiencing acute negative consequences, as well as long term alcohol-related problems (e.g., Foster et al., 2016; Zamboanga et al., 2010). Notably, the literature makes a distinction between the direct negative effects of high-risk drinking, and the compounding effects of a negative consequence, such as skipping class, leading to additional consequences, such as poor academic performance (Luebbe et al., 2009).

## Ecological Risk and Protective Factors

A broad array of social, cognitive, and environmental factors have been identified that significantly contribute to alcohol-related problems among college students (Borsari

et al., 2007). From an ecological perspective, in order to understand and address the effects of these contributing factors, it is essential to consider their broader contexts and interactions throughout the ecological system that represents students' lives. Further, within the ecological framework developed by Bronfenbrenner (1994), it is necessary to consider the influences occurring at each level of the ecological system, starting with the individual, and including micro-, meso-, exo-, and macro-systemic factors.

Examination of the literature on college student alcohol use from an ecological perspective identified specific, critical influences across the ecological system that warrant assessment in this investigation (e.g., Borsari et al., 2007). The existing literature contains extensive research on individual factors (e.g., currents beliefs and behaviors), and considerable examination of many socially-oriented micro-systemic factors (e.g., Greek Life affiliation, college athletics). Exo-systemic factors related to the broader campus neighborhood, such as students' access to purchasing alcohol(e.g., proximity of liquor stores to campus) and the density of bars near campus (Toomey, Lenk, & Wagenaar, 2007) have also received significant investigation. However, there is notably less literature on more proximate exo-systemic factors, such as the effects of the campus built environment, student housing, and residence hall environments (Cross, Zimmerman, & O'Grady, 2009; Scribner et al., 2008).

Based on an extensive review of the literature, this investigation identified and assessed specific ecological risk and protective contexts expected to significantly impact relationships between students' alcohol expectancies, high-risk and protective drinking behaviors, and alcohol-related negative consequences. The specifically identified risk and protective contexts including: (a) residence hall housing (e.g., Page & O'Hegarty,

2006), (b) fraternity and sorority (i.e., Greek Life) affiliations (e.g., Park et al., 2009), (c) participation in intercollegiate athletics (e.g., Barry, Howell, Riplinger, & Piazza-Gardner, 2015), and involvements in (d) volunteer/community service (e.g., Buettner & Debies-Carl, 2012), (e) political/social action groups (e.g., Theall et al., 2009), and (f) student religious groups (e.g., White et al., 2006).

**Greek Life Affiliations**

Fraternity and sorority affiliations are major risk factors for more frequent and risky drinking (Soule, Barnett, & Moorhouse, 2015). Moreover, a recent meta-analysis of alcohol interventions targeting Greek Life students found them to be less successful at reducing consumption and negative outcomes relative to controls (Scott-Sheldon et al., 2016). Compared to other students, Greek Life members endorse more tolerant views on alcohol abuse and experience more negative consequences (Park, Sher, & Krull, 2009). Notably, *residing* in a fraternity or sorority house is not critical to these impacts, as mere *affiliation* increases risky drinking and alcohol-related problems (Capone, Wood, Borsari, & Laird, 2007). Research further indicates both Greek Life *selection* (i.e., choosing to join), and ongoing *socialization* (i.e., the sociocognitive context) contribute to increases to these outcomes (McCabe et al., 2005; Park et al., 2009). This distinction is supported by the finding that students who began college as low frequency drinkers (i.e., less than 6 drinks per occasion) were three times more likely to start drinking heavily (i.e., 6 or more drinks per occasion) if they joined a fraternity (McCabe et al., 2005). Moreover, students who reported *termination* of their Greek Life affiliation while still enrolled in classes also reported a significant reduction in their frequency and quantity of alcohol consumption, as well as fewer alcohol-related problems (Borsari et al., 2007).

**Intercollegiate Athletics**

Research on alcohol use among college student athletes identifies these students as a high-risk drinking group who exhibiting more frequent high-risk drinking behaviors than their non-athlete peers (Barry et al., 2015). In addition, multiple investigations have found that student athletes experience greater negative alcohol-related consequences and are at greater risk for problematic drinking than non-athletes (e.g., Zamboanga & Ham, 2008). Findings indicate that student athletes drink alcohol more frequently and in greater quantities, engage in more heavy episodic drinking and sexual violence, and experience more negative alcohol-related consequences as compared to their non-athlete counterparts (Labrie, Hummer, Huchting, & Neighbors, 2009). Furthermore, binge drinking behaviors continue to increase as students increase their involvement in athletics (Hildebrand et al., 2001). It is clear that the unique ecological contexts for individuals involved in athletics place them at increased risk for alcohol misuse; however, research to date has not provided a comprehensive understanding of the underlying influences that increase the alcohol-related risks associated with involvement in college athletics.

**College Residence Halls**

Contexts related to the campus built environment, and college residence halls in particular, have been shown to significantly influence college student alcohol use (e.g., Cross et al., 2009). These contexts have been found to influence students' situational motivation to drink, as well as their ongoing engagement in high-risk drinking patterns (Park et al., 2009). More specifically, drinking rates among students living in residence halls are significantly higher than rates among students who live off-campus or with family (Page & O'Hegarty, 2006). At particularly high risk are students living in a

residence hall with suites (i.e., two rooms connected by a bathroom), which have been found to significantly increase students' odds of drinking more frequently, drinking more alcohol when socializing, heavy episodic drinking, and drinking more often in their residence halls (Cross et al., 2009). This is likely due at least in part to the common cultural norms in college residence halls that encourage frequent binge drinking (Wechsler, Lee, Kuo, et al., 2002).

**Volunteer/Community Service and Political/Social Action Groups**

Research on the effects of volunteering, community service and participation in political/social action groups among college students suggests these activities can facilitate increases in moderate drinking behaviors, protect against negative alcohol-related outcomes, and mitigate the impacts of risk-elevating peer associations (Theall et al., 2009). Conceptualized as social capital, these associations are believed to increase college students' "bridging capital" by creating their connections across *heterogeneous* groups and societal divisions such as social class, race and ethnicity, and religion (Buettner & Debies-Carl, 2012). Research on social capital among college students suggests that increases in bridging capital (e.g., community service) provide important benefits for the well-being of both individuals and communities, and are thought to reduce the restricting influences of "bonding capital." Bonding capital (e.g. fraternity "brotherhood") tends to reinforce the effects of socially and ethnically *homogeneous* social networks, such fraternities and sororities, residence halls, and intercollegiate athletics. Thus, student involvement in community service or political/social action groups may both increase moderate drinking behaviors and reducing exposure to high-risk contexts (Theall et al., 2009).

### Student Religious Groups

As a macro-systemic factor, religiosity has a significant influence on college student alcohol use. Research has found students who are more religious engage in less heavy drinking, and drink less frequently than those who value religion less and are less involved in religious organizations (e.g. White et al., 2006). As a micro-systemic factor, involvement in religious associations and groups has been shown to be a protective factor against excessive alcohol use among college students (Carmack & Lewis, 2016). The literature suggests it may be important to differentiate between types of religiosity, as intrinsic religiosity (e.g., living one's life according to religious beliefs) has been found to be a better predictor of alcohol use than religious behaviors (e.g., attending church) (Galen & Rogers, 2004). However, recent research on college campuses indicates that student religious organization memberships and affiliations are significantly associated with more moderate alcohol use, fewer high-risk drinking behaviors, and reduced negative alcohol-related consequences (Carmack & Lewis, 2016; Theall et al., 2009).

## AlcoholEdu for College

The analyses conducted in this investigation utilized student self-report data gathered from University of Oregon *AlcoholEdu for College* program participants. AlcoholEdu for College is an anonymous, online alcohol misuse prevention program typically completed over two sessions approximately 45 days apart. Program participants (i.e., incoming first-year students) are required to complete the first part of the program (i.e., initial assessment, intervention, post-test assessment) prior to matriculation, and complete a follow up assessment mid-way through their first term. The AlcoholEdu program typically represents one component within a more comprehensive, three-tiered

model of alcohol abuse prevention and intervention efforts (Sugai & Horner, 2010). This model includes a: (a) primary tier that provides approximately 80% of students with adequate support, (b) secondary tier that includes specific interventions for "at risk" student groups (e.g., athletes, students in recovery), and (c) tertiary tier that provides individualized interventions for individual, high-risk students (e.g., mandated students).

AlcoholEdu for college is a primary tier prevention and harm reduction program for college students typically requiring 2–3 hours to complete. Depending on the implementation method selected by the specific college, students generally complete Part I of the program in late summer, prior to matriculation and shortly before the beginning of the fall semester. Part I of the course consists of a baseline survey, and four modules: (a) *Introduction,* (b) *Getting the Facts,* (c) *Deciding for Yourself,* and (d) *Review and Exam.* Thirty to forty-five days later (typically more than half way through the fall term), students are prompted by email to complete Part II of AlcoholEdu, which consists of one module that comprises review materials, some new content, and a follow-up survey.

The AlcoholEdu course includes attitudinal and behavioral surveys, program-related knowledge assessments, as well as multimedia components (i.e., interactive animations, audio discussions of topics, informational text with graphics, case studies with streaming video clips of college students in different drinking situations, blog simulations, and self-reflection exercises). Some of the AlcoholEdu content of the course is tailored to respond to students' specific drinking status and gender. For example, students who report high-risk drinking behaviors are provided with feedback using national statistics concerning the prevalence of alcohol use among college students to correct any misperceptions about this behavior.

## Study Purpose

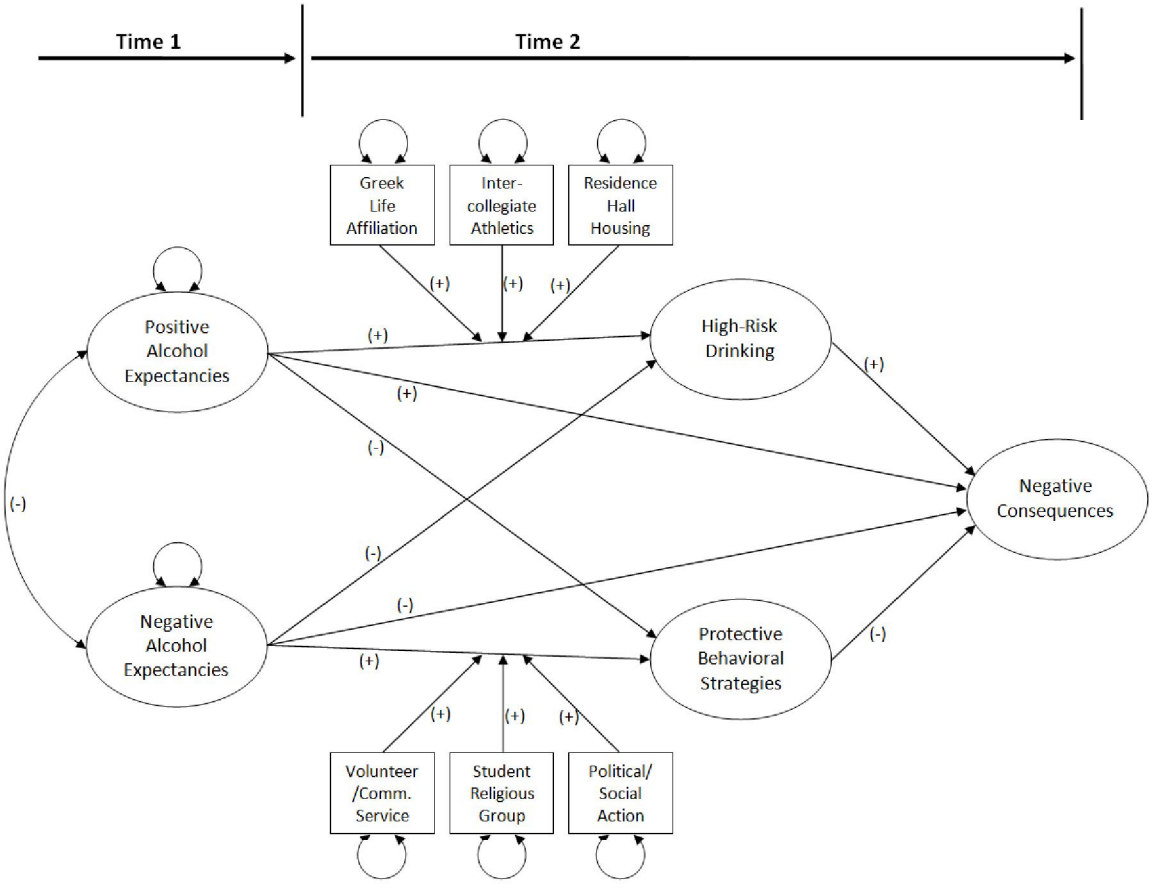
The purpose of this study was to test a proposed model of interrelated influences on negative alcohol-related consequences among first year college students during their first academic term. This study's primary goals were to assess critical direct, indirect, mediating, and moderating influences on students' alcohol-related consequences. The analyses conducted assessed: (a) direct effects of positive and negative expectancies (assessed 1-3 weeks prior to matriculation) on negative alcohol-related consequences (assessed between weeks 5-7 of the term); (b) mediation of expectancies' effects on negative consequences by high-risk drinking and protective behavioral strategies; and (c) moderation of expectancies' relationships with high-risk drinking and protective behavioral strategies by specific ecological risk and protective contexts (e.g., Greek Life affiliation, residence hall housing, political/social religious groups).

By analyzing two time points of self-report data (gathered approximately 45 day apart) through the University of Oregon's AlcoholEdu program, we assessed the influences and interactions of these variables among approximately 3,200 first year university students during their first academic term. In the hypothesized model (see Figure 1 below), students' pre-matriculation reports (Time 1) of positive and negative alcohol expectancies predicted their subsequent mid-term reports (Time 2) of engagement in high-risk drinking and use of protective behavioral strategies, as well as their experience of negative alcohol-related consequences. Students' Time 2 reports on their exposure to the proposed ecological risk (residence hall housing, Greek Life affiliation, and intercollegiate athletics participation) and protective contexts (volunteer/community service, student religious group involvement, and political action group involvement)

were used to assess the hypothesized moderating influences of these variables on the relationships between students' alcohol expectancies and their engagement in risk and protective behaviors. Time 1 reports of ecological risk and protective contexts were not used to assess these moderating variables as the Time 1 reports were gathered pre-matriculation, and therefore only measured students' *anticipated* living arrangements and involvements in the groups and activities of interest.

Figure 1

*Theoretical model of relationships among alcohol expectancies, drinking behaviors, ecological contexts, and negative alcohol-related consequences.*




*Note: Positive and negative expectancies, high-risk drinking, protective behavioral strategies, and negative consequences are latent constructs in this model. Factor analyses were conducted to determine the specific scale items to be used for each latent construct.*

The proposed model for this study is a framework of multiple, interacting influences on first year students' experience of negative alcohol-related consequences. The model accounts for the influences and interactions of students' (a) positive and negative alcohol expectancies, (b) engagement in high-risk drinking, (c) use of protective behavioral strategies, and (d) exposure to ecological risk and protective factors, on their experience of negative alcohol-related consequences. Within the model, positive and negative expectancies, high-risk drinking, protective behavioral strategies, and negative consequences were each represented as latent constructs. The ecological risk (residence hall housing, Greek Life affiliation, and intercollegiate athletics participation) and protective contexts (volunteer/community service, student religious group involvement, and political action group involvement) were included as measured variables.

## Study Hypotheses

### Positive Expectancies

In this study we proposed four hypotheses related to *positive* expectancies' direct effects, the mediation of positive expectancies' effect on negative consequences, and the moderation of positive expectancies' effect on high-risk drinking. Specifically, we hypothesized that (a) increases in positive expectancies would have a direct, *positive* effect on students' engagement in high-risk drinking, and a direct, *negative* effect on their use of protective behavioral strategies. Furthermore, we hypothesized that (b) increases in positive expectancies would also have a direct, *positive* effect on students' experience of negative consequences, and that (c) this effect would be mediated in a *negative* direction by their use of protective behavioral strategies, and mediated in a *positive* direction by their engagement in high-risk drinking. More specifically, we predicted that

when high-risk drinking and protective behavioral strategies were included in model testing as mediating variables, the direct effect of positive expectancies on negative consequences would no longer be statistically significant. Last, we hypothesized that (d) the direct, *positive* effect of increased positive expectancies on students' engagement in high-risk drinking would be moderated in a *positive* direction by their exposure to ecological *risk* contexts (i.e., residence hall housing, Greek Life affiliation, and intercollegiate athletics participation). That is, we predicted that the presence of these ecological risk contexts in students' lives would strengthen the positive relationship between their positive expectancies and their engagement in high-risk drinking.

**Negative Expectancies**

Regarding *negative* expectancies, we proposed four additional hypotheses related to *negative* expectancies' direct effects, the mediation of negative expectancies' effect on negative consequences, and the moderation of negative expectancies' effect on protective behavioral strategies. Specifically, we hypothesized that (a) increases in negative expectancies would have a direct, *negative* effect on students' engagement in high-risk drinking, and a direct, *positive* effect on their use of protective behavioral strategies. In addition, we hypothesized that (b) increases in negative expectancies would also have a direct, *negative* effect on students' experience of negative consequences, and that (c) this effect would be mediated in a *negative* direction by their use of protective behavioral strategies, and mediated in a *positive* direction by their engagement in high-risk drinking. More specifically, we predicted that once high-risk drinking and protective behavioral strategies were included in model testing as mediating variables, the direct effect of negative expectancies on negative consequences would no longer be statistically

significant. Last, we hypothesized that (d) the direct, *positive* effect of increased negative expectancies on students' use of protective behavioral strategies would be moderated in a *positive* direction by their exposure to ecological *protective* contexts (i.e., volunteer/ community service, student religious groups, and political action groups). That is, we predicted that the presence of these ecological protective contexts in students' lives would strengthen the positive relationship between their negative expectancies and their use of protective behavioral strategies.

In addition to testing the principle hypotheses presented above, we also assessed the prediction that the association between positive and negative expectancies would exhibit an inverse relationship. Last, in addition to examining the relationships as outlined in the proposed model for the present study, alternative analyses were conducted to assess: (a) moderation of the relationship between *positive* expectancies and high-risk drinking by ecological *protective* factors, and (b) moderation of the relationship between *negative* expectancies and protective behavioral strategies by ecological *risk* factors.

## Research Questions

In order to assess the hypothesized influences on students' experience of negative alcohol-related consequences, the present study addressed specific research questions related to the direct, mediating, and moderating relationships among the variables identified in the study hypotheses.

1. Is there is a significant, direct, *positive* relationship between students' positive alcohol expectancies and their experience of negative alcohol-related consequences?

2. Is there is a significant, direct, *negative* relationship between students' negative alcohol expectancies and their experience of negative alcohol-related consequences?

3. Do students' positive alcohol expectancies have a direct, *positive* effect on their engagement in high-risk drinking, and a direct, *negative* effect on their engagement in protective behavioral strategies?

4. Do students' negative alcohol expectancies have a direct, *positive* effect on their engagement in protective behavioral strategies, and a direct, *negative* effect on their engagement in high-risk drinking?

5. Is the effect of students' positive alcohol expectancies on their experience of negative alcohol-related consequences significantly mediated by their engagement in high-risk drinking or use of protective behavioral strategies?

6. Is the effect of students' negative alcohol expectancies on their experience of negative alcohol-related consequences significantly mediated by their engagement in high-risk drinking or use of protective behavioral strategies?

7. Is there a significant moderating effect of ecological *risk* contexts (i.e., residence hall housing, Greek Life affiliations, or intercollegiate athletics) on the relationship between students' positive alcohol expectancies and engagement in high-risk drinking?

8. Is there a significant moderating effect of ecological *protective* factors (i.e., involvement in community service groups, student religious groups, or political action groups) on the relationship between students' negative alcohol expectancies and their engagement in protective behavioral strategies?

# CHAPTER II

# METHODOLOGY

## Participants

The investigation utilized pre-existing data in the assessment of its hypotheses and proposed model, and therefore had no active participants or related sampling and recruitment procedures. The data analyzed included approximately 3,200 University of Oregon first-year undergraduate students (freshmen and transfer students under the age of 21 years old) who completed self-report surveys for the 2011-12 AlcoholEdu program. In addition, the data for this investigation included only students who completed all three parts of the AlcoholEdu for College surveys, and matriculated to the university during the 2011 fall academic term. Approximately an additional 1,000 students completed Part 1 of the program, but did not complete one or more of the subsequent surveys and were therefore not included in the analyses of this investigation.

Prior to matriculation, all incoming students received an email from the Office of the Dean of Students with a "soft mandate" (i.e., required participation with no punitive repercussions associated with noncompliance) to complete the two-part, web-based AlcoholEdu program, completing part one just prior to matriculation and part two 30-45 days later. The response rate was approximately 75% of incoming students. International students and students with otherwise restricted internet access (e.g., impoverished students, rural students) were over-represented among students who failed to complete the program. As this was implemented as a mandated, population-level primary prevention program, no randomization procedures were implemented regarding participant selection or assignment to intervention.

## Procedures

AlcoholEdu is a population-level, primary prevention approach to educating students on the issues associated with alcohol use and sexual assault. Customized course pathways for males and females provide substance-related information and interactive experiences that have been shown to shift both use and attitudes (Paschall, Antin, Ringwalt, & Saltz, 2011). The program includes five modules and is typically broken up into two parts, with modules 1-4 completed during Part 1 and module 5 completed during Part 2). In addition to the psychoeducational materials, the modules also include a course examination, program evaluation scales and quizzes. As this investigation is not an evaluation of the AlcoholEdu program itself, none of the course examination, quiz, or program evaluation data were analyzed in the study.

Part 1 of the AlcoholEdu program begins with Module 1, which includes a course overview, a baseline quiz on course-related knowledge, and a pre-intervention survey on alcohol-related attitudes, beliefs, and experiences. Next, Module 2 challenges alcohol-related perceptions, presents a blood alcohol concentration (BAC) calculation exercise, and provides information about alcohol-related laws and policies. Module 3 then focuses on enhancing motivation to set goals and develop harm reduction strategies, teaching how to deal with alcohol-related problems, and providing information on relevant campus resources. Part 1 concludes with Module 4, which consists of a course review and an examination. Part 2 of the program consists of only Module 5, and is completed 30–45 days after completion of Part I. Module 5 includes a follow-up survey, material on how to manage stress and recognize problems related to alcohol misuse, a review of the personalized harm reduction strategies students developed in Part I, and a final quiz.

## Data Collection

Institutional review board (IRB) approval for data collection, analysis and publication was obtained prior to implementation of the original AlcoholEdu program, and this post-hoc analysis of the program's data was determined to be "not human subject research" by the University of Oregon's Research Compliance Services. The program's data for the 2011-2012 academic year was collected in three segments, with the vast majority of participants completing the first two segments (the pre-test assessment and AlcoholEdu intervention) together during one online session just prior to matriculation. 30 to 45 days after completing the pre-test assessment (which provided Time 1 data for this study), AlcoholEdu intervention and post-test assessment (which were not used in this investigation), participants completed the follow-up assessment (which provided Time 2 data for this investigation). Both the initial pre-test assessment, and subsequent follow-up assessment included the complete AlcoholEdu Survey. The immediate post-test assessment, which was not used in this study, consisted of a subset of the overall survey, as well as additional subscales assessing AlcoholEdu course outcomes.

The pre-test assessment, intervention, and immediate post-test assessment were completed by incoming first year students prior to matriculation during September of 2011. Although the AlcoholEdu program considers the intervention, and immediate post-test assessment to be the second phase of data collection, in the large majority of cases they were completed by students during the same online session as their initial pre-test assessment. For the Time 1 variables of the present study, students' pre-test assessment responses to the Expectancies of Alcohol Use survey subscale were used to establish their

pre-matriculation positive and negative alcohol expectancies, and their responses to Personal Characteristics items were used to establish salient demographic information.

The subsequent follow-up assessment data, which was used for Time 2 variables of this study, was gathered 30-45 days after the pre-test assessment in November of 2011 between weeks 5-7 of the fall term. Students' follow-up assessment responses to the Risk Behaviors, Protective Behaviors, and Negative Consequences survey subscales were used, as well as their responses to Personal Characteristics item regarding housing status, and involvements in Greek Life, intercollegiate athletics, community service groups, student religious groups and political action groups. Time 2 responses to these Personal Characteristics items were used instead of Time 1 responses as Time 1 data was gathered pre-matriculation and therefore only measured students' anticipated living arrangements and involvements in groups and activities of interest in this investigation.

## Measures

All variables used in this investigation were assessed using the AlcoholEdu for College program's online self-report survey measures. The complete AlcoholEdu survey consists of eleven subscales, including alcohol expectancies, drinking behaviors, and alcohol-related outcome subscales, a demographic questionnaire and intervention outcome evaluation measures. A summary of the variables and corresponding survey subscales assessed in this investigation is provided in Table 1, and a copy of the relevant AlcoholEdu survey subscales is provided in Appendix A.

Table 1

*Summary of variables of interest and related AlcoholEdu survey subscales*

| Variable | AlcoholEdu survey subscale |
|---|---|
| Alcohol expectancies | |
| a) Positive expectancies | Expectancies of Alcohol Use |
| b) Negative expectancies | Expectancies of Alcohol Use |
| Protective behavioral strategies | Protective Behaviors |
| High-risk drinking | Risk Behaviors |
| Negative consequences | Negative Consequences |
| Ecological protective factors | Personal Characteristics |
| Ecological risk factors | Personal Characteristics |

**Expectancies of Alcohol Use**

The *Expectancies of Alcohol Use* subscale is a 21-item scale which assesses both positive and negative expectations of use. Students were asked "How likely or unlikely is it that the following things would happen to you if you were to drink 3 or 4 alcoholic beverages", with seven possible responses that ranged from 1 (*strongly disagree*) to 7 (*strongly agree*). The scale contains seven *positive* expectancies items such as "Feel more attractive", "Be outgoing in social situations", and "Feel comfortable pursuing an opportunity to have sex," and fourteen *negative* expectancies items such as "Feel sick to your stomach", "Do something you'd regret", and "Be taken advantage of sexually". Previous research with college student samples (Lovecchio et al., 2010) found good internal reliability for both positive (alpha = 0.88) and negative (alpha = 0.90) items.

**Protective Behaviors**

The *Protective Behaviors* subscale is a 19-item scale which prompted students with the phrase "When you drink, to what degree do you do the following:", and proved

seven possible responses that ranged from 1 (*strongly disagree*) to 7 (*strongly agree*). Scale items included such items as “Eat food before or while drinking”, “Alternate non-alcoholic beverages with alcoholic drinks”, and “Make your own drinks to control the amount of alcohol you have”. Previous research with college student samples (Lovecchio et al., 2010) found good internal reliability for items ranging from a Cronbach alpha of .59 to .76.

**Risk Behaviors**

The *Risk Behaviors* subscale is a 4-item scale which prompted students with the phrase “When you drink, to what degree do you do the following:”, and proved seven possible responses that ranged from 1 (*strongly disagree*) to 7 (*strongly agree*). Scale items included “Choose a drink containing more alcohol”, “Chug alcohol”, “Do shots”, and “Start drinking before going out (i.e., pre-gaming)”.

**Negative Consequences**

The *Negative Consequences* subscale is a 23-item scale which prompted students with the phrase “During the past two weeks, to what degree did the following happen to you when drinking or as a result of your drinking? Don’t count things that have happened to you but were not because of drinking”, and included seven possible responses that ranged from 1 (*strongly disagree*) to 7 (*strongly agree*). Scale items included such items as “Got a hangover”, “Passed out”, “Missed a class”, “Injured yourself” and “Got in trouble with authorities”.

**Personal Characteristics**

Among other basic demographic information, students reported their age, sex, race/ethnicity (non-Hispanic White, Black, Asian, Hispanic, other), nationality and

family history of alcohol-related problems. Regarding academic characteristics, students reported their living arrangements (campus residence hall, fraternity or sorority house, off-campus apartment or house, at home with parents), extracurricular memberships and affiliations, previous college attendance, and high school grade-point average.

## Analytic Strategy

All preliminary analyses prior to model testing, including data screening and examination of missing data, were conducted using IBM SPSS Statistics for Windows, Version 22.0. (IBM Corp., 2013). Initial analyses were conducted to assess the frequency and normality of the data distribution using descriptive statistics including mean, standard deviation and frequency distributions. Multivariate normality was evaluated using Mardia's test for multivariate normality, and univariate indices of skewness and kurtosis were examined to determine if the absolute value of any of these indices was greater than 2.0. Also, missing data and influential case outliers (within the limits of +/−2.0) were examined prior to conducting the main study analyses (Wilcox, 2003).

All model testing was conducted using Mplus, Version 7.31 (Muthén & Muthén, 2015) because of its ability to handle missing data using full information maximum likelihood (FIML). FIML uses all available information from the observed data while conducting structural equation modeling (SEM) analyses (Kline, 2011). FIML estimates are computed by maximizing the likelihood of a missing value based on observed values in the data. Compared to mean-imputation, list-wise, or pair-wise deletion models, FIML provides more statistically reliable standard errors (Brown et al., 2008; Graham, 2003).

SEM was the principle strategy use for assessment of the proposed model. SEM assumes multivariate normality and is a maximum likelihood estimation procedure that

simultaneously combines factor analyses and multiple regression path analyses. Based on the recommendations of Bollen and Long (1993), multiple global fit indices were used, including indices of absolute fit, relative fit, and fit with a penalty function for lack of parsimony. These include the overall chi square test of model fit (statistically non-significant), Root Mean Square Error of Approximation (< 0.08), p value for the test of close fit (statistically non-significant), Comparative Fit Index ( > 0.95), standardized root mean square residual (< 0.05), as well as examination of the standardized residual covariances (within the limits of +/−2.0) and modification indices (< 4.00).

For all multi-item scales, the coefficient alphas and factor structures of the measures were first evaluated to ensure that they behaved as expected based on their psychometric histories. Intercorrelations of variables were examined and confirmatory factor analyses were conducted in order to make determinations regarding combining indices and introducing latent constructs into the analysis.

# CHAPTER III

# RESULTS

This chapter describes the study findings. Contents are presented in the following order: data screening and missing data, exploratory factor analyses (EFAs) for each latent construct (positive expectancies, negative expectancies, high-risk drinking, protective behavioral strategies, and negative consequences), parceling of latent constructs' variable items, bivariate correlations, direct effects analyses, mediation and indirect effects analyses, and moderating effects analyses.

## Data Screening and Missing Data

The *AlcoholEdu* survey contains inclusion criteria related to alcohol use that determine whether participants complete specific survey scales at Time 2, which resulted in unequal numbers of participants across study variables. Only students that endorsed drinking during the past year completed the high-risk drinking and protective strategies scales, and only those that endorsed drinking during the past two weeks completed the negative consequences scale. In addition, modest participant attrition from Time 1 to Time 2 (12.5%) also reduced sample sizes for Time 2 variables. Rather than restrict the sample to listwise or complete cases only, full information modeling was conducted to minimize potential selection bias. At Time 1, approximately 3,280 students completed demographic items , and the alcohol expectancies scales. At Time 2, approximately 2,710 students endorsed item(s) related to the ecological contexts variables (i.e., Greek Life, residence hall, intercollegiate athletics, volunteering/community service, political action group, and religious group); approximately 1,970 students (that endorsed drinking in the past year) completed the high-risk drinking and protective behavioral strategies

scales; and approximately 1,510 students (that endorsed drinking in the past two weeks) completed the negative consequences variable items.

In addition to these influences on participant numbers, a minimum item-completion rate of 60-70% of scale items, depending on the total number of items per scale (e.g., 3 out of 5 items, 16 out of 23 items), was used as the cut off for retaining participants for each variable. This produced participant exclusion rates ranging between 5.3-8.8% for all study variables. Overall participant numbers across all study variables ranged from 3,282 to 1,506.

**Missing-Values Analysis**

A missing-values analysis was conducted on the means, variances, and covariances for all study variables, and Little's test of missing data indicated the SEM covariance data could not be assumed missing completely at random [Little's MCAR $\chi 2$ (26) = 661.69, $p < .000$]. However, this result is unsurprising given the large number of students missing from certain variables due to failure to meet inclusion criteria (i.e., drinking during the past year, or drinking during the past two weeks). A standard attrition analysis of Time 2 variables revealed that incomplete cases, which consisted predominantly of participants that failed to meet the inclusion criteria for specific scales, exhibited differences in variable means more consistent with limited alcohol use relative to complete cases. That is, a comparison between variable means for incomplete and complete cases revealed that incomplete cases were: (a) lower on positive expectancies ($M$ = 3.7 and 4.2, SD = 1.4 and 1.1, respectively, $t$ = 12.47, $p$ <.001), (b) higher on negative expectancies ($M$ = 3.3 and 2.6, SD = 1.5 and 1.1, respectively, $t$ = −15.00, $p$ <.001), (c) lower on high-risk drinking ($M$ = 3.1 and 3.9, SD = 1.3 and 1.3, respectively, $t$

= 11.52, $p$ <.05), and (d) higher on protective behavioral strategies ($M$ = 4.9 and 4.3, SD = 1.2 and 1.2, respectively, $t$ = −9.61, $p$ <.005). Incomplete cases also had a lower variable mean for negative consequences; however, this difference is not meaningful as there were only 19 incomplete cases out of approximately 1,500.

Although full information maximum likelihood (FIML) and multiple imputation (MI) approaches can be problematic when data are not missing completely at random (MCAR), they are still the recommended strategies for handling missingness, particularly when covariates associated with attrition are included in the model, as is the case here (Enders, 2010). FIML and MI methods both provide more statistically efficient standard errors than listwise or pairwise deletion, or mean substitution (Allison, 2003; Shafer & Graham, 2002).

**Personal Characteristics**

Participant responses to personal characteristics scale items for sex and race/ ethnicity at Time 1 indicated the overall sample of 3,280 identified as: 57% female and 43% male, 80% European White, 10% Asian/Pacific Islander, 6% Hispanic/Latino, 3% African American, and 1% Native American/Alaskan. At Time 2, responses to personal characteristics scale items for sex and race/ethnicity indicated the sub-sample of 2,710 participants (who met survey inclusion criteria) identified as: 59% female and 41% male, 85% European White, 7% Asian/Pacific Islander, 5% Hispanic/Latino, 2% African American, and 1% Native American/Alaskan. Female and male participants' Time 2 responses to the personal characteristics scale items used for the ecological risk and protective contexts variables are illustrated in Table 2 below. Female and male participants' Time 1 variable means and standard deviations for Alcohol Expectancies,

and Time 2 variable means and standard deviations for High-Risk Drinking, Protective Behavioral Strategies, and Negative Consequences, are illustrated in Table 3 below.

Table 2

*Ecological Risk and Protective Context Item Endorsement for Females and Males.*

| Ecological Contexts | Female % | Male % |
|---|---|---|
| Risk Contexts | | |
| Greek Life Affiliation | 31 | 34 |
| Intercollegiate Athletics Participation | 14 | 8 |
| Residence Halls Housing | 78 | 78 |
| Protective Contexts | | |
| Volunteering/Community Service Participation | 31 | 55 |
| Student Religious Group Participation | 9 | 14 |
| Social/Political Action Group Participation | 12 | 13 |

Table 3

*Mean and Standard Deviations of Positive & Negative Expectancies, High-Risk Drinking, Protective Behavioral Strategies, and Negative Consequences, for Females and Males.*

| Study Variables | Female | | Male | |
|---|---|---|---|---|
| | *M* | *SD* | *M* | *SD* |
| Time 1 | | | | |
| Positive Expectancies | 3.91 | 1.28 | 3.93 | 1.32 |
| Moderate Neg. Expectancies | 3.67 | 1.51 | 2.88 | 1.46 |
| Severe Neg. Expectancies | 2.46 | 1.32 | 2.30 | 1.24 |
| Time 2 | | | | |
| High-Risk Drinking | 3.70 | 1.31 | 3.74 | 1.37 |
| Protective Behavioral Strategies | 4.71 | 1.12 | 4.07 | 1.22 |
| Negative Consequences | 4.17 | 1.43 | 5.41 | 1.78 |

*Note.* Values based on a 7-point scale ranging from 1 (strongly disagree) to 7 (strongly agree).

## Exploratory Factor Analysis

The *AlcoholEdu for College* survey is intended to assess multiple constructs related to the college student alcohol use. Previous studies of college-based *AlcoholEdu* programs are inconsistent regarding the constellations of survey items used to measure latent constructs, including some of the constructs proposed in this study, such as alcohol expectancies, high-risk drinking and protective behavioral strategies (e.g., Lovecchio et al., 2010; Paschall et al., 2011). Although it is clear that the survey items in the *AlcoholEdu* program are intended to measure these constructs, neither the *AlcoholEdu* surveys nor the *AlcoholEdu* program itself, provide exploratory or confirmatory factor analysis or validity evidence related to these constructs. Therefore, in this investigation we first conducted EFAs to ascertain the underlying factor structures of the latent constructs of interest in this study: positive and negative expectancies, high-risk drinking, protective behavioral strategies, and negative consequences.

A principle components EFA with a varimax rotation was completed to examine the factorial structure of each of the relevant scales of the *AlcoholEdu* questionnaire. After determining the dimensionality of each item set from the factor analyses, a minimum loading of 0.40 and an Eigenvalue of >1.0 were used as demarcation points for identifying any separate factors within the proposed latent constructs. Kaiser-Meyer-Olkin (KMO) statistics were used to measure sample adequacy; with a value of 1.0 being the highest, 0.70 being middling and <0.50 being poor (Hutcheson & Sofroniou, 1999). Bartlett's Test of Sphericity was used to test multivariate normality, and should be <0.05. Finally, Cronbach's alpha was as also computed for each extracted factor.

Analyses on the scale items associated with the five proposed latent constructs (i.e., positive expectancies, negative expectancies, high-risk drinking, protective behavioral strategies, and negative consequences), revealed that student responses to four of the five scales held together as latent constructs. However, analysis of the negative expectancies scale items revealed that student responses did not adequately hold together as a single latent construct when conducting a nested model comparison for 1 versus 2 factor models [1-Factor Model 1 $\chi^2(77) = 4786.72$; 2-Factor Model 2 $\chi^2(76) = 2755.915$, $\Delta\ \chi^2(1) = 2030.804$, $p < .001$].

**Negative Expectancies EFA**

Examination of the scree plot and eigenvalues table of the negative expectancies items indicated that the first eigenvalue (7.66) accounted for 54.68% of the variation and the second eigenvalue (1.463) accounted for 10.45%, together accounting for just over 65% of the total variance. The third eigenvalue (0.82) explained 5.92% of the variation, and the contributions from the remaining eigenvalues were negligible. In terms of the negative expectancies subscale items, nine of the fourteen items held together as the primary factor, and the remaining five items constituted a secondary factor. Due to the two-factor nature of these scale item responses, the initially proposed path model for this investigation was re-specified to incorporate both the primary and secondary factors, and both factors were examined in the subsequent analysis of factor relationships.

Upon examination of the negative expectancies factors, the primary factor was designated *moderate neg.* expectancies, and the secondary factor was designated *severe neg.* expectancies. Examination of the individual items revealed that the primary factor consisted of comparatively moderate negative expectations (i.e., expectations of low-

impact negative consequences), such as "get a hangover," "get into trouble with your parents," and "feel clumsy." In contrast, the secondary factor predominantly consisted of comparatively severe negative expectations (i.e., expectations of high-impact negative consequences), such as "ride with a driver who was drunk or high," "be taken advantage of sexually," and "take advantage of someone sexually." The results of the EFA for negative expectancies are shown in Table 4 below. The two factor solution displayed the best fit with a KMO of .943 and Bartlett's Test <.000. Cronbach's alpha for *moderate neg.* expectancies was .931, and for *severe neg.* expectancies was .846.

Table 4

*Rotated Factor Loadings for the Negative Expectancies Items*

| Negative Expectancies Scale Items | Moderate neg. | Severe neg. |
|---|---|---|
| Moderate neg. expectancies | | |
| Get into trouble with authorities | **.573** | .312 |
| Get into trouble with your parents | **.674** | -- |
| Get a hangover | **.847** | -- |
| Feel sick to your stomach | **.853** | -- |
| Forget where you were or what you did | **.777** | .352 |
| Do something you'd regret | **.721** | .421 |
| Feel out of control | **.795** | .357 |
| Pass out | **.764** | .395 |
| Feel clumsy | **.745** | -- |
| Severe neg. expectancies | | |
| Ride with a driver who was drunk or high | -- | **.779** |
| Be argumentative | .405 | **.646** |
| Strain a relationship with a friend | .502 | **.668** |
| Be taken advantage of sexually | .346 | **.720** |
| Take advantage of someone sexually | -- | **.802** |

*Note.* Coefficients smaller than .30 are omitted.

**Positive Expectancies EFA**

The results of the EFA for the positive expectancies items are outlined in Table 5 below. A single factor solution was the best fit for the positive expectancies items, with a KMO of .865 and Bartlett's Test <.000. Cronbach's alpha was .874. In addition, visual examination of the individual items revealed them to be fairly homogeneous in terms of the nature of the explicit expectancies, and analyses revealed them to have strong item-to-construct loadings (see Table 5).

Table 5

*Factor Loadings for the Positive Expectancies Items*

| Positive Expectancies Scale Items | |
|---|---|
| Feel less stressed | .730 |
| Feel happy | .784 |
| Feel more attractive | .733 |
| Feel more confident or sure of yourself | .840 |
| Be outgoing in social situations | .814 |
| Feel comfortable pursuing an opportunity to have sex | .573 |
| Feel connected with the people around me | .805 |

**High-Risk Drinking EFA**

The EFA results for the high-risk drinking items are shown in Table 6 below. The latent construct proposed in the hypothesized model was supported by the analyses, with EFA results indicating that a single factor solution was the best fit. Bartlett's Test of Sphericity was p<.000 and the KMO was .692. Cronbach's alpha was .757. In addition, examination of the individual items revealed them to be adequately homogeneous in terms of the nature and severity of the explicit behaviors, and to have strong item-to-construct loadings.

Table 6

*Factor Loadings for the High-Risk Drinking Items*

| High-Risk Drinking Scale Items | |
|---|---|
| Choose a drink containing more alcohol | .690 |
| Chug alcohol | .729 |
| Do shots | .820 |
| Start drinking before going out | .798 |

**Protective Behavioral Strategies EFA**

The EFA results for the protective behavioral strategies items are shown below in Table 7. The latent construct proposed in the hypothesized model was supported by the analyses, with EFA results indicating that a single factor solution was the best fit. Bartlett's Test of Sphericity was $p<.000$ and the KMO was .947. Cronbach's alpha was .922. In addition, examination of the individual items revealed them to be predominately homogeneous in terms of the nature and severity of the explicit behaviors (except one reverse scored item) and to have strong item-to-construct loadings. Scale item 76 ("... intentionally not eat food before drinking.") is worded as the opposite of a protective behavioral strategy, and elicited a high percentage of "strongly disagree" responses and significantly less variance in responses relative to other scale items, leading to poor item-to-factor loading (.060). Despite this, further analyses revealed that deleting the item lead to no significant change in the scale mean, variance or Cronbach's alpha, and so the item was retained in the scale for subsequent analyses.

Table 7

*Factor Loadings for the Protective Behavioral Strategies Items*

| Protective Behavioral Strategies Scale Items | |
|---|---|
| Eat food before or while drinking | .454 |
| Intentionally not eat food before drinking (reverse scored) | .060 |
| Pace your drinks to 1 or fewer per hour | .662 |
| Set a limit on how many drinks you'll have | .736 |
| Alternate non-alcoholic beverages with alcoholic drinks | .692 |
| Keep track of how many drinks you've had | .712 |
| Make your own drinks to control the amount of alcohol you | .668 |
| Not accept drinks from a shared source (e.g., punch bowl) | .649 |
| Make plans to avoid driving after drinking | .548 |
| Have a friend let you know when you've had enough to drink | .731 |
| Limit the amount of money you bring to spend on alcohol | .701 |
| Hold a drink so people stop bothering you about drinking | .560 |
| Avoid drinking games | .643 |
| Know where your drink has been at all times | .675 |
| Stop drinking at a predetermined time | .737 |
| Put extra ice in your drink | .650 |
| Avoid trying to 'keep up' or 'out drink' others | .701 |
| Monitor you BAC to avoid drinking-related problems | .681 |
| Choose a drink containing less alcohol | .714 |

**Negative Consequences EFA**

The EFA results for the negative consequences items are shown in Table 8 below. The initially proposed latent construct was supported by the analyses, with EFA results indicating that a single factor solution was the best fit. Bartlett's Test of Sphericity was $p<.000$ and the KMO was .962. Cronbach's alpha was .950. In addition, examination of the individual items revealed them to be comparatively heterogeneous in the nature and severity of the explicit consequences, and to have adequate item-to-construct loadings.

Table 8

*Factor Loadings for the Negative Consequences Items*

| Negative Consequences Scale Items | |
|---|---|
| Got a hangover | .440 |
| Passed out | .668 |
| Forgot where you were or what you did | .597 |
| Did something you regretted | .616 |
| Felt sick to your stomach | .501 |
| Performed poorly on an assignment/test | .767 |
| Got behind in school work | .656 |
| Missed a class | .706 |
| Missed going to work | .871 |
| Injured another person | .876 |
| Injured yourself | .722 |
| Got involved in a physical fight | .853 |
| Damaged property | .840 |
| Drove after drinking 4/5 or more drinks | .844 |
| Rode with a driver who had been drinking | .791 |
| Strained a relationship with a friend | .765 |
| Said things you didn't mean that hurt others' feelings | .759 |
| Was argumentative | .660 |
| Got into trouble with authorities | .807 |
| Deliberately vomited to continue drinking | .831 |
| Embarrassed yourself | .614 |
| Been taken advantage of sexually | .705 |
| Taken advantage of someone sexually | .805 |

## Parceling of Latent Construct Variable Items

In order to increase the stability of the latent constructs to be used in the structural equation modeling (SEM) analyses, the individual scale items to be used in these constructs were compiled into a smaller number of item parcels. Parceling is a well-

established data-reduction strategy used to create aggregate-level indicators comprised of the sum (or average) of multiple items or participant responses (e.g., Cole, Perkins, & Zelkowitz, 2016; Little, Cunningham, Shahar, & Widaman, 2002). Inspection of the individual scale items that constitute the latent constructs of interest in this investigation revealed them to be somewhat "heterogeneous" in nature (i.e., have a range of characteristics) and to have a low degree of "explicitness" (i.e., clear demarcations of the boundaries of the constructs), characteristics which suggest the potential benefits of parceling in order to strengthen model-fit (Little et al., 2002, p. 153). Specifically, the psychometric and estimation advantages of parcels create models with fewer estimated parameters, fewer chances for residuals to be correlated (or dual loadings to emerge) and fewer sources of sampling error (MacCallum, Widaman, Zhang, & Hong, 1999).

After completing the EFAs, which examined the dimensionality of the items to be parceled, an "item-to-construct balance" technique (Little et al., 2002, p. 166) was used to build individual parcels for each latent construct. For the item-to-construct balance technique, the item-to-construct relationships were examined and then used to derive parcels that were equally balanced in terms of their difficulty and discrimination (i.e., intercept and slope). As described by Little et al. (2002), the items with the highest loadings were used to anchor each parcel, then the items with the next highest item-to-construct loadings were added to the anchors in an inverted order to maximize balance between the parcels, and so forth with all remaining items.

**Latent Constructs**

Depending on the number of individual items per scale, each proposed latent construct was divided into either 3 parcels (positive expectancies, moderate neg.

expectancies, protective behavioral strategies, and negative consequences items), or 2 parcels (severe neg. expectancies, and high-risk drinking items), using the item-to-construct balancing technique outlined by Little (Little et al., 2002). Subsequent analyses revealed the parcels to be well-balanced within each construct, and all parcel loadings to be significant ($p < .001$), ranging from .719 to .959. Results of the analysis of the parcels are shown in Table 9 below.

Table 9

*Parceling of Latent Construct Variables*

| Variable Parcels | B | Std. Error | Est./Std. Error | P |
|---|---|---|---|---|
| Positive expectancies | | | | |
| - Parcel 1 | .826 | .007 | 111.13*** | .000 |
| - Parcel 2 | .915 | .006 | 145.08*** | .000 |
| - Parcel 3 | .785 | .008 | 94.08*** | .000 |
| Moderate neg. expectancies | | | | |
| - Parcel 1 | .954 | .004 | 266.69*** | .000 |
| - Parcel 2 | .809 | .007 | 120.40*** | .000 |
| - Parcel 3 | .895 | .005 | 191.93*** | .000 |
| Severe neg. expectancies | | | | |
| - Parcel 1 | .881 | .007 | 127.36*** | .000 |
| - Parcel 2 | .893 | .007 | 131.96*** | .000 |
| Negative consequences | | | | |
| - Parcel 1 | .959 | .003 | 298.87*** | .000 |
| - Parcel 2 | .944 | .004 | 254.59*** | .000 |
| - Parcel 3 | .939 | .004 | 242.48*** | .000 |
| High-risk drinking | | | | |
| - Parcel 1 | .719 | .029 | 24.87*** | .000 |
| - Parcel 2 | .906 | .033 | 27.65*** | .000 |
| Protective behavioral strategies | | | | .000 |
| - Parcel 1 | .954 | .004 | 226.63*** | |
| - Parcel 2 | .851 | .007 | 117.37*** | .000 |
| - Parcel 3 | .919 | .005 | 181.58*** | .000 |

*$p < .05$. **$p < .01$. ***$p < .001$.

*Note.* Moderate neg. expectancies = moderate negative expectancies; Severe neg. expectancies = Severe negative expectancies.

**Measured Variables**

The three ecological risk context variables (i.e., Greek Life affiliation, intercollegiate athletics participation, and residence hall housing) and three protective context variables (i.e., volunteering/community service engagement, student political action group participation, and student religious group participation), were individual, dichotomous, yes/no response items and were therefore not subject to parceling. These items comprised the six exogenous, moderating factors in the proposed model, and were included as measured variables (as opposed to latent constructs) in all data analyses.

## Bivariate Correlations

Bivariate correlations among the parcels for each of the latent construct variables (i.e., positive expectancies, moderate neg. expectancies, severe neg. expectancies, high-risk drinking, protective behavioral strategies, and negative consequences) were examined. Means, standard deviations, and bivariate correlations of the latent construct variables are presented in Table 10 below. Correlations among parcels within each latent construct variable are outlined in dashed boxes along the diagonal of the table below, and indicate strong within-variable associations. Correlations among within-variable parcels were significant at $p < .001$ for all latent construct.

Table 10

*Means, Standard Deviations and Bivariate Correlations among Study Latent Construct Variables*

| | Variable | *M* | *SD* | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pos. expectancies | | | | | | | | | | | | | | | | | |
| 1. | - Parcel 1 | 3.54 | 1.46 | - | | | | | | | | | | | | | | |
| 2. | - Parcel 2 | 4.08 | 1.53 | .76*** | - | | | | | | | | | | | | | |
| 3. | - Parcel 3 | 4.05 | 1.39 | .64*** | .72*** | - | | | | | | | | | | | | |
| | Moderate neg. expec. | | | | | | | | | | | | | | | | | |
| 4. | - Parcel 1 | 3.19 | 1.72 | .04* | -.06** | .10*** | - | | | | | | | | | | | |
| 5. | - Parcel 2 | 3.27 | 1.64 | .08*** | -.03 | .08*** | .78*** | - | | | | | | | | | | |
| 6. | - Parcel 3 | 3.52 | 1.63 | .17*** | .10*** | .25*** | .85*** | .71*** | - | | | | | | | | | |
| | Severe neg. expec. | | | | | | | | | | | | | | | | | |
| 7. | - Parcel 1 | 2.36 | 1.30 | .20*** | .11*** | .31*** | .60*** | .52*** | .61*** | - | | | | | | | | |
| 8. | - Parcel 2 | 2.44 | 1.46 | .16*** | .08*** | .27*** | .62*** | .53*** | .62*** | .79*** | - | | | | | | | |
| | High-risk drinking | | | | | | | | | | | | | | | | | |
| 9. | - Parcel 1 | 3.82 | 1.43 | .17*** | .21*** | .19*** | -.06** | -.04 | .03 | .01 | .00 | - | | | | | | |
| 10. | - Parcel 2 | 3.61 | 1.52 | .17*** | .20*** | .19*** | -.15*** | -.12*** | -.07** | -.04 | -.02 | .64*** | - | | | | | |
| | Prot. behav. strat. | | | | | | | | | | | | | | | | | |
| 11. | - Parcel 1 | 4.26 | 1.28 | -.06* | -.10*** | -.09*** | .21*** | .25*** | .15*** | .03 | .03 | -.05* | -.13*** | - | | | | |
| 12. | - Parcel 2 | 4.97 | 1.26 | -.04 | -.07** | -.07** | .18*** | .23*** | .13*** | -.01 | -.03 | .00 | -.13*** | .80*** | - | | | |
| 13. | - Parcel 3 | 4.12 | 1.31 | -.04 | -.09*** | -.06** | .26*** | .26*** | .18*** | .07** | .07** | -.05* | -.17*** | .87*** | .77*** | - | | |
| | Neg. consequences | | | | | | | | | | | | | | | | - | |
| 14. | - Parcel 1 | 1.72 | 2.24 | .09*** | .12*** | .11*** | .01 | -.00 | .04 | .14*** | .16*** | .09** | .15*** | -.14*** | -.27*** | -.14*** | | |
| 15. | - Parcel 2 | 1.63 | 2.23 | .09** | .10*** | .09*** | .03 | .00 | .05 | .12*** | .14*** | .10*** | .14*** | -.14*** | -.27*** | -.13*** | .90*** | - |
| 16. | - Parcel 3 | 1.34 | 2.04 | .08** | .09*** | .09** | .03 | -.01 | .05 | .12*** | .15*** | .08** | .12*** | -.12*** | -.25*** | -.11*** | .90*** | .89*** |

**p < .05. **p < .01. ***p < .001.*

*Note.* Pos. Expectancies = Positive alcohol expectancies; Moderate neg. expec. = moderate negative expectancies; Severe neg. expec. = severe negative expectancies - secondary factor; Prot. Behav. Strat. = Protective Behavioral Strategies; Neg. Consequences = Negative alcohol-related consequences.

## Direct Effects of Alcohol Expectancies

The SEM analyses for the proposed model were completed using Mplus to test for direct effects, indirect effects, mediating influences, moderators, and model fit. The direct relationship between positive expectancies at Time 1, and negative consequences at Time 2, was examined in order to address research question 1. The direct relationships between moderate neg. expectancies and severe neg. expectancies at Time 1, and negative consequences at Time 2 were examined in order to address research question 2. The direct relationships between positive expectancies, moderate neg. expectancies, and severe neg. expectancies at Time 1, and high-risk drinking and protective behavioral strategies at Time 2, were examined in order to address research questions 3 and 4.

### Effect of Positive Expectancies on Negative Consequences

Research question 1 regarding the direct effects of students' positive expectancies on their experience of negative consequences was supported by the analyses. Analyses showed that students' positive expectancies had a significant, direct, positive effect ($b = .095$, $p < .01$) on their experience of negative consequences. That is, a one standard unit increase in positive expectancies was associated with a .095 standard unit increase in negative consequences. This finding suggests that increases in students' expectations of positive alcohol-related outcomes accounted for increases in their experience of negative consequences. See Table 9 below for additional results of this analysis.

### Effects of Negative Expectancies on Negative Consequences

Research question 2, regarding direct effects of students' negative expectancies on their experience of negative consequences, was partially supported by the analyses. The

partial support for the hypotheses was unsurprising, given that the initially proposed single construct was subsequently split into two variables with distinct characteristics.

As predicted, negative expectancies' primary factor (moderate neg. expectancies) had a significant, direct, *negative* effect (b = -.223, p <.001) on students' experience of negative consequences. That is, increases in students' expectations of moderate, negative outcomes accounted for decreases in their experience of negative alcohol-related consequences. However, contrary to the initial hypothesis, negative expectancies' secondary factor (severe neg. expectancies) had a significant, direct, *positive* effect (b = 0. 315, p <.001) on negative consequences, which was in the opposite direction of the predicted effect. That is, increased expectations of relatively severe, negative outcomes accounted for increased experience of negative alcohol-related consequences. See Table 9 below for additional results of this analysis.

**Relationships between Positive and Negative Expectancies**

Analysis results on positive expectancies' relationships with moderate neg. expectancies, and severe neg. expectancies, revealed correlations of .047 and .198 respectively, which do not reflect the predicted negative correlations. The relationship between the two negative expectancies factors was also analyzed, and a strong correlation (.736) was identified between the two factors. This was unsurprising as both factors' were derived from the same scale. However, given the unexpected, positive relationship between severe neg. expectancies and negative consequences, analyses were conducted to assess for potential co-linearity. First, the model was run with negative expectancies factors one at a time, and substantive findings for each factor were identical to the final model. Second, multiple regressions were conducted in SPSS to evaluate regression

diagnostics, and no evidence of co-linearity were present using tolerance, variance inflation factor (VIF), and condition index.

Table 11

*Direct effects of Positive Expectancies, Negative Expectancies (moderate and severe), on Negative Consequences*

| Variable | B | Std. Error | Est./Std. Error | P |
|---|---|---|---|---|
| Positive expectancies | .095 | .033 | 2.892** | .004 |
| Moderate neg. expectancies | -.223 | .050 | -4.464*** | .000 |
| Severe neg. expectancies | .315 | .049 | 6.378*** | .000 |

*Note.* Moderate neg. expectancies = moderate negative expectancies; Severe neg. expectancies = severe negative expectancies.

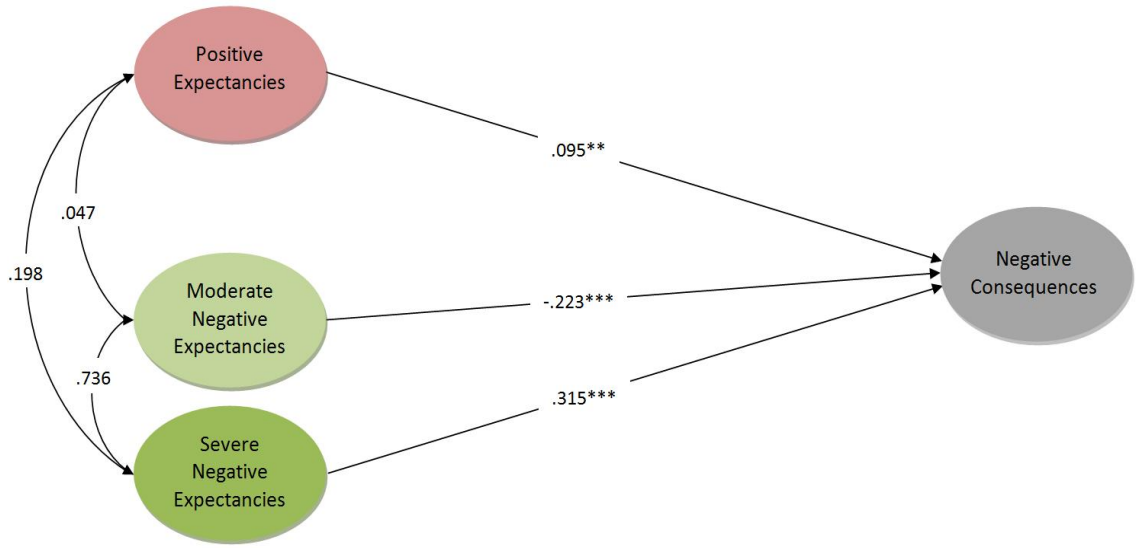
**p < .05. **p < .01. ***p < .001.*

Results of the model testing on the direct relationships of Time 1 positive expectancies, moderate neg. expectancies, and severe neg. expectancies, with Time 2 negative consequences (research questions 1 and 2), are illustrated in Figure 2 below in the form of standardized beta path coefficients. The specified model provided adequate fit to the data [$\chi^2$ (38) = 843.16, p = .000, $\chi^2/df$ = 22.19, CFI = .966, TLI = .951, RMSEA = .081]. Although the chi-square ratio was high and the chi-square minimization *p* value was less than .05 (indicating the observed covariance structure differed from the specified theoretical model), the remaining fit indices indicated acceptable model fit, with the comparative fit index (CFI) above .95, root mean square error of approximation (RMSEA) below .08, and the Tucker Lewis index above .95 (McDonald & Ho, 2002). The significance of the model chi-square test was likely due to the large sample size (exceeding 3,200 for some variables). As described by Kline (2011), with very large samples it can happen that "the chi-square test is failed even though differences between

observed and predicted covariances are slight" (p.201), and for small model-data discrepancies to result in a statistically significant value of model chi-square.

Figure 2

*Model of Direct Effects of Positive and Negative Expectancies on Negative Consequences.*




*Note.* Model fit: $\chi^2$ (38) = 843.16, p = .000, $\chi^2$/df = 22.19, CFI = .966, TLI = .951, RMSEA = .081. Paths are standardized coefficients.
**p < .05. **p < .01. ***p < .001.*

**Effects of Positive Expectancies on Risk and Protective Behaviors**

Research question 3, regarding the direct effects of students' positive expectancies on their engagement in high-risk drinking and protective behavioral strategies, was supported by the analyses. Analyses indicated that students' positive expectancies had a significant, direct, *positive* effect (b = .327, p <.001) on their engagement in high-risk drinking, and a significant, direct, *negative* effect (b = -0.142, p <.001) on their use of protective behavioral strategies. That is, increases in students' expectations of positive alcohol-related outcomes accounted for increases in high-risk drinking and decreases in

protective behavioral strategies. See Table 10 below for additional results of this analysis.

**Effects of Negative Expectancies on Risk and Protective Behaviors**

Research question 4, regarding the direct effects of students' negative expectancies on their engagement in high-risk drinking and protective behavioral strategies, was only partially supported by the analyses. As predicted, moderate neg. expectancies demonstrated a significant, direct, *negative* effect (b = -.279, p <.001) on students' engagement in high-risk drinking, and a significant, direct, *positive* effect (b = .495, p <.001) on their use of protective behavioral strategies. That is, increases in students' expectations of moderate negative outcomes accounted for decreases in high-risk drinking and increases in protective behaviors. However, contrary to the initial hypotheses, severe neg. expectancies had no significant impact on students' engagement in high-risk drinking (b = .057, p =.203), and a significant, direct, *negative* effect (b = -0.235, p <.001) on their use of protective behavioral strategies, which was in the opposite direction of the predicted effect. That is, increases in students' expectations of critical negative outcomes accounted for decreases in their use of protective behaviors. See Table 12 below for additional results of these analyses.

Table 12

*High-Risk Drinking Regressed on Alcohol Expectancies, and Protective Behavioral Strategies Regressed on Alcohol Expectancies.*

| Variable | B | Std. Error | Est./Std. Error | P |
|---|---|---|---|---|
| High-risk drinking regressed on | | | | |
| Positive expectancies | .327 | .030 | 11.077*** | .000 |
| Moderate neg. expectancies | -.279 | .042 | -6.614*** | .000 |
| Severe neg. expectancies | .057 | .044 | 1.273 | .203 |

| | | | | |
|---|---|---|---|---|
| Prot. behav. strat. regressed on | | | | |
| Positive expectancies | -.142 | .027 | -5.317*** | .000 |
| Moderate neg. expectancies | .495 | .038 | 12.919*** | .000 |
| Severe neg. expectancies | -.235 | .042 | 5.646*** | .000 |

*$p < .05$. **$p < .01$. ***$p < .001$.

*Note.* Prot. Behav. Strat. = Protective Behavioral Strategies.

## Mediation and Indirect Effects

Mediation analyses were completed using Mplus through a three step process. The first step was testing the paths from the positive expectancies, moderate neg. expectancies, and severe neg. expectancies variables, to the negative consequences outcome variable, which was completed as a part of the direct effects analyses above. The second step was to examine the direct effects of positive expectancies, moderate neg. expectancies, and severe neg. expectancies, on negative consequences with the mediator variables included (high-risk drinking and protective behavioral strategies). If a change occurred in the estimate (i.e., a change in the magnitude of the coefficient) from the direct effect to the direct effect with the mediators, it indicated a mediation effect might be present. Furthermore, if a change in the magnitude of the estimate altered the statistical significance of the effect (i.e., changes from significant to non-significant or vice-versa), it indicated the presence of a mediation effect.

The third step was to examine the indirect effects of the mediators. If the indirect effect was significant ($p<0.05$), then mediation occurred; if the indirect effect is not significant ($p>0.05$) then there is no evidence of mediation. The indirect effects were examined through the bootstrapping method. The number of bootstrap samples was set

to 1000, a 95% confidence interval was chosen, and the maximum likelihood estimate was used. If $p<0.05$, then there was evidence of mediation.

**Mediation of Positive Expectancies' Effect**

Research question 5, regarding whether the effect of students' positive expectancies on their experience of negative consequences was mediated by their engagement in high-risk drinking or use of protective behavioral strategies, was supported by the analyses. Although the finding on the direct effect of positive expectancies on negative consequences was significant, when the high-risk drinking and protective behavioral strategies variables were included in the model, the direct effect was no longer significant ($b = .044$, $p = .201$), indicating the presence of mediation (see Figure 3 below). In addition, the specific indirect effects of high-risk drinking ($b = .046$, $p < .001$) and protective behavioral strategies ($b = .024$, $p < .001$) in the relationship between positive expectancies and negative consequences were both significant, which also indicates the presence of mediation effects through these variables. See Table 13 below for additional results of this analysis.

Table 13

*Indirect Effects from Positive Expectancies to Negative Consequences*

| Variables | B | Std. Error | Est./Std. Error | P |
|---|---|---|---|---|
| Pos. Expec. → Prot. Behav. Strat → Neg. Conseq. | .024 | .006 | 3.858*** | .000 |
| Pos. Expec. → High-Risk Drink. → Neg. Conseq. | .046 | .011 | 4.096*** | .000 |

**p < .05. **p < .01. ***p < .001.*

*Note.* Pos. Expec. = Positive alcohol expectancies; High-Risk Drink. = High-Risk Drinking; Prot. Behav. Strat. = Protective Behavioral Strategies; Neg. Conseq. = Negative alcohol-related consequences.

**Mediation of Negative Expectancies' Effects**

Research question 6, regarding whether negative expectancies' effect on negative consequences was mediated by high-risk drinking or protective behavioral strategies, was partially supported by the analyses. That is, the effect of *moderate neg.* expectancies on negative consequences was partially mediated by *both* high-risk drinking and protective behavioral strategies, whereas the effect of *severe neg.* expectancies on negative consequences was partially mediated *only* by protective behavioral strategies.

**Moderate Neg. Expectancies.** Moderate neg. expectancies' direct effect on negative consequences was significant; however, when high-risk drinking and protective behavioral strategies were included in the model, this effect was cut nearly in half (from b = −.223 to b = −.116) and the level of significance dropped from p <.001 to p <.05, indicating the presence of a partial mediation effect. In addition, the specific indirect effects of high-risk drinking (b = −.040, p <.001) and protective behavioral strategies (b = −.082, p <.001) in the relationship between moderate neg. expectancies and negative consequences were both significant, which further indicates the presence of partial mediation effects. See Table 12 below for additional results of this analysis.

**Severe Neg. Expectancies.** The direct effect of severe neg. expectancies on negative consequences (without a mediator) was significant (p <.001), and although adding the protective behavioral strategies and high-risk drinking variables to the model reduced the magnitude of this effect (from b = 0. 315 to b =.270), the change in effect was not statistically significant. This finding does not indicate the presence of mediation; however, the specific indirect effect of protective behavioral strategies in the relationship between severe neg. expectancies and negative consequences was significant (b =.039, p

<.001), suggesting partial mediation of this relationship by protective behavioral strategies. The specific indirect effect of high-risk drinking was not significant, indicating that high-risk drinking did not mediate this relationship (see Table 14 below).

Table 14

*Indirect Effects from Negative Expectancies (moderate and severe) to Negative Consequences*

| Variables | B | Std. Error | Est./Std. Error | P |
|---|---|---|---|---|
| Mod. neg. exp. → Prot. Behav. Strat → Neg. Conseq. | -.082 | .016 | -5.275*** | .000 |
| Mod. neg. exp. → High-Risk Drink. → Neg. Conseq. | -.040 | .010 | -3.841*** | .000 |
| Svr. neg. exp. → Prot. Behav. Strat → Neg. Conseq. | .039 | .009 | 4.126*** | .000 |
| Svr. neg. exp → High-Risk Behav. → Neg. Conseq. | .008 | .006 | 1.248 | .212 |

*$*p < .05$. $**p < .01$. $***p < .001$.

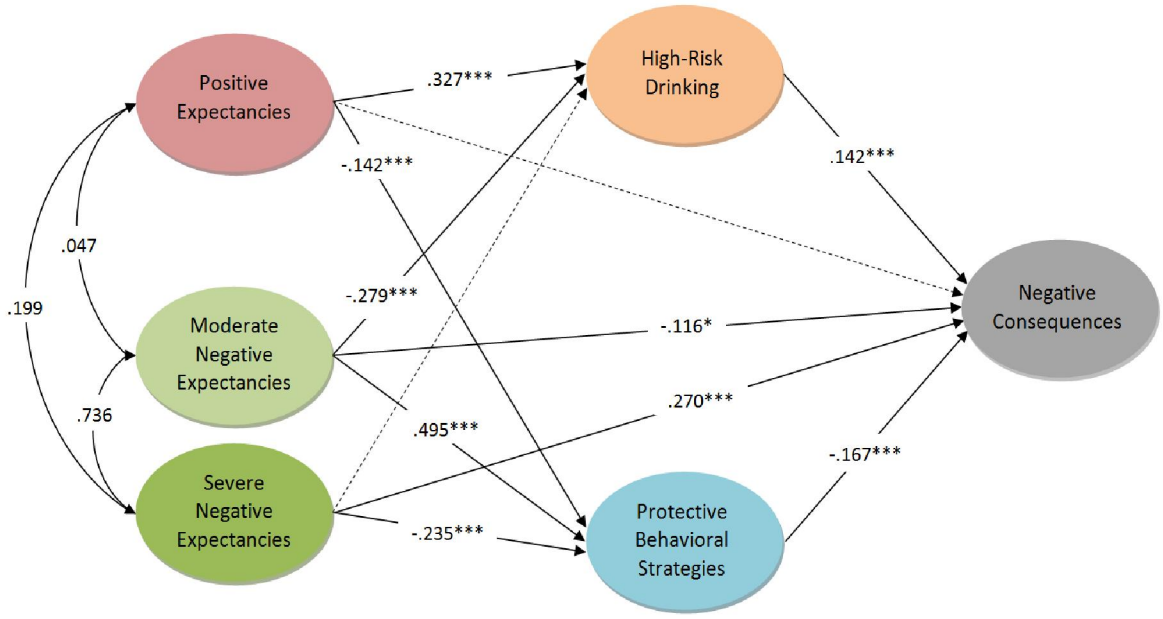
*Note.* Mod. neg. exp. = moderate neg. expectancies; Svr neg. exp. = Severe neg. expectancies; High-Risk Drink. = High-Risk Drinking; Prot. Behav. Strat. = Protective Behavioral Strategies; Neg. Conseq. = Negative alcohol-related consequences.

The results of mediation analyses are illustrated in Figure 3 below in the form of standardized beta path coefficients. These analyses evaluated both high-risk drinking and protective behavioral strategies as potential mediators of the relationships between alcohol expectancies and negative consequences. Specifically, analyses assessed whether high-risk drinking and/or protective behavioral strategies significantly mediated associations between: (a) *positive* expectancies and negative consequences, (b) *moderate neg.* expectancies and negative consequences, and (c) *severe neg.* expectancies and negative consequences. The specified model provided adequate fit to the data [$\chi^2$ (90) = 1,136.86, p = .000, $\chi^2/df$ = 12.63, CFI = .966, TLI = .954, RMSEA = .060]. Although the chi-square ratio was high and the chi-square minimization *p* value was less than .05 (indicating the observed covariance structure differed from the specified model), the

remaining fit indices indicated acceptable model fit, with the comparative fit index (CFI) above .95, root mean square error of approximation (RMSEA) below .08, and the Tucker Lewis index above .95 (McDonald & Ho, 2002). The significance of the model chi-square test was likely due to the large sample size (exceeding 3,200 for some variables). As described by Kline (2011), with very large samples it can happen that "the chi-square test is failed even though differences between observed and predicted covariances are slight" (p.201), and for small model-data discrepancies to result in a statistically significant value of model chi-square.

Figure 3

*Model of Mediation Effects of High-Risk Drinking and Protective Behavioral Strategies.*




*Note.* Model fit: $\chi^2$ (90) = 1,136.86, p = .000, $\chi^2$/df = 12.63, CFI = .966, TLI = .954, RMSEA = .060. Paths are standardized coefficients. Dashed lines represent non-significant relationships. *$p < .05$. **$p < .01$. ***$p < .001$.

## Moderating Effects of Ecological Risk and Protective Contexts

### Ecological Risk Contexts

Research question 7, which suggests the potentially moderating effects of ecological risk factors (i.e., Greek Life affiliation, intercollegiate athletics participation, and college residence hall housing), was not supported by the analyses. However, the analyses did reveal significant, main effects associated with two of these risk context (Greek Life, and residence hall housing) which substantiate ongoing concerns about the negative impacts of these factors on college students' well-being.

**Greek Life.** In terms of risk, the main effect ($b = .293$, $p < .001$) of Greek Life affiliation was associated with significantly increased engagement in high-risk drinking at Time 2. However, this study's hypothesized positive, moderating effect of Greek Life Affiliation on the relationship between positive expectancies and high-risk drinking was not supported. The latent variable interaction ($b = -.007$, $p = .891$) was not significant, meaning that the relationship between positive expectancies and high-risk drinking was not notably influenced by students' affiliation with Greek Life.

**Intercollegiate Athletics.** The hypothesized positive, moderating effect of student participation in intercollegiate athletics on the relationship between positive expectancies and high-risk drinking was not supported. In addition, involvement in intercollegiate athletics had no significant main effect ($b = .110$, $p = .192$) on engagement in high-risk drinking, and the latent variable interaction ($b = .028$, $p = .744$) was also not significant, meaning that the relationship between positive expectancies and high-risk drinking was not notably influenced by student participation in intercollegiate athletics.

**Residence Halls.** The analyses indicated that living in a college residence hall was a significant risk factor for increased engagement in high-risk drinking; however, the hypothesized positive, moderating effect of residence hall housing on the relationship between positive expectancies and high-risk drinking was not supported. The main effect of residence hall housing (b = .203, p <.001) was significantly associated with higher levels of high-risk drinking. However, the latent variable interaction (*b* = -.178, *p* <.05) indicated that the relationship between positive expectancies and high-risk drinking was lower for students in residence hall housing relative to those with other housing arrangements.

**Ecological Protective Contexts**

Research question 8, regarding the potentially moderating effects of ecological protective factors (i.e., engagement in volunteering/community service, political action groups and student religious groups), was also not supported by the analyses. However, similar to the analyses of ecological risk factors outlined above, results did indicate a significant, direct effect associated with one of the protective contexts (volunteering/ community Service) that support ongoing assessment of the beneficial impacts of these factors on college students' well-being.

**Volunteer/Community Service.** The main effect of volunteer/community service was associated with significantly higher levels of protective behavioral strategies (b = .324, p <.001). However, the hypothesized *positive*, moderating effect of students' volunteer/community service on the relationship between negative expectancies and protective behavioral strategies was not supported. Analysis of the latent variable interaction effect related to moderate neg. expectancies (*b* = -.134, *p* <.05) indicated a

significant *negative* relationship. That is, the relationship between moderate neg. expectancies and protective behavioral strategies was *lower* for students who volunteered relative to those who did not volunteer. The latent variable interaction effect related to severe neg. expectancies ($b$ = .138, $p$ = .119) was not significant, indicating that the relationship between severe neg. expectancies and protective behavioral strategies was not notably influenced by students' volunteer/community service.

**Political/Social Action Groups.** The hypothesized positive, moderating effect of student involvement in political/social action groups on the relationship between negative expectancies and the use of protective behavioral strategies was not supported. Analysis of the political/social action groups latent variable interactions related to both moderate neg. expectancies (b = **-.**174, p = .079), and severe neg. expectancies (b = .191, p = .175), were not significant. Analyses further indicated no significant main effect (b = -.124, p = .144) related to engagement in political action groups, suggesting no attributable protective benefit to students in terms of increased use of protective behavioral strategies.

**Student Religious Groups.** The hypothesized positive, moderating effect of student involvement in religious groups on the relationship between negative expectancies and the use of protective behavioral strategies was not supported. Analysis of the student religious groups latent variable interactions related to moderate neg. expectancies (b = -.149, p = .169), and severe neg. expectancies (b = .157, p = .287), were not significant. In addition, analyses indicated no significant main effect (b = .044, p = .662) related to engagement in student religious groups, suggesting no attributable protective benefit to students in terms of increased use of protective behavioral strategies.

# CHAPTER IV

# DISCUSSION

Heavy drinking, binge-drinking, and experiencing severe alcohol-related consequences are significant problems among college students in the U.S., making them one of the highest risk groups for alcohol-related problems (Carey et al., 2016). Alcohol expectancies, drinking behaviors, and college-specific contexts play critical roles in the perpetuation of this risk (Scott-Sheldon et al., 2012), and are frequent targets of efforts to reduce students' alcohol misuse (Ickes et al., 2015). To better understand this risk and the roles of these critical influences, we tested a model of relationships among positive and negative alcohol expectancies, high-risk and protective drinking behaviors, ecological risk and protective contexts, and negative alcohol-related consequences among a sample of first-year college students. The primary aims of this investigation were to clarify the natures of the direct, indirect, mediating, and moderating relationships among the factors, and assess each factor's influence on students' experience of negative consequences.

This study produced several key findings. Preliminary analyses and model testing predominantly supported the proposed latent constructs and predicted relationships, and indicated that the model tested was a fit to the data. That is, the overall hypothesized model that positive and negative expectancies' effects on negative consequences would be mediated by high-risk drinking and protective behavioral strategies was largely supported by analyses with this sample of college students. Factor analysis of scale items for the proposed latent constructs produced six constructs, including: positive expectancies, moderate negative expectancies, severe negative expectancies, high-risk drinking, protective behavioral strategies, and negative consequences. Model testing

revealed that increased *positive* expectancies accounted for: reduced protective behavioral strategies, greater high-risk drinking, and greater negative consequences. That is, the more students expected *good* things to happen while drinking, the less they tried to actively avoid risks, and the more they engaged in risky drinking and experienced alcohol-related problems. Conversely, increases in *moderate negative* expectancies accounted for: greater protective behavioral strategies, reduced high-risk drinking, and reduced negative consequences. That is, the more students expected *moderately bad* things to happen while drinking, the more they tried to actively avoid risks, and the less they engaged in risky drinking behaviors and experienced alcohol-related problems. Mediation analysis revealed that both high-risk drinking and protective behavioral strategies partially mediated the relationship between *positive* expectancies and negative consequences, as well as the relationship between *moderate negative* expectancies and negative consequences. Finally, analyses on the ecological context variables revealed that both Greek Life affiliation and residence hall housing were associated with increased high-risk drinking, whereas volunteer/community service was associated with increased protective behavioral strategies.

Study findings on the direct effects of positive expectancies, moderate neg. expectancies, high-risk drinking, and protective behavioral strategies were consistent with the literature, and corroborate their critical influences on alcohol-related outcomes (e.g., Scott-Sheldon et al., 2016). That is, these findings reflect existing research evidence that positive expectances and high-risk drinking behaviors significantly increase alcohol-related problems among college students (e.g., Foster et al., 2016), and that negative expectancies and protective behavioral strategies significantly reduce negative

outcomes (e.g., Grazioli, 2015). In contrast, the finding that increased positive expectancies directly accounted for reduced use of protective behavioral strategies has little prior documentation, and represents an important contribution to the literature. Other studies have documented a negative *association* between these factors (e.g., Bonar et al., 2012); however, an extensive literature review revealed only one prior study that identified a *direct effect* by positive expectancies on protective behavioral strategies, and that study's findings indicate the effect was only significant among a subset of their sample (Madson et al., 2013). This study's finding provides preliminary support for this significant effect, and has practical implications for ongoing intervention efforts. Namely, this finding suggests that students' with high positive expectancies may be less responsive to interventions aimed at increasing protective behaviors, while interventions targeting high-risk behaviors, or positive expectancies specifically, may prove more effective among these individuals.

Findings on the *mediation* of alcohol expectancies' effects on negative consequences also expand the literature, and clarify relationships that have received little prior investigation. Specifically, results showing that *both* positive and negative expectancies' effects on negative consequences are mediated by *both* high-risk drinking and protective behavioral strategies represent a unique contribution to the literature. These findings support the continued targeting of risky and protective drinking behaviors by interventions, and illustrate the utility of these behaviors as mechanisms for influencing positive and negative expectancies' opposing effects on alcohol-related outcomes. That is, while these behaviors are already frequent targets of intervention efforts, understanding their roles in mediating positive and negative expectancies' effects

on consequences could facilitate development of more comprehensive and effectively targeted interventions. Each of the findings highlighted here, as well as the remaining findings of this investigation, are discussed in detail in the sections below.

## Direct Effects of Positive and Negative Expectancies

### Positive Expectancies

The first step in model testing was to assess the direct effects of positive expectancies, moderate neg. expectancies, and severe neg. expectancies, on high-risk drinking, protective behavioral strategies, and negative consequences. Results on *positive* expectancies' direct effects showed that increased positive expectancies accounted for reduced protective behavioral strategies, increased high-risk drinking, and increased negative consequences. That is, the more students expected *desired* outcomes to occur (e.g., "feel more attractive") as a result of drinking, the less they took precautions to limit negative outcomes, and the more they engaged in risky drinking and experienced alcohol-related problems. Results support the hypotheses on positive expectancies' direct effects, and bear out the theoretical rationale underlying the predictions. The rationale for these hypotheses was based on *expectancy theory*, which asserts that the choice to engage in a behavior is explained by "expectations of particular reinforcing effects" as a consequence of that behavior (Jones et al., 2001, p. 59). Expectancy theory also asserts that expectations do not have to be valid, or reflect actual experience, to have an impact on behavior (Jones, 2004). Results on the effect of positive expectancies (e.g., "feel more confident or sure of yourself") on negative consequences (e.g., "embarrassed yourself") are consistent with that assertion.

The findings on positive expectancies' effects on high-risk drinking and negative consequences are consistent with the literature, which shows high positive expectancies are associated with greater frequency and quantity of drinking, and more negative outcomes (e.g., Foster et al., 2016; Labbe & Maisto, 2011). However, results on positive expectancies' effect on protective behavioral strategies has little prior documentation, and its implications for intervention efforts warrant further research (Linden et al., 2014). That is, the finding that students' with high positive expectancies used significantly fewer protective strategies (e.g., "keep track of how many drinks you've had") suggests these students may also be significantly more resistant to interventions intended to increase those strategies. Together, these findings illustrate positive expectancies' pernicious influence, as students' inflated expectations of desired outcomes undermine their risk evaluations, and lower the threshold for risky drinking behaviors expected to achieve those outcomes. That is, while students can hold equally high levels of positive and negative expectancies at the same time, these expectancies do not exert equal influences on drinking behaviors. Indeed, a study by Leeman et al. (2012) found that students who endorsed high levels of both positive and negative expectancies had the highest levels of risks associated with positive expectancies. It's plausible that in these cases, negative expectancies have little protective influence, yet still reflect an accurate appraisal of the risky behaviors associated with high positive expectancies.

**Moderate Neg. Expectancies**

For the initially proposed negative expectancies construct (moderate neg. and severe neg. combined), it was hypothesized that increased negative expectancies would account for (a) increased protective behavioral strategies, (b) reduced high-risk drinking,

and (c) reduced negative consequences. Results related to *moderate neg.* expectancies supported these hypotheses, showing that increased moderate neg. expectancies accounted for increased protective behavioral strategies, reduced high-risk drinking, and fewer negative consequences. That is, the more students expected *unwanted* outcomes to occur (e.g., “do something you'd regret") as a result of drinking, the more they took precautions to limit negative outcomes, and the less they engaged in risky drinking and experienced alcohol-related problems. These findings are consistent with the literature, which has found greater negative expectancies to be associated with reduced alcohol use, and reduced negative outcomes (e.g., Ham et al., 2016; Labbe & Maisto, 2011). The finding that moderate neg. expectancies had a positive effect on protective behaviors represents a valuable contribution to the literature. This finding shows the functionality of negative expectancies in building motivation for protective behaviors, and their potential utility for interventions aimed at increasing those behaviors. Together, findings on moderate neg. expectancies support the hypotheses on negative expectancies and their underlying theoretical rationale. The rationale for these predictions was founded on *expectancy theory*, which asserts that negative expectations represent a critical component of "motivation to *restrain*" behavior (Jones et al., 2001, p. 59). This elevated motivation to restrain manifests in both students' reduced high-risk drinking behaviors (e.g., “chug alcohol”), and their increased use of protective behavioral strategies (e.g., “eat a meal before drinking”).

**Severe neg. Expectancies**

Analyses results related to *severe neg.* expectancies did not support the hypotheses, and in fact revealed unexpected, significant associations which warrant

further investigation. Results showed that increased severe neg. expectancies had no significant effect on high-risk drinking, but did account for *increased* negative consequences and *decreased* use of protective behavioral strategies, both of which were in the opposite directions of the predicted effects. These results appear to run counter to the principles of expectancy theory (Jones, 2004), and are incongruent with overall trends in research findings on negative expectancies (e.g., Ham et al., 2016). However, a thorough examination of the alcohol expectancies literature does suggest that negative expectancies' associations with other influences are somewhat less consistent than positive expectancies' associations (Zamboanga et al., 2010). For example, one study found that among participants with *low* negative expectancies, those using more protective behavioral strategies experienced *fewer* consequences, while among participants with *high* negative expectancies, those using more protective behavioral strategies experienced *greater* negative consequences (Grazioli et al., 2014). Similarly, a recent meta-analysis of findings led researchers to speculate that a proportion of students with high negative expectancies are actually students who drink *more*, and who drinking more frequently in high-risk settings (Pearson, 2013). These findings suggest that negative expectancies' associations with other variables may vary significantly in both strength and directionality in the presence of other contextual factors, such as elevated protective behaviors or high positive expectancies.

From a theoretical perspective, the atypical associations among high severe neg. expectancies, high negative consequences, and low protective behavioral strategies, suggest the likely influence of a confounding factor. That is, these associations could be plausibly explained by the presence of one or more additional influences. For example,

factors associated with greater alcohol-related problems, such as frequent drinking in high-risk settings (Clapp, Reed, & Ruderman, 2014), or regularly drinking alone prior to socializing (Keough, et al., 2015), might also be associated with high expectations of severe negative outcomes that accurately reflect their risks. It is also plausible that students' engagement in protective behaviors and experience of negative consequences were affected by demographic factors, such as family history of alcohol abuse (LaBrie, Migliuri, Kenney, & Lac, 2011), early age of first alcohol use (DeWit, Adlaf, Offord, & Ogborne, 2000), trauma history (Khoury et al., 2010), or lack of early school connectedness (Chapman et al., 2014).

In addition to considering possible influences on the identified associations among severe negative expectancies, protective behaviors, and negative consequences, it is important to also recognize that these particular associations suggest a high-risk profile for diagnostically significant levels of alcohol-related problems. That is, it is possible that students who reported elevated levels of this secondary factor of more severe negative expectancies were experiencing early symptoms of an alcohol use disorder. As an example, student engagement in frequent, heavy alcohol use (i.e., binge drinking) provides a plausible explanation of the factor profile of these students (i.e., strong agreement that severe negative consequences are "likely," more frequent and intense negative consequences, and limited use of protective behaviors). This inference holds even in the absence of significant engagement in other high-risk drinking behaviors (i.e., pre-gaming, taking shots, chugging, playing drinking games), as was indicated by these analyses on severe neg. expectancies.

Considered together, analysis results on the moderate and severe negative expectancies constructs illustrate distinct differences in the natures of the primary and secondary factors, and suggest that the observed differences in severity of items associated with each factor may bear significantly upon differences in their associations with other variables. That is, the contrast between the primary factor's expectations of relatively mild negative consequences (e.g., "feel clumsy," "get a hangover"), and the secondary factor's expectations of relatively severe negative consequences (e.g., "be taken advantage of sexually," "ride with a driver who was drunk or high"), may account for their markedly different associations with the other factors. Likewise, developmental factors may influence students' valuations of these distinct expectancies. At a minimum, the findings associated with severe neg. expectancies suggest that the rationale underlying the hypotheses for the initially proposed negative expectancies construct (moderate neg. and severe neg. combined) may not apply to, or may not be sufficient to explain, severe neg. expectancies' relationships with other factors.

## Risk and Protective Behaviors as Mediating Variables

### Positive Expectancies

Mediation analysis on the relationship between *positive* expectancies and negative consequences revealed that this relationship was mediated by both high-risk drinking and protective behavioral strategies. That is, the greater negative outcomes among students' with high positive expectancies was partly accounted for by both their increased high-risk drinking (e.g., pre-gaming), and reduced use of protective strategies (e.g., "pace your drinks to 1 or fewer per hour"). As predicted, positive expectancies' effect on negative consequences became insignificant ($b = .044$, $p = .201$) when high-risk drinking and

protective behavioral strategies were included as mediators. Also, the indirect effects of both high-risk drinking and protective behavioral strategies were significant, further indicating significant mediating roles.

The findings on high-risk drinking are consistent with the literature, which has identified risky drinking' mediating influence on relationships between on positive expectancies' and several alcohol-related outcome (e.g., Zamboanga et al., 2010). In contrast, an extensive literature review revealed only one other study that identifies protective behavioral strategies as a mediator of positive expectancies' effect on alcohol-related problems among college students (Madson et al., 2013). Other researchers have noted a paucity of research on the effects of protective strategies on associations between positive expectancies and other factors (Linden et al., 2014). Furthermore, no other studies were found which examined both high-risk drinking and protective behavioral strategies as mediators of expectancies' effects on negative consequences within a single model. The findings of this investigation advance the literature by strengthening empirical support for these relationships, and provide additional insight into the mechanisms (i.e., risky drinking and protective strategies) that account for differences in positive expectancies' influence on negative alcohol-related consequences.

**Moderate Neg. Expectancies**

Analyses on the relationship between negative expectancies' primary factor (moderate neg. expectancies) and negative consequences revealed partial mediation by both high-risk drinking and protective behavioral strategies. That is, the reduced negative outcomes among students' with high moderate neg. expectancies was partly accounted for by both their decreased high-risk drinking, and increased use of protective strategies

(e.g., "choose a drink with less alcohol"). Inclusion of high-risk drinking and protective behavioral strategies reduced the significance level ($p < .001$ to $p < .05$) of moderate neg. expectancies' effect on negative consequences, and revealed significant indirect effects by both high-risk drinking and protective behavioral strategies. However, the continued significance of moderate neg. expectancies' effect indicates the importance of further examination of factors that may explain additional variance in the relationship. Although some research indicates that alcohol expectancies are directly linked (without mediation) to increased negative outcomes in some cases (e.g., Turrisi, Wiersma & Hughes, 2000), the literature as a whole shows that expectancies typically have an indirect effect on alcohol-related problems, and can be mediated by multiple factors (e.g., Ham et al., 2016; Linden et al., 2014). This study's finding of partial mediation suggests the possible influence of other mediating factors associated with negative expectancies' effects, such as drinking motives (Tyne, et al., 2011), social anxiety (Ham et al., 2016), or other hazardous alcohol use patterns (e.g., frequent, heavy drinking) distinct from the specific high-risk behaviors (e.g., pre-gaming) assessed here (Zamboanga et al., 2010).

The findings specific to high-risk drinking are consistent with the literature on its role as a mediator (e.g., Pabst et al., 2014). However, the findings specific to protective behavioral strategies have little prior documentation in the literature, as few studies have examined its *mediating* role in the relationship between negative expectancies and negative outcomes (Grazioli et al., 2015). Prior research has identified the *moderating role* of protective behavioral strategies in relationships between risk factors such as positive expectancies and negative outcomes, indicating that protective strategies reduce the effects of these risk factors (e.g., Borden et al., 2011). In contrast however, this

study's findings indicate that protective behavioral strategies also partially account for the effect of a protective factor (i.e., negative expectancies). In regards to intervention efforts, these findings clearly illustrate the value of addressing both protective behavioral strategies and negative expectancies simultaneously, as these strategies provide practical, preemptive choices that directly address negative expectations.

**Severe Neg. Expectancies**

Results showed that *severe neg.* expectancies' effect on negative consequences was partially mediated by protective behavioral strategies, but not mediated by high-risk drinking. That is, the increased negative outcomes among students' with high severe neg. expectancies was partly accounted for by their decreased use of protective strategies (e.g., alternating alcohol and non-alcoholic beverages). Inclusion of protective behavioral strategies and high-risk drinking in model testing produced an insignificant change in severe neg. expectancies' effect on negative consequences; however, protective behavioral strategies' indirect effect ($b = .039$, $p < .001$) was significant. This indirect effect suggests that students' use of protective behavioral strategies partially mediated severe neg. expectancies' effect on negative consequences. In relation to the literature, a small number of studies have identified high-risk drinking as a mediator of negative expectancies' effects on negative outcomes (e.g., Greenfield, Harford, & Tam, 2009), although this study's findings do not support this relationship. Only one prior study was found that identified protective behavioral strategies' role as a mediator of alcohol expectancies' effects (e.g., Madson et al., 2013); however, that study only examined positive expectancies, and only identified protective behavioral strategies' role as a mediator among part of their sample.

As a whole, analyses on this secondary factor of severe negative expectancies provided limited support study hypotheses, and highlight the need for continuing research on negative expectancies as a construct. The literature on *positive* expectancies identifies it as a consistent and robust predictor of alcohol-related outcomes; however research findings on *negative* expectancies have been markedly less consistent. While many studies have found negative expectancies to be associated with decreased alcohol use (e.g., Nicolai et al., 2010; Scott-Sheldon et al., 2012), other investigations have found negative expectancies to be associated with problematic drinking (Pearson, 2013; Zamboanga et al., 2010), or to be unrelated to drinking patterns altogether (Neighbors et al., 2007). This study's findings on severe neg. expectancies' *direct effects* demonstrate clear incongruence with expectancy theory's assertion that negative expectations provide motivation to *restrain* behavior (Jones et al., 2001). In light of these inconsistencies in the literature, it's plausible that study results on severe neg. expectancies' counterintuitive relationships with other variables indicate issues related to negative expectancies as a construct. Moreover, it may be that the two-factor nature of the negative expectancies items found in this study is indicative of the multidimensional nature of negative expectancies, as opposed to a characteristic unique to responses in this sample.

## Ecological Risk Contexts as Moderating Variables

### Risk Contexts

Analyses on the ecological *risk* context variables revealed significant effects associated with Greek Life affiliation and residence hall housing, but no significant effects associated with intercollegiate athletics participation. Study hypotheses on the positive, moderating effects of these contexts on the relationship between positive

expectancies and high-risk drinking were not supported. Findings on these contexts are discussed in detail below.

**Greek Life affiliation.** Study analyses showed that Greek Life affiliation had a direct, positive effect ($b = .293$, $p < .001$) on students' engagement in high-risk drinking. That is, students who reported affiliation with a fraternity/sorority also reported greater engagement in high-risk drinking behaviors. However, the predicted moderation of positive expectancies' effect on high-risk drinking by Greek Life affiliation was not supported, as the latent variable interaction was non-significant. The finding on Greek Life affiliation's direct effect on high-risk drinking is consistent with the literature showing that fraternity/sorority affiliation is associated with significant increases in drinking frequency, risky drinking behaviors (e.g. pre-gaming), and alcohol-related problems (e.g., Scott-Sheldon et al., 2016; Soule et al., 2015). Prior research has also identified specific sociocognitive mechanisms through which Greek Life affiliation increases risky drinking, such as observing in-group risky drinking behaviors, and assimilation of permissive drinking norms and attitudes (e.g., Park et al., 2009). A review of these findings led to the prediction that the same sociocognitive mechanisms would also cause Greek Life affiliation to *strengthen* (i.e., moderate) the relationship between students' positive expectancies and engagement in high-risk drinking, but this was not supported. However, further study on the interactions among Greek Life affiliation, positive expectancies and drinking behaviors is needed, as research shows positive expectancies play a critical role in both negative outcomes and the effectiveness of interventions for this population (Fried & Dunn, 2012). Together, this study's findings

corroborate the existing literature on Greek Life affiliation's *direct role* in increasing negative alcohol-related outcomes.

Regarding intervention efforts, this study's findings on the influence of Greek Life affiliation support calls for the development of more robust programs that specifically address this high-risk population. A recent meta-analysis of interventions among Greek Life affiliated students found them to be predominantly ineffective at reducing consumption rates and alcohol-related problems, and less effective than interventions among college students in general (Scott-Sheldon et al., 2016). Notably, interventions targeting positive expectancies were found to be most effective with this population (Scott-Sheldon et al., 2016). This investigation's findings on the impacts of both positive expectancies and Greek Life affiliation underscore the compounded risks of this population, and the need for more effective interventions.

**Residence hall housing.** Analyses on residence hall housing also identified a direct, positive effect ($b = .203$, $p < .001$) on increased high-risk drinking. That is, students who reported living in a residence hall also reported greater engagement in high-risk drinking behaviors. This finding supports prior research showing that living in a residence hall is associated with more frequent drinking, drinking more while socializing, and greater high-risk drinking (Cross et al., 2009). However, the hypothesis that residence hall housing would *strengthen* (i.e., moderate) the relationship between positive expectancies and high-risk drinking was not supported. On the contrary, the latent variable interaction ($b = -.178$, $p < .05$) showed that positive expectancies' effect on high-risk drinking was actually *weaker* among students in residence hall housing. That is, the positive expectancies of students living in residence halls had less influence on their

engagement in high-risk drinking behaviors than the positive expectancies of students in other housing contexts.

Together, the findings on residence hall housing's (a) *positive*, direct effect on high-risk drinking, and (b) *negative*, moderating effect on positive expectancies' relationship with high-risk drinking, reveal complex variable interactions. Specifically, students living in residence halls engage in more high-risk drinking than other students, although positive expectancies have less influence on their high-risk drinking than they do for students in other housing contexts. The co-occurrence of these effects suggests possible confounding factors associated with these contexts. For example, the greater monitoring and academic consequences associated with residence hall housing (Cross et al., 2009) may restrict the extent of high-risk drinking among students with the highest positive expectancies. Alternatively, the greater access to alcohol associated with off-campus housing may amplify high-risk drinking among students with high positive expectancies. These findings suggest the need for further evaluation of these contexts and the mechanisms of their contributions to alcohol-related consequences.

## Ecological Protective Contexts as Moderating Variables

### Protective Contexts

Analyses on the ecological *protective* context variables showed significant effects associated with volunteer/community service, but no significant effects associated with either student religious groups, or political/social action groups. Study hypotheses on the *positive, moderating* effects of these contexts on the relationship between negative expectancies and protective behavioral strategies were not supported. The findings on volunteer/community service are discussed in detail below.

**Volunteer/community service.** Analyses revealed that volunteer/community service had a direct, positive effect (b = .324, p <.001) on students' use of protective behavioral strategies. That is, students who reported engaging in volunteer/community service also reported greater use of protective behavioral strategies while drinking. This finding is consistent with the literature, but also provides new insight into the effects of volunteer/community service. Prior research shows that engagement in volunteerism/ community service is associated with greater *moderate drinking behaviors*, and is protective against alcohol-related problems (Theall et al., 2009). This study's finding shows that volunteerism/community service also directly accounts for increased use of *protective behavioral strategies* (as distinct from moderate drinking behaviors), which was previously undocumented in the literature.

In contrast, the hypothesis that volunteer/community service would *strengthen* (i.e., moderate) the relationship between negative expectancies and protective behavioral strategies was not supported. Specifically, results showed that the relationship between the primary factor of negative expectancies (moderate neg.) and protective behavioral strategies was significantly *weaker* ($b$ = -.134, $p$ <.05) among students who reported engaging in volunteer/community service. That is, the moderate negative expectancies of students engaged in volunteer/community service had *less influence* on their use of protective behavioral strategies than the negative expectancies of students who did not report engagement in volunteer/community service. The finding related to the secondary factor of negative expectancies (severe neg.) was non-significant.

Together, findings on volunteer/community service's (a) *positive* effect on protective behavioral strategies, and (b) *negative* effect on the relationship between

moderate neg. expectancies' and protective strategies, indicate complex variable interactions. That is, students engaged in volunteer/community service use more protective strategies than other students, but negative expectancies have less influence on their use of protective strategies than they do for other students. A plausible inference based on the co-occurrence of these effects is that volunteer/community service may also have a direct, *negative* association with negative expectancies. In other words, the significant increases in moderate drinking and protective behaviors associated with volunteer/ community service may directly account for a significant decrease in these students' expectations of negative outcomes (i.e., negative expectancies). Together, volunteer/community service's direct associations with *greater* protective behaviors and *reduced* negative expectancies would plausibly account for analysis results indicating a *weakened* relationship between moderate neg. expectancies and protective behavioral strategies among these students.

## Strengths and Limitations

### Strengths

The present study has several strengths and limitations. Strengths related to the AlcoholEdu dataset and the proposed model enhanced the findings in several ways. First, the dataset's sample of over 3,200 first-year college students provided strong statistical power and increased the findings' generalizability to the target population. In addition, the data included a broad assessment of alcohol-related factors that allowed examination of the cognitive, behavioral, and ecological constructs necessary to assess this study's research questions. The longitudinal nature of this dataset was another key asset, as it

enabled a more accurate account of the order of influences in the proposed model, and more accurate conclusions about mediation (Gunzler et al., 2013).

The use of longitudinal data in the analyses on protective behavioral strategies addressed an identified deficiency in the literature. Specifically, a review of 62 studies on protective behavioral strategies found that 80% utilized only cross-sectional data, which is problematic given students' use of these strategies changes over time and by contexts (Pearson, 2013). Furthermore, the present study provides important preliminary evidence that increased positive expectancies *directly* accounts for reduced protective behavioral strategies, as a review of existing research revealed only one prior study that also reported this finding (Linden et al., 2014).

The examination of moderated mediation in model testing enabled assessment of factor associations that advance the literature. This examination provided key findings on the mediation of alcohol expectancies' effects on negative consequences by specific drinking behaviors, as well as differences in the *amount* of mediation depending on specific ecological contexts (i.e., conditional indirect effects). In particular, the finding on a conditional indirect effect associated with protective behavioral strategies provides support for associations with protective behavioral strategies' that are poorly documented the literature (Borden et al., 2011). In other words, analysis of the moderation of negative expectancies' effect on protective behavioral strategies addresses the dearth of empirical documentation in the literature on antecedents and moderators of protective behavioral strategies (Pearson, 2013).

The present study is one of only two identified studies to examine protective behavioral strategies as a *mediator* of alcohol expectancies' effects on alcohol-related

consequences among college students (Linden et al., 2014). Researchers have noted the paucity of findings on the influence of protective behaviors on associations between alcohol expectancies and other factors (e.g., Grazioli, 2015), and this investigation directly addresses these relationships. In addition, no other studies were identified that examined *both* high-risk drinking and protective behavioral strategies as mediators of alcohol expectancies' effects on negative consequences within a single model. Consequently, the findings that positive and negative expectancies' effects on negative consequences were mediated by both high-risk drinking *and* protective behavioral strategies represents a new contribution to the literature. These findings advance the literature on the relationships among these factors, and help clarify the multiple mechanisms (i.e., risky drinking and protective strategies) through which alcohol expectancies' influence negative consequences.

**Limitations**

This study has several limitations related to variable measurement and study design pertinent to interpreting its results. Regarding the AlcoholEdu dataset, its large size supports generalizability of the findings to the target population; however, the majority of students in the sample self-identified as European-American, which restricts how well the findings apply to ethnically and geographically diverse student populations. More broadly, the sample's limited diversity in terms of age, education, socioeconomic status, nationality, and other demographics, reduces generalizability beyond the U.S. college student population.

Reliance on self-report measures of alcohol use in this study increases the risk of measurement bias. While the literature on college students' self-reports of alcohol use

shows them to be valid and reliable (e.g., Del Boca & Darkes, 2003), recent studies indicate that self-reports of alcohol use among underage drinkers are susceptible to underreporting bias (Mason & Fleming, 2014). The use of *standard* self-report measures in this investigation is consistent with current methods; however, recent findings indicate that underage drinkers using *augmented* self-reports, such as *brand-specific* measures (i.e., brands consumed, and frequencies and quantities by brands) report significantly more alcohol use that underage drinkers using standard self-reports (Roberts, Siegel, DeJong, & Jernigan, 2014).

Re-specification of the proposed model to include two negative expectancies variables significantly impacted analysis results and findings. Model re-specification resulted from initial analyses indicating that the proposed negative expectancies construct did not adequately fit the data. Further analysis revealed that the data fit a two-factor solution more accurately; therefore, the model was re-specified to include two negative expectancies (moderate neg. and severe neg.) constructs, and model testing was adjusted to account for the increased interactions. These adjustments were analytically appropriate (Kline, 2011), and provided a better fit to the data; however, dividing the survey items produced two constructs with dissimilar natures, neither of which precisely reflected the originally proposed construct.

Assessment of students' expectancy *valuations* (i.e., desirability of outcomes) was not included in this study, and may have provided some insight into the unexpected results related to severe neg. expectancies. Assessing valuations of expectancies accounts for the possibility that some individuals might view certain researcher-labeled "negative" expectancies (e.g., “feel out of control,” “be argumentative”) as neutral or

even desirable (i.e., positive). Such discrepancies can lead to these "negative" expectancies being associated with increased drinking and negative outcomes (Tyne et al., 2011). While expectancy valuations are seldom assessed by researchers, studies that have examined their influence indicate valuations can explain additional variance in drinking behaviors and negative consequences (Zamboanga & Ham, 2008).

## Implications for Practice and Research

### Practice

This study's findings have important implications for research and practice. One clear theme among the findings is the strong support for protective behavioral strategies' role in reducing negative alcohol-related consequences. This support corroborates previous research that identify protective behavioral strategies as an effective intervention target for reducing risky drinking and alcohol-related problems (e.g., Clarke et al., 2016; Walters et al., 2007). Interventions targeting protective strategies often provide skills-training on the use of behavioral, and other use-control strategies, as a fundamental approach to harm reduction (LaBrie, Napper, Grimaldi, Kenney, & Lac, 2015). This study's findings endorse the furtherance of protective behavioral strategies as an effective approach to reducing high-risk drinking and negative consequences.

Mediation analysis results for this study present important implication for intervention efforts targeting alcohol expectancies, high-risk drinking, and protective behaviors. Findings on the mediation of positive and negative expectancies' effects by high-risk drinking and protective behavioral strategies illustrate the value simultaneously targeting expectancies, and risk and protective drinking behaviors, within a single intervention. These findings affirm existing interventions that target risk and protective

behaviors; however, they also reveal the utility of targeting these behaviors within the context of their roles as mediators of alcohol expectancies' persistent, robust effects. Similarly, targeting positive and negative expectancies independent of specific risk and protective behaviors is often unsuccessful undertaking (Scott-Sheldon et al., 2016). This study's findings indicate that addressing expectancies' effects through targeting high-risk drinking and protective behavioral strategies is a more practical, effective path to reducing consumption and negative consequences. Specifically, these findings reveal the importance of targeting *particular* positive expectancies likely to undermine the *specific* protective strategies supported by an intervention, as well as the functionality of reinforcing *particular* negative expectancies likely to increase engagement in *specifically* targeted protective behaviors.

**Research**

This study's examination of whether positive and negative expectancies' effects on negative consequences are mediated by high-risk drinking and protective behavioral strategies represents a unique contribution to the research on college student alcohol use. Moreover, assessment of ecological risk and protective contexts as moderators of these mediated associations produced new and clinically significant findings related to these factors. However, the unique nature of these findings indicates the need for additional research. In addition, the relatively homogenous characteristics of this study's research sample suggest the need for replication among more diverse populations to determine the generalizability of these findings and uphold their practical implications.

This study's analyses on negative expectancies indicate the need for additional research on negative expectancies as a construct. Several of the findings on negative

expectancies were inconsistent with the rationale of expectancy theory (e.g., Jones et al., 2001). Similar inconsistencies have been found by other researchers assessing negative expectancies' associations with other risk and protective variables (e.g., Pearson, 2013). Findings within the literature show analyses on negative expectancies yield complex and unexpected results indicative of interactions with confounding factors (e.g., Grazioli et al., 2014; Leeman et al., 2012). In addition, some researchers suggest that negative expectancy *valuations* (i.e., appraised desirability) are particularly vulnerable to discrepancies in which researchers characterize an expectancy as "negative" that participants viewed as "positive" (Zamboanga et al., 2010). This study's findings suggest negative expectancies' associations do not always conform to the fundamental rationale of expectancy theory (i.e., negative expectations restrain behaviors), and that greater clarification is needed on the complex nature of negative expectancies' influences. In addition, further clarification is needed on the impacts of expectancy valuation discrepancies, and their role in explaining variance in drinking behaviors.

Though this study's hypotheses on the moderating effects of ecological risk and protective contexts were not supported, analyses identified other significant and unexpected moderating effects of these contexts. This study's findings on the significant, direct effects of Greek Life affiliations, residence hall housing, and volunteer/community service substantiate the need for ongoing assessment of these critical risk and protective context. A substantial body of research indicates that students' group associations, extracurricular engagements, and the campus built environment significantly influence drinking behaviors and alcohol-related problems (e.g., Barry et al., 2015; Cross et al., 2009; Park et al., 2008; Zamboanga & Ham, 2008). However, additional research is

needed in order to clarify the mechanisms though which college-specific contexts influence students' drinking behaviors and negative consequences.

## Conclusions

Study results highlight that college students' positive and negative expectations of alcohol-related outcomes impact their high-risk drinking, use of protective strategies, and experience of alcohol-related problems. Students' *positive* expectations accounted for reduced protective strategies, and increased risky drinking and negative consequences. *Negative* expectations primarily accounted for increased protective strategies, and reduced risky drinking and negative consequences; however, results also revealed a secondary group of negative expectations that accounted for reduced protective strategies, and increased negative consequences. These distinct patterns illustrate the need for further research on negative expectations' interactions with other alcohol-related factors and outcomes. Together, findings on the influences of alcohol-related expectations highlight the need to further study how they can be influenced to increase positive outcomes among college students.

Results further highlight that alcohol-related expectations' effects on negative outcomes were partially explained by specific high-risk drinking behaviors (e.g., pre-gaming, taking shots, chugging alcohol) and protective strategies (e.g., eat a meal before drinking, limit drinks to 1 per hour, avoid drinking games). Risky and protective behaviors accounted for nearly all of *positive* expectations' influence on negative consequences, and a proportion of negative expectations' primary influence on negative consequences. In addition, results show that Greek Life affiliation and residence hall housing increase risky drinking, while volunteer/community service increases protective

behaviors. Together, these results help clarify the complex interactions among alcohol expectancies, drinking behaviors, and college-specific contexts.

This study's examination of protective behavioral strategies and high-risk drinking as dual mediators of alcohol expectancies' effects on negative outcomes contributes valuable findings to the literature. Results illustrate the utility of addressing positive and negative expectancies' impacts through multi-dimensional interventions that target specific high-risk and protective behaviors, as well as expectations that undermine risk evaluations. Findings also highlight the importance of assessing complex models of direct, indirect, mediating and moderating factor relationships in order to clarify the critical influences on college students' alcohol-related outcomes. Further study of the variables assessed here is need continue to identify points of intervention for addressing students' negative alcohol-related outcomes.

APPENDIX A

UO INSTITUTIONAL REVIEW BOARD APPROVAL

**Research Compliance Services**
**University of Oregon Institutional Review Board**

DATE: October 29, 2012 **IRB Protocol Number: 09252012.012**

TO: David Brule, Principal Investigator
Department of Family and Human Services

RE: Protocol entitled, "Alcohol Expectancies, Drinking Patterns and Ecological Contexts: Influences on University Freshmen's Negative Alcohol-Related Consequences"

**Notice of Review and Determination-Not Human Subject Research as per Title 45 CFR Part 46.102 (c-f)**

Research Compliance Services has reviewed the proposed study project named above. Based on submitted materials and the project description, the study activities do not meet the definition of research with human subjects according to Title 45 CFR 46.102 (c-f).

You may conduct your activities as described without further submission. However, if the activities described are implemented in conjunction with any other human experimentation or if this project is modified to involve research with human subjects, you will need to submit a new protocol application for review by Research Compliance Services and/or the University of Oregon Institutional Review Board (IRB).

If you have any questions regarding your protocol or the review process, please contact Research Compliance Services at ResearchCompliance@uoregon.edu or (541)346-2510.

Sincerely,

Sheryl Johnson, BS, CHES, CIP
Associate Director
Research Compliance Services
University of Oregon

CC: Elizabeth Stormshak, Faculty Advisor

APPENDIX B

MEASURES

AlcoholEdu Survey Subscales

AlcoholEdu survey subscale: Expectancies of Alcohol Use

| Survey 1 | Survey 3 | Question as it appears in StudentVoice: |
|---|---|---|
| Q43 (Q44) | Q44 | Expectancies of Alcohol Use - How likely or unlikely is it that the following things would happen to you personally if you were to drink 3 or 4 alcohol beverages: [survey 1, survey 3] - Get into trouble with authorities |
| Q44 (Q45) | Q45 | Expectancies of Alcohol Use - How likely or unlikely is it that the following things would happen to you personally if you were to drink 3 or 4 alcohol beverages: [survey 1, survey 3] - Get into trouble with your parents |
| Q45 (Q46) | Q46 | Expectancies of Alcohol Use - How likely or unlikely is it that the following things would happen to you personally if you were to drink 3 or 4 alcohol beverages: [survey 1, survey 3] - Feel less stressed |
| Q46 (Q47) | Q47 | Expectancies of Alcohol Use - How likely or unlikely is it that the following things would happen to you personally if you were to drink 3 or 4 alcohol beverages: [survey 1, survey 3] - Feel happy |
| Q47 (Q48) | Q48 | Expectancies of Alcohol Use - How likely or unlikely is it that the following things would happen to you personally if you were to drink 3 or 4 alcohol beverages: [survey 1, survey 3] - Get a hangover |
| Q48 (Q49) | Q49 | Expectancies of Alcohol Use - How likely or unlikely is it that the following things would happen to you personally if you were to drink 3 or 4 alcohol beverages: [survey 1, survey 3] - Feel sick to your stomach |
| Q49 (Q50) | Q50 | Expectancies of Alcohol Use - How likely or unlikely is it that the following things would happen to you personally if you were to drink 3 or 4 alcohol beverages: [survey 1, survey 3] - Feel more attractive |
| Q50 (Q51) | Q51 | Expectancies of Alcohol Use - How likely or unlikely is it that the following things would happen to you personally if you were to drink 3 or 4 alcohol beverages: [survey 1, survey 3] - Forget where you were or what you did |
| Q51 (Q52) | Q52 | Expectancies of Alcohol Use - How likely or unlikely is it that the following things would happen to you personally if you were to drink 3 or 4 alcohol beverages: [survey 1, survey 3] - Do something you'd regret |
| | | Expectancies of Alcohol Use - How likely or unlikely is it that |

| | | |
|---|---|---|
| Q52 (Q53) | Q53 | the following things would happen to you personally if you were to drink 3 or 4 alcohol beverages: [survey 1, survey 3] - Feel more confident or sure of yourself |
| Q53 (Q54) | Q54 | Expectancies of Alcohol Use - How likely or unlikely is it that the following things would happen to you personally if you were to drink 3 or 4 alcohol beverages: [survey 1, survey 3] - Be outgoing in social situations |
| Q54 (Q55) | Q55 | Expectancies of Alcohol Use - How likely or unlikely is it that the following things would happen to you personally if you were to drink 3 or 4 alcohol beverages: [survey 1, survey 3] - Feel out of control |
| Q55 (Q56) | Q56 | Expectancies of Alcohol Use - How likely or unlikely is it that the following things would happen to you personally if you were to drink 3 or 4 alcohol beverages: [survey 1, survey 3] - Pass out |
| Q56 (Q57) | Q57 | Expectancies of Alcohol Use - How likely or unlikely is it that the following things would happen to you personally if you were to drink 3 or 4 alcohol beverages: [survey 1, survey 3] - Feel clumsy |
| Q57 (Q58) | Q58 | Expectancies of Alcohol Use - How likely or unlikely is it that the following things would happen to you personally if you were to drink 3 or 4 alcohol beverages: [survey 1, survey 3] - Feel comfortable pursuing an opportunity to have sex |
| Q58 (Q59) | Q59 | Expectancies of Alcohol Use - How likely or unlikely is it that the following things would happen to you personally if you were to drink 3 or 4 alcohol beverages: [survey 1, survey 3] - Feel connected with the people around me |
| Q59 (Q60) | Q60 | Expectancies of Alcohol Use - How likely or unlikely is it that the following things would happen to you personally if you were to drink 3 or 4 alcohol beverages: [survey 1, survey 3] - Ride with a driver who was drunk or high |
| Q60 (Q61) | Q61 | Expectancies of Alcohol Use - How likely or unlikely is it that the following things would happen to you personally if you were to drink 3 or 4 alcohol beverages: [survey 1, survey 3] - Be argumentative |
| Q61 (Q62) | Q62 | Expectancies of Alcohol Use - How likely or unlikely is it that the following things would happen to you personally if you were to drink 3 or 4 alcohol beverages: [survey 1, survey 3] - Strain a relationship with a friend |
| Q62 (Q63) | Q63 | Expectancies of Alcohol Use - How likely or unlikely is it that the following things would happen to you personally if you were to drink 3 or 4 alcohol beverages: [survey 1, survey 3] - Be taken advantage of sexually |
| Q63 (Q64) | Q64 | Expectancies of Alcohol Use - How likely or unlikely is it that the following things would happen to you personally if you were to drink 3 or 4 alcohol beverages: [survey 1, survey 3] - Take advantage of someone sexually |

| | | |
|---|---|---|
| Q64 (Q65) | Q65 | Expectancies of Alcohol Use - How important to you is each of the following reasons for drinking alcoholic beverages? [survey 1, survey 3] - To get drunk |
| Q65 (Q66) | Q66 | Expectancies of Alcohol Use - How important to you is each of the following reasons for drinking alcoholic beverages? [survey 1, survey 3] - Because you like the taste |
| Q66 (Q67) | Q67 | Expectancies of Alcohol Use - How important to you is each of the following reasons for drinking alcoholic beverages? [survey 1, survey 3] - To have a good time with my friends |
| Q67 (Q68) | Q68 | Expectancies of Alcohol Use - How important to you is each of the following reasons for drinking alcoholic beverages? [survey 1, survey 3] - To celebrate |
| Q68 (Q69) | Q69 | Expectancies of Alcohol Use - How important to you is each of the following reasons for drinking alcoholic beverages? [survey 1, survey 3] - To experiment |
| Q69 (Q70) | Q70 | Expectancies of Alcohol Use - How important to you is each of the following reasons for drinking alcoholic beverages? [survey 1, survey 3] - To decrease inhibitions |
| Q70 (Q71) | Q71 | Expectancies of Alcohol Use - How important to you is each of the following reasons for drinking alcoholic beverages? [survey 1, survey 3] - Feel happy |
| Q71 (Q72) | Q72 | Expectancies of Alcohol Use - How important to you is each of the following reasons for drinking alcoholic beverages? [survey 1, survey 3] - Feel more attractive |
| Q72 (Q73) | Q73 | Expectancies of Alcohol Use - How important to you is each of the following reasons for drinking alcoholic beverages? [survey 1, survey 3] - Feel more confident or sure of yourself |
| Q73 (Q74) | Q74 | Expectancies of Alcohol Use - How important to you is each of the following reasons for drinking alcoholic beverages? [survey 1, survey 3] - Be outgoing in social situations |
| Q74 (Q75) | Q75 | Expectancies of Alcohol Use - How important to you is each of the following reasons for drinking alcoholic beverages? [survey 1, survey 3] - Feel comfortable pursuing an opportunity to have sex |
| Q75 (Q76) | Q76 | Expectancies of Alcohol Use - How important to you is each of the following reasons for drinking alcoholic beverages? [survey 1, survey 3] - Feel connected with the people around me |

AlcoholEdu survey subscale: Protective Behaviors

| Survey 1 | Survey 3 | Question as it appears in StudentVoice: |
|---|---|---|
| Q76 (Q77) | Q77 | Protective Behaviors - drinkers only - When you drink, to what degree do you do the following: [survey 1, survey 3] - Eat food before or while drinking |
| Q77 (Q78) | Q78 | Protective Behaviors - drinkers only - When you drink, to what degree do you do the following: [survey 1, survey 3] - Intentionally not eat food before drinking |
| Q78 (Q79) | Q79 | Protective Behaviors - drinkers only - When you drink, to what degree do you do the following: [survey 1, survey 3] - Pace your drinks to 1 or fewer per hour |
| Q79 (Q80) | Q80 | Protective Behaviors - drinkers only - When you drink, to what degree do you do the following: [survey 1, survey 3] - Set a limit on how many drinks you'll have |
| Q80 (Q81) | Q81 | Protective Behaviors - drinkers only - When you drink, to what degree do you do the following: [survey 1, survey 3] - Alternate non-alcoholic beverages with alcoholic drinks |
| Q81 (Q82) | Q82 | Protective Behaviors - drinkers only - When you drink, to what degree do you do the following: [survey 1, survey 3] - Keep track of how many drinks you've had |
| Q82 (Q83) | Q83 | Protective Behaviors - drinkers only - When you drink, to what degree do you do the following: [survey 1, survey 3] - Make your own drinks to control the amount of alcohol you have |
| Q83 (Q84) | Q84 | Protective Behaviors - drinkers only - When you drink, to what degree do you do the following: [survey 1, survey 3] - Not accept drinks from a shared source (e.g., punch bowl) |
| Q84 (Q85) | Q85 | Protective Behaviors - drinkers only - When you drink, to what degree do you do the following: [survey 1, survey 3] - Make plans to avoid driving after drinking |
| Q85 (Q86) | Q86 | Protective Behaviors - drinkers only - When you drink, to what degree do you do the following: [survey 1, survey 3] - Have a friend let you know when you've had enough to drink |
| Q86 (Q87) | Q87 | Protective Behaviors - drinkers only - When you drink, to what degree do you do the following: [survey 1, survey 3] - Limit the amount of money you bring to spend on alcohol |
| Q87 (Q88) | Q88 | Protective Behaviors - drinkers only - When you drink, to what degree do you do the following: [survey 1, survey 3] - Hold a drink so people stop bothering you about drinking |
| Q88 (Q89) | Q89 | Protective Behaviors - drinkers only - When you drink, to what degree do you do the following: [survey 1, survey 3] - Avoid drinking games |
| Q89 (Q90) | Q90 | Protective Behaviors - drinkers only - When you drink, to what degree do you do the following: [survey 1, survey 3] - Know where your drink has been at all times |
| | | Protective Behaviors - drinkers only - When you drink, to what |

| | | |
|---|---|---|
| Q90 (Q91) | Q91 | degree do you do the following: [survey 1, survey 3] - Stop drinking at a predetermined time |
| Q91 (Q92) | Q92 | Protective Behaviors - drinkers only - When you drink, to what degree do you do the following: [survey 1, survey 3] - Put extra ice in your drink |
| Q92 (Q93) | Q93 | Protective Behaviors - drinkers only - When you drink, to what degree do you do the following: [survey 1, survey 3] - Avoid trying to "keep up" or "out drink" others |
| Q93 (Q94) | Q94 | Protective Behaviors - drinkers only - When you drink, to what degree do you do the following: [survey 1, survey 3] - Monitor your BAC (Blood Alcohol Concentration) to reduce drinking-related problems |
| Q94 (Q95) | Q95 | Protective Behaviors - drinkers only - When you drink, to what degree do you do the following: [survey 1, survey 3] - Choose a drink containing less alcohol |

AlcoholEdu survey subscale: Risk Behaviors

| Survey 1 | Survey 3 | Question as it appears in StudentVoice: |
|---|---|---|
| Q98 (Q99) | Q99 | Risk Behaviors - drinkers only - When you drink, to what degree do you do the following: [survey 1, survey 3] - Choose a drink containing more alcohol |
| Q99 (Q100) | Q100 | Risk Behaviors - drinkers only - When you drink, to what degree do you do the following: [survey 1, survey 3] - Chug alcohol |
| Q100 (Q101) | Q101 | Risk Behaviors - drinkers only - When you drink, to what degree do you do the following: [survey 1, survey 3] - Do shots |
| Q101 (Q102) | Q102 | Risk Behaviors - drinkers only - When you drink, to what degree do you do the following: [survey 1, survey 3] - Start drinking before going out (i.e., pre-gaming) |

AlcoholEdu survey subscale: Negative Consequences

| Survey 1 | Survey 3 | Question as it appears in StudentVoice: |
|---|---|---|
| Q110 (Q111) | Q103 | Negative Consequences - drinkers only - During the past two weeks, to what degree did the following happen to you when drinking or as a result of your drinking? Don't count things that have happened to you but were not because of drinking. [survey 1, survey 3] - Got a hangover |
| Q111 (Q112) | Q104 | Negative Consequences - drinkers only - During the past two weeks, to what degree did the following happen to you when drinking or as a result of your drinking? Don't count things that have happened to you but were not because of drinking. [survey 1, survey 3] - Passed out |
| Q112 (Q113) | Q105 | Negative Consequences - drinkers only - During the past two weeks, to what degree did the following happen to you when drinking or as a result of your drinking? Don't count things that have happened to you but were not because of drinking. [survey 1, survey 3] - Forgot where you were or what you did |
| Q113 (Q114) | Q106 | Negative Consequences - drinkers only - During the past two weeks, to what degree did the following happen to you when drinking or as a result of your drinking? Don't count things that have happened to you but were not because of drinking. [survey 1, survey 3] - Did something you regretted |
| Q114 (Q115) | Q107 | Negative Consequences - drinkers only - During the past two weeks, to what degree did the following happen to you when drinking or as a result of your drinking? Don't count things that have happened to you but were not because of drinking. [survey 1, survey 3] - Felt sick to your stomach |
| Q115 (Q116) | Q108 | Negative Consequences - drinkers only - During the past two weeks, to what degree did the following happen to you when drinking or as a result of your drinking? Don't count things that have happened to you but were not because of drinking. [survey 1, survey 3] - Performed poorly on an assignment/test |
| Q116 (Q117) | Q109 | Negative Consequences - drinkers only - During the past two weeks, to what degree did the following happen to you when drinking or as a result of your drinking? Don't count things that have happened to you but were not because of drinking. [survey 1, survey 3] - Got behind in school work |
| Q117 (Q118) | Q110 | Negative Consequences - drinkers only - During the past two weeks, to what degree did the following happen to you when drinking or as a result of your drinking? Don't count things that have happened to you but were not because of drinking. [survey 1, survey 3] - Missed a class |
| Q118 (Q119) | Q111 | Negative Consequences - drinkers only - During the past two weeks, to what degree did the following happen to you when drinking or as a result of your drinking? Don't count things that |

| | | |
|---|---|---|
| | | have happened to you but were not because of drinking. [survey 1, survey 3] - Missed going to work |
| Q119 (Q120) | Q112 | Negative Consequences - drinkers only - During the past two weeks, to what degree did the following happen to you when drinking or as a result of your drinking? Don't count things that have happened to you but were not because of drinking. [survey 1, survey 3] - Injured another person |
| Q120 (Q121) | Q113 | Negative Consequences - drinkers only - During the past two weeks, to what degree did the following happen to you when drinking or as a result of your drinking? Don't count things that have happened to you but were not because of drinking. [survey 1, survey 3] - Injured yourself |
| Q121 (Q122) | Q114 | Negative Consequences - drinkers only - During the past two weeks, to what degree did the following happen to you when drinking or as a result of your drinking? Don't count things that have happened to you but were not because of drinking. [survey 1, survey 3] - Got involved in a physical fight |
| Q122 (Q123) | Q115 | Negative Consequences - drinkers only - During the past two weeks, to what degree did the following happen to you when drinking or as a result of your drinking? Don't count things that have happened to you but were not because of drinking. [survey 1, survey 3] - Damaged property |
| Q123 (Q124) | Q116 | Negative Consequences - drinkers only - During the past two weeks, to what degree did the following happen to you when drinking or as a result of your drinking? Don't count things that have happened to you but were not because of drinking. [survey 1, survey 3] - Drove after drinking 5 or more drinks (men)/4 or more drinks (women) (Original 2008-2009 question: Drove after drinking 4 or more drinks) |
| Q124 (Q125) | Q117 | Negative Consequences - drinkers only - During the past two weeks, to what degree did the following happen to you when drinking or as a result of your drinking? Don't count things that have happened to you but were not because of drinking. [survey 1, survey 3] - Rode with a driver who had been drinking |
| Q125 (Q126) | Q118 | Negative Consequences - drinkers only - During the past two weeks, to what degree did the following happen to you when drinking or as a result of your drinking? Don't count things that have happened to you but were not because of drinking. [survey 1, survey 3] - Strained a relationship with a friend |
| Q126 (Q127) | Q119 | Negative Consequences - drinkers only - During the past two weeks, to what degree did the following happen to you when drinking or as a result of your drinking? Don't count things that have happened to you but were not because of drinking. [survey 1, survey 3] - Said things you didn't mean that hurt others' feelings |
| | | Negative Consequences - drinkers only - During the past two |

| | | |
|---|---|---|
| Q127 (Q128) | Q120 | weeks, to what degree did the following happen to you when drinking or as a result of your drinking? Don't count things that have happened to you but were not because of drinking. [survey 1, survey 3] - Was argumentative |
| Q128 (Q129) | Q121 | Negative Consequences - drinkers only - During the past two weeks, to what degree did the following happen to you when drinking or as a result of your drinking? Don't count things that have happened to you but were not because of drinking. [survey 1, survey 3] - Got into trouble with authorities |
| Q129 (Q130) | Q122 | Negative Consequences - drinkers only - During the past two weeks, to what degree did the following happen to you when drinking or as a result of your drinking? Don't count things that have happened to you but were not because of drinking. [survey 1, survey 3] - Deliberately vomited to continue drinking |
| Q130 (Q131) | Q123 | Negative Consequences - drinkers only - During the past two weeks, to what degree did the following happen to you when drinking or as a result of your drinking? Don't count things that have happened to you but were not because of drinking. [survey 1, survey 3] - Embarrassed yourself |
| Q131 (Q132) | Q124 | Negative Consequences - drinkers only - During the past two weeks, to what degree did the following happen to you when drinking or as a result of your drinking? Don't count things that have happened to you but were not because of drinking. [survey 1, survey 3] - Been taken advantage of sexually |
| Q132 (Q133) | Q125 | Negative Consequences - drinkers only - During the past two weeks, to what degree did the following happen to you when drinking or as a result of your drinking? Don't count things that have happened to you but were not because of drinking. [survey 1, survey 3] - Taken advantage of someone sexually |

AlcoholEdu survey subscale: Personal Characteristics

| Survey 1 | Survey 3 | Question as it appears in StudentVoice: |
|---|---|---|
| Q136 (Q137) | Q127 | Personal Characteristics - What sex are you? [survey 1, survey 2, survey 3] |
| Q137 (Q138) | Q128 | Personal Characteristics - Choose one answer that best describes your race/ethnicity: [survey 1, survey 2, survey 3] |
| Q138 (Q139) | Q129 | Personal Characteristics - Are you a United States citizen? [survey 1, survey 2, survey 3] |
| Q139 (Q140) | Q130 | Personal Characteristics - What year of school are you entering? [survey 1, survey 2, survey 3] |
| Q140 (Q141) | Q131 | Personal Characteristics - How old are you? [survey 1, survey 2, survey 3] |
| Q141 (Q142) | Q132 | Personal Characteristics - Which best describes your intended living arrangements for college? [survey 1, survey 2, survey 3] |
| Q142 (Q143) | Q133 | Personal Characteristics - Do you intend to be a member of any of the following while at college? Please check all that apply. (Post Mat Survey 1: Are you currently a member of any of the following? Please check all that apply.) [survey 1, survey 2, survey 3] |
| Q143 (Q144) | | Personal Characteristics - Did you transfer, or are you transferring, to this institution this term? [survey 1] |
| Q144 (Q145) | | Personal Characteristics - With whom do you intend to live while at college? Please check all that apply. (Post Mat Survey 1: With whom do you live? Please check all that apply.) [survey 1] |
| Q145 (Q146) | | Personal Characteristics - How old were you when you first started drinking, not counting small sips or tastes of alcohol? [survey 1] |
| Q146 (Q147) | | Personal Characteristics - How old were you when you first got drunk? [survey 1] |
| Q147 (Q148) | | Personal Characteristics - How many of your blood relatives have been a problem drinker or alcoholic, either now or in the past? [survey 1] |
| Q148 (Q149) | Q134 | Personal Characteristics - From what state did you graduate high school? [survey 1, survey 2, survey 3] |
| Q149 (Q150) | Q135 | Personal Characteristics - Student Sub-Account Group [survey 1, survey 2, survey 3] |

## REFERENCES


Allison, P. D. (2003). Missing Data Techniques for Structural Equation Modeling. *Journal of Abnormal Psychology, 112(4), 545-557. doi:10.1037/0021-843x.112.4.545*

American College Health Association. (2007). American college health association national college health assessment, spring 2006 reference group data report (abridged). *Journal of American College Health, 55, 195-206.*

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders (5th ed.).* Washington, D. C: American Psychiatric Association.

Anderson, D. S., & Gadaleto, A. (2001). *Results of the 2000 college alcohol survey: comparison with 1997 results and baseline year.* Fairfax, VA7 Center for the Advancement of Public Health, George Mason University

Bandura, A. (1977) *Social Learning Theory* (Englewood Cliffs, NJ, Prentice-Hall).

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory.* Englewood Cliffs, NJ: Prentice Hall.

Barnett, N. P., & Read, J. P. (2005). Mandatory alcohol intervention for alcohol-abusing college students: A systematic review. *Journal of Substance Abuse Treatment*, *29,* 147-158.

Barnett, N. P., O'Leary Tevyaw, T., Fromme, K., Borsari, B., Carey, K. B., Corbin, W. R., & Monti, P. M. (2004). Brief alcohol interventions with mandated or adjudicated college students. *Alcoholism: Clinical and Experimental Research, 28*, 966-975.

Barry, A. E., Howell, S. M., Riplinger, A., & Piazza-Gardner, A. K. (2015). Alcohol Use among College Athletes: Do Intercollegiate, Club, or Intramural Student Athletes Drink Differently? *Substance Use & Misuse, 50(3),* 302-307

Barry, A. (2007). Using theory-based constructs to explore the impact of greek membership on alcohol-related beliefs and behaviors: A systematic literature review. *Journal of American College Health*, *56*(3), 307-315.

Bhochhibhoya, A., Hayes, L., Branscum, P., & Taylor, L., (2015). The Use of the Internet for Prevention of Binge Drinking Among the College Population: A Systematic Review of Evidence. *Alcohol and Alcoholism, 50(5),* 526-535.

Bingham, C.R., Shope, J.T., & Tang X (2005). Drinking behavior from high school to young adulthood: Differences by college education. *Alcoholism, Clinical and Experimental Research, 29*, 2170–2180.

Boekeloo B. O., Bush E. N., & Novik M. G. (2009). Perceptions about residence hall wingmates and alcohol-related secondhand effects among college freshmen. *Journal of American College Health*, 57(6), 619–28

Bollen, K. & Long, S. (1993). Testing structural equation models. Newbury Park: Sage.

Borden, L. A., Martens, M. P., McBride, M. A., Sheline, K. T., Bloch, K. K., & Dude, K. (2011). The role of college students' use of protective behavioral strategies in the relation between binge drinking and alcohol- related problems. Psychology of Addictive Behaviors, 25, 346–351.

Borsari, B., & Carey, K. B. (2005). Two brief alcohol interventions for mandated college students. *Psychology of Addictive Behaviors, 19,* 296-302.

Borsari, B., Murphy, J. & Barnett, N. (2007). Predictors of alcohol use during the first year of college: Implications for prevention. *Addictive Behaviors 32, 2062–2086*

Borsari, B., Murphy, J. G., & Carey, K. B. (2009). Readiness to change in brief motivational interventions: A requisite condition for drinking reductions? *Addictive Behaviors, 34,* 232-235.

Braitman, A. L., Henson, J. M., & Carey, K. B. (2015). Clarifying observed relationships between protective behavioral strategies and alcohol outcomes: The importance of response options. Psychology of Addictive Behaviors, 29(2), 455-466.

Bronfenbrenner, U. (1994). Ecological models of human development. In International Encyclopedia of Education, Vol. 3, 2nd Ed. Oxford; Elsevier. Reprinted in: Gauvain, M. & Cole, M. (Eds.), Readings on the development of childern, 2nd Ed. (1993, p. 37-43). NY: Freeman.

Bronfenbrenner, U., & Evans, G. W. (2000). Developmental science in the 21st century: Emerging questions, theoretical models, research designs and empirical findings. *Social Development, 9*(1), 115-125.

Brown, H. C., Wang, W., Kellam, S. G., Muthén, B. O., Petras, H., Toyinbo, P., . . . Windham, A. (2008). Methods for testing theory and evaluating impact in randomized field trials: Intent-to-treat analyses for integrating the perspectives of person, place, and time. *Drug and Alcohol Dependence, 95*(Suppl1), S74-S104.

Buettner, C. , & Debies-Carl, J. (2012). The ties that bind: Bonding versus bridging social capital and college student party attendance. , *73*(4), 604-612.

Capone, C., Wood, M. D., Borsari, B., & Laird, R. D. (2007). Fraternity and sorority involvement, social influences, and alcohol use among college students: A prospective examination. *Psychology of Addictive Behaviors, 21(3),* 316–327.

Carey, K. B., Scott-Sheldon, L. A. J., Garey, L., Elliott, J. C., & Carey, M. P. (2016, April 21). Alcohol Interventions for Mandated College Students: A Meta-Analytic Review. *Journal of Consulting and Clinical Psychology*. Advance online publication. http://dx.doi.org/10.1037/ a0040275

Carmack, C., & Lewis, R. K. (2016). Assessing whether religious behaviors and positive and negative affect are associated with alcohol use and abuse among a sample of college students living in the Midwest. *Journal of Religion and Health, Vol 55(3),* 1107-1119.

Center for Behavioral Health Statistics and Quality. (2015). *2014 National Survey on Drug Use and Health: Methodological summary and definitions*. Rockville, MD: Substance Abuse and Mental Health Services Administration.

Chapman, R., Buckley, L., Reveruzzi, B., Sheehan, M. (2014). Injury prevention among friends: The benefits of school connectedness. *Journal of Adolescence, 37,* 937-944.

Christiansen, B. A., Goldman, M. S., & Inn, A. (1982). Development of alcohol-related expectancies in adolescents: Separating pharmacological from social-learning influences. *Journal of Consulting and Clinical Psychology, 50(3),* 336−344.

Clarke, N., Kim, S., Ray, A. E., White, H. R., Jiao, Y., Mun, E. (2016). The association between protective behavioral strategies and alcohol-related problems: An

examination of race and gender differences among college drinkers. *Journal of Ethnicity in Substance Abuse, 15(1),* 25-45.

Cole, D. A., Perkins, C. E., & Zelkowitz, R. L. (2016). Impact of homogeneous and heterogeneous parceling strategies when latent variables represent multidimensional constructs. *Psychological Methods, 21*(2), 164-174. http://dx.doi.org.libproxy.uoregon.edu/10.1037/met0000047

Crawford, L, & Novak, K. (2010). Beliefs about alcohol and the college experience as moderators of the effects of perceived drinking norms on student alcohol use. *Journal of Alcohol and Drug Education*, *54*(3), 69-86.

D'Lima, G. M.; Pearson, M. R.; Kelley, M. L. (2012). Protective behavioral strategies as a mediator and moderator of the relationship between self-regulation and alcohol-related consequences in first-year college students. *Psychology of Addictive Behaviors, 26(2),* 330-337.

Davis, R., & DeBarros, A. (2006). In college first year is by far the riskiest. *USA Today.* Available: http://www.usatoday.com/news/nation/2006-01-24-campus-deaths-cover_x.htm

Darkes, J., Greenbaum, P., & Goldman, M. (2004). Alcohol Expectancy Mediation of Biopsychosocial Risk: Complex Patterns of Mediation. *Experimental and Clinical Psychopharmacology,* Vol 12(1), 27-38.

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,* 1–12. doi:10.1046/j.1359-6357.2003.00586.x

Del Boca, F. K., Darkes, J., Greenbaum, P. E., & Goldman, M. S. (2004). Up close and personal: Temporal variability in the drinking of individual college students during their first year. *Journal of Consulting and Clinical Psychology,* 72, 155−164.

DeWit, D., Adlaf, E., Offord, D., & Ogborne, A. (2000). Age at First Alcohol Use: A Risk Factor for the Development of Alcohol Disorders. *Am J Psychiatry, 157,* 745–750

Enders, C. K. (2010). *Applied missing data analysis. New York: Guilford Publications.*

Frank, C., Thake, J., & Davis, C. (2012). Assessing the protective value of protective behavioral strategies. *Journal of Studies on Alcohol and Drugs, 73(5),* 839-843.

Fried, A. B., & Dunn, M. E. (2012). The Expectancy Challenge Alcohol Literacy Curriculum (ECALC): A single session group intervention to reduce alcohol use. *Psychology of Addictive Behaviors, 26*, 615–620. http://dx.doi.org/10.1037/a0027585

Foster, D. W., Dukes, K., Sartor, C. E. (2016). The road to drink is paved with high intentions: Expectancies, refusal self-efficacy, and intentions among heavy drinking college students. *Alcohol, 50,* 65-71.

Galen, L., & Rogers, W. (2004). Religiosity, alcohol expectancies, drinking motives and their interaction in the prediction of drinking among college students. *Journal of Studies on Alcohol, 65*, 469−476.

Garey, L., Prince, M., & Carey, K. (2011). Alcohol policy support among mandated college students. *Addictive Behaviors*, *36*(10), 1015-1018.

Gates, J. R., Corbin, W. R., & Fromme, K. (2016). Emerging Adult Identity Development, Alcohol Use, and Alcohol-Related Problems During the Transition Out of College. *Psychology of Addictive Behaviors. Advance online publication. http://dx.doi.org/10.1037/adb0000179*

Graham, J. W. (2003). Adding missing-data-relevant variables to FIML-based structural equation models. *Structural Equation Modeling, 10*(1), 80–100.

Grazioli, V. S., Lewis, M. A., Garberson, L. A., Fossos-Wong, N., Lee, C. M., & Larimer, M. E. (2015). Alcohol Expectancies and Alcohol Outcomes: Effects of the Use of Protective Behavioral Strategies. *Journal of Studies on Alcohol and Drugs, 76(3),* 452–458.

Greenfield, T. K., Harford, T. C., & Tam, T. W. (2009). Modeling cognitive influences on drinking and alcohol problems. *Journal of Studies on Alcohol and Drugs, 70(1),* 78-86.

Greenfield, T. & Rogers, J. (1999). Who drinks most of the alcohol in the US? The policy implications. *Journal of Studies on Alcohol, 60*, 78–89.

Grekin, E. R., & Sher, K. J. (2006). Alcohol dependence symptoms among college freshmen: Prevalence, stability and person environment interactions. *Experimental and Clinical Psychopharmacology*, 14, 329−338.

Grossbard, J. R., Mastroleo, N. R., Geisner, I. M., Atkins, D., Ray, A. E., Kilmer, J. R., Mallett, K., Larimer, M. E., Turrisi, R. (2016). Drinking norms, readiness to change, and gender as moderators of a combined alcohol intervention for first-year college students. *Addictive Behaviors*, 52, 75–82.

Gunzler D, Chen T, Wu P, Zhang H. 2013. Introduction to media- tion analysis with structural equation modeling. Shanghai Arch Psychiatry 25:390–394.

Ham, L. S., Bacon, A. K., Carrigan, M. H., Zamboanga, B., Casner, H. G. (2016). Social anxiety and alcohol use: The role of alcohol expectancies about social outcomes. *Addiction Research & Theory, Vol 24(1)*, 9-16.

Ham, L. S., & Zamboanga, B. (2008). Alcohol Expectancies and Context-Specific Drinking Behaviors among Female College Athletes. *Behav Ther., 39(2)*, 162-70.

Ham, L. S., Zamboanga, B., & Bacon, A. K. (2009). Drinking Motives as Mediators of Social Anxiety and Hazardous Drinking Among College Students. *Cognitive Behaviour Therapy 38, 3*, 133–145.

Harford, T. C., Yi, H. Y., & Hilton, M. E. (2006). Alcohol abuse and dependence in college and noncollege samples: A ten-year prospective follow-up in a national survey. *Journal of Studies on Alcohol, 67,* 803-809.

Harford, T. C.,Wechsler, H., & Seibring, M. (2002). Attendance and alcohol use at parties and bars in college: A national survey of current drinkers. *Journal of Studies on Alcohol*, 63, 726−733.

Hingson, R., Edwards, E., Heeren, T., & Rosenbloom, D. (2009). Age of drinking onset and injuries, motor vehicle crashes, and physical fights after drinking and when not drinking. *Alcoholism Clinical and Experimental Research, 33,* 783-790.

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.

Hoover, E. (2004). Alcohol arrests on campuses increased again in 2002. *The Chronicle of Higher Education,* A33.

Hutcheson, G., & Sofroniou, N. (1999). The Multivariate Social Scientist: an introduction to generalized linear models. Sage Publications.

IBM Corp., (2013). *IBM SPSS Statistics for Windows Version 22.0.* Armonk, NY: IBM Corp.

Ickes, M. J., Haider, T., Sharma, M., (2015). Alcohol abuse prevention programs in college students. *Journal of Substance Use, 20(3),* 208-227.

Jaccard, J. and Wan, C. (1996). *LISREL analyses of interaction effects in multiple regression.* Newbury Park: Sage.

Johnston, L. D., O'Malley, P. M., Bachman, J. G., & Schulenberg, J. E. (2013). Monitoring the future national survey results on drug use, 1975–2012. Volume II : College students and adults ages 19–50 . Ann Arbor, MI: Institute for Social Research, University of Michigan

Johnson, P., Richter, L., Kleber, H., McLellan, A., & Carise, D. (2005). Telescoping of drinking-related behaviors: Gender, racial/ethnic, and age comparisons. *Substance Use & Misuse*, *40*(8), 1139-1151.

Jones, B. T., Corbin, W., & Fromme, K. (2001). A review of expectancy theory and alcohol consumption. *Addiction, 96*, 57−72.

Jones, B. T. (2004). Changing Alcohol Expectancies: Techniques for Altering Motivations for Drinking. Handbook of motivational counseling: Concepts, approaches, and assessment, (pp. 373-387). New York, NY, US: John Wiley & Sons Ltd.

Kaplan, D., & George, R. (1995). A study of the power associated with testing factor mean differences under violations of factorial invariance. *Structural Equation Modeling: A Multidisciplinary Journal, 2,* 101-118.

Keough, M.T.; Battista, S. R.; O'Connor, R. M.; Sherry, S. B.; Stewart, S. H. (2015). Getting the party started—Alone: Solitary predrinking mediates the effect of social anxiety on alcohol-related problems. *Addictive Behaviors, Vol 55*, 19-24

Kline, R. (2011). Principles and practice of structural equation modeling. New York, NY: Guilford Press.

Knight, J. R., Wechsler, H., Kuo, M., Seibring, M., Weitzman, E.R., Schuckit, M. A. (2002). Alcohol abuse and dependence among U.S. college students. *Journal of Studies on Alcohol*, *63*(3), 263.

Kraft, D. P. (1988). The prevention and treatment of alcohol problems on a college campus. *Journal of Alcohol and Drug Education, 34,* 37–51.

Khoury, L., Tang, Y., Bradley, B., Cubells, J., & Ressler, K., (2010). Substance use, childhood traumatic experience, and Posttraumatic Stress Disorder in an urban civilian population. *Depress Anxiety, 27(12):* 1077–1086

Labbe, A., & Maisto, S. (2011). Alcohol expectancy challenges for college students: A narrative review. *Clinical Psychology Review, 31*(4), 673-683.

Labrie, J., Hummer, J., Huchting, K., & Neighbors, C. (2009). A brief live interactive normative group intervention using wireless keypads to reduce drinking and alcohol consequences in college student athletes. *Drug & Alcohol Review, 28(1),* 40-47.

LaBrie, J., Migliuri, S., Kenney, S., & Lac, A. (2010). Family history of alcohol abuse associated with problematic drinking among college students. *Addictive Behaviors 35,* 721 – 725

Labrie, J., Lac, A., Kenney, S., & Mirza, T. (2011). Protective behavioral strategies mediate the effect of drinking motives on alcohol use among heavy drinking college students: Gender and race differences. *Addictive Behaviors 36, 354–361.*

LaBrie, J., Napper, L., Grimaldi, E.. Kenney, S., & Lac, A. (2015). The Efficacy of a Standalone Protective Behavioral Strategies Intervention for Students Accessing Mental Health Services. *Prevention Science, 16(5),* 663-673.

Leeman, R. F., Kulesza, M., Stewart, D. W., & Copeland, A. L. (2012). Cluster analysis of undergraduate drinkers based on alcohol expectancy scores. *Journal of Studies on Alcohol and Drugs, 73,* 238–249.

Linden, A. N., Lau-Barraco, C., & Milletich, R. J. (2014). Protective behavioral strategies, alcohol expectancies, and drinking motives in a model of college student drinking. *Psychology of Addictive Behaviors, 28*(4), 952-959.

Litt, D. M.; Lewis, M. A.; Blayney, J. A.; Kaysen, D. L. (2013). Protective behavioral strategies as a mediator of the generalized anxiety and alcohol use relationship among lesbian and bisexual women. *Journal of Studies on Alcohol and Drugs, 74(1),* 168-174.

Little, R. J. A. (1988). A test of missing completely at random for multivariate data with missing values. *Journal of the American Statistical Association, 83(404), 1198-1202.*

Little, T. D., Cunningham, W. A., Shahar, G., & Widaman, K. F. (2002): To Parcel or Not to Parcel: Exploring the Question, Weighing the Merits, Structural Equation Modeling: A Multidisciplinary Journal, 9:2, 151-173

Luebbe, A., Varvel, S., & Dude, K. (2009). Reciprocal relations of protective behavioral strategies and risk-amplifying behaviors with alcohol-related consequences: Targets for intervention with female college students. , *53*(2), 7-30.

MacCallum, R. C.,Widaman, K. F., Zhang, S., & Hong, S. (1999). Sample size in factor analysis. *Psychological Methods, 4,* 84–99.

Madson, M. B., Moorer, K. D., Zeigler-Hill, V., Bonnell, M. A., & Villarosa, M. (2013). Alcohol expectancies, protective behavioral strategies, and alcohol-related outcomes: A moderated mediation study. *Drugs: Education, Prevention and Policy, 20(4),* 286-296

Martens, M. P., Kilmer, J. R., Beck, N. C., & Zamboanga, B. L. (2010). The efficacy of a targeted personalized drinking feedback intervention among intercollegiate athletes: A randomized controlled trial. *Psychology of Addictive Behaviors*, *24*(4), 660-669.

Mason, W. A., & Fleming, C. B. (2014). A more accurate approach to assessing alcohol use by self-report? *American Journal of Drug and Alcohol Abuse, 40 (6),* 422-423.

Mastroleo, N., Murphy, J., Colby, S., Monti, P., & Barnett, N. (2011). Incident-specific and individual-level moderators of brief intervention effects with mandated college students. *Psychology of Addictive Behaviors, 25(4),* 616-624.

McCabe, S. E., Schulenberg, J. E., Johnston, L. D., O'Malley, P. M., Bachman, J. G., & Kloska, D. D. (2005). Selection and socialization effects of fraternities and sororities on US college student substance use: A multi-cohort national longitudinal study. *Addiction,100*, 512−514.

McDonald, R. P., & Ho, M.-H. R. (2002). Principles and practice in reporting structural equation analyses. *Psychological Methods, 7(1),* 64-82.

Muthén, L. K., & Muthén, B. O. (1998-2015). Mplus: *Statistical Analysis with Latent Variables User's Guide (Seventh ed.)*. Los Angeles, CA: StatModel.

National Institute of Alcohol Abuse and Alcoholism, (2002). *Call to action: changing the culture of drinking on U.S. campuses*, Author, Washington, DC Report from the Task Force on College Drinking.

Neighbors, C., Lee, C. M., Lewis, M. A., Fossos, N., & Larimer, M. E. (2007). Are social norms the best predictor of outcomes among heavy- drinking college students? *Journal of Studies on Alcohol and Drugs, 68*, 556–565.

Nichter, M., Nichter, M., Carkoglu, A., & Lloyd-Richardson, E. (2010). Smoking and drinking among college students: "It's a package deal". Drug and Alcohol Dependence, 106, 16–20. doi:10.1016/j.drugalcdep.2009.07.025

Nicolai, J., Demmel, R., & Moshagen, M. (2010). The comprehensive alcohol expectancy questionnaire: Confirmatory factor analysis, scale refinement, and further validation. *Journal of Personality Assessment, 92(5)*, 400-409.

Obasi, E. M.; Brooks, J. J.; Cavanagh, L. (2016). The relationship between psychological distress, negative cognitions, and expectancies on problem drinking: Exploring a

growing problem among university students. *Behavior Modification, Vol 40(1-2),* 51-69

Oetting, E., & Beauvais, F. (1990). Adolescent drug use: Findings of national and local surveys. *Journal of Consulting and Clinical Psychology, 58,* 385-394.

Pabst, A., Kraus, L., Piontek, D., Mueller, S., & Demmel, R. (2014). Direct and indirect effects of alcohol expectancies on alcohol-related problems. *Psychology of Addictive Behaviors, 28(1),* 20-30. doi:10.1037/a0031984

Page, R., & O'Hegarty, M. (2006). Type of student residence as a factor in college students' alcohol consumption and social normative perceptions regarding alcohol use. *Journal of Child & Adolescent Substance Abuse*, *15*(3), 15-31.

Park, A., Sher, K., & Krull, J. (2008). Risky drinking in college changes as fraternity/ sorority affiliation changes: A person–environment perspective. Psychology of Addictive Behaviors, 22(2), 219–229.

Park, A., Sher, K., & Krull, J. (2009). Selection and socialization of risky drinking during the college transition: The importance of microenvironments associated with specific living units. *Psychology of Addictive Behaviors*, *23*(3), 404-414.

Paschall, M., Antin, T., Ringwalt, C., & Saltz, R. (2001). Effects of AlcoholEdu for College on Alcohol-Related Problems Among Freshmen: A Randomized Multicampus Trial. *Journal of Studies on Alcohol and Drugs, 72,* 642–650, 2011.

Pearson, M. R. (2013). Use of alcohol protective behavioral strategies among college students: A critical review. *Clinical Psychology Review, 33,* 1025–1040.

Pedersen, E. R., & LaBrie, J. W. (2008). Normative misperceptions of drinking among college students: A look at the specific contexts of prepartying and drinking games. *Journal of Studies on Alcohol and Drugs, 69,* 406–411.

Perkins, H. W. (2002). Surveying the damage: A review of research on consequences of alcohol misuse in college populations. *Journal of Studies on Alcohol, Supplement No. 14*, pp. 91-100.

Ray, A. E., Stapleton, J. L., Turrisi, R., & Mun, E.-Y. (2014). Drinking game play among first-year college student drinkers: An event-specific analysis of the risk for alcohol use and problems. The American Journal of Drug and Alcohol Abuse, 40(5), 353–358. http://doi.org/10.3109/00952990.2014.930151

Roberts, S., Siegel, M. B., DeJong, W., & Jernigan, D. H. (2014). A comparison between brand-specific and traditional alcohol surveillance methods to assess underage drinkers' reported alcohol use. *The American Journal of Drug and Alcohol Abuse. 40, (6)*

Schafer, J. L., & W.Graham, J. (2002). Missing data: Our view of the state of the art. *Psychological Methods, 7(2), 147-177. doi:10.1037/1082-989X.7.2.147*

Scheir, L. M., & Botvin, G. J. (1997). Expectancies as mediators of the effects of social influences and alcohol knowledge on adolescent alcohol use: A prospective analysis. *Psychology of Addictive Behaviors, 11,* 48−64.

Schweizer, C. A., Doran, N., Roesch, S.C., & Myers, M.G. (2011). Progression to problem drinking among Mexican American and White European first-year college students: a multiple group analysis. *Journal of Studies on Alcohol and Drugs, 72(6),* 975-80.

Scott-Sheldon, L., Carey, K., Kaiser, T., Knight, J., & Carey, M. (2016). Alcohol Interventions for Greek Letter Organizations: A Systematic Review and Meta-Analysis, 1987 to 2014. Health Psychology . Advance online publication. http://dx.doi.org/10.1037/ hea0000357

Scott-Sheldon, L., Terry, D., Carey, K., Garey, L., & Carey, M. (2012). Efficacy of expectancy challenge interventions to reduce college student drinking: A meta-analytic review. *Psychology of Addictive Behaviors: Journal of the Society of Psychologists in Addictive Behaviors, 26(3),* 393-405.

Scribner, R., Mason, K., Theall, K., Simonsen, N., Schneider, S. K., Towvim, L. G., et al. (2008). The contextual role of alcohol outlet density in college drinking. *Journal of Studies on Alcohol and Drugs, 69*, 112-120.

Soule, E.; Barnett, T.; Moorhouse, M. (2015). Protective behavioral strategies and negative alcohol-related consequences among US college fraternity and sorority members. Journal of Substance Use, Vol 20(1), Feb 2015, 16-21. http://dx.doi.org.libproxy.uoregon.edu/10.3109/14659891.2013.858783

Substance Abuse and Mental Health Services Administration. (2015). *Results from the 2014 National Survey on Drug Use and Health: Summary of National Findings, NSDUH Series H-46, HHS Publication No. (SMA) 13–4795.* Rockville, MD: Substance Abuse and Mental Health Administration.

Sugai, G., & Horner, R. (2010). School-wide positive behavior supports: Establishing a continuum of evidence-based practices. *Journal of Evidence-Based Practices for Schools*, *11*(1), 62-83.

Tatarsky A. (2003). Harm reduction psychotherapy: Extending the reach of traditional substance use treatment. *Journal of Substance Abuse Treatment, 25,* 249–256.

Terlecki, M. A., Larimer, M. E., & Copeland, A. L. (2010). Clinical outcomes of a brief motivational intervention for heavy drinking mandated college students: A pilot study. *Journal of Studies on Alcohol and Drugs, 71*, 54-60.

Theall, K., DeJong, W., Scribner, R., Mason, K., Schneider, S., et al. (2009). Social capital in the college setting: The impact of participation in campus activities on drinking and alcohol-related harms. *Journal of American College Health*, *58*(1), 15-25.

Toomey, T. L., Lenk, K. M., & Wagenaar, A. C. (2007). Environmental policies to reduce college drinking: An update of research findings. *Journal of Studies on Alcohol and Drugs, 68*, 208-219.

Turrisi, R., Wiersma, K. A., & Hughes, K. K. (2000). Binge-drinking- related consequences in college students: Role of drinking beliefs and mother-teen communications. *Psychology of Addictive Behaviors, 14,* 342–355.

Tyne, K., Zamboanga, B. L., Ham, L. S., Olthuis, J. V., Pole, N., (2011). Drinking motives as mediators of the associations between alcohol expectancies and risky drinking behaviors among high school students. *Cognitive Therapy and Research, 36,* 756-768.

U.S. Department of Health and Human Services. (2007). *The Surgeon General's call to action to prevent and reduce underage alcohol use*. Rockville, MD: Public Health Service, Office of the Surgeon General.

U.S. Department of Health and Human Services. (2000). (conference ed.). *Healthy People 2010, Vol. II* (pp. 26– 29). Washington, DC7 US Department of Health and Human Services.

Walters, S., Roudsari, B., Vader, A., & Harris, T. (2007). Correlates of protective behavior utilization among heavy-drinking college students. *Addictive Behaviors, 32, 2633−2644.*

Wechsler, H., Davenport, A., Dowdall, G., Moeykens, B., & Castillo, S. (1994). Health and behavioral consequences of binge drinking in college: A national survey of students at 140 campuses. *Journal of the American Medical Association, 272*, 1672-1677.

Wechsler, H., L., Nelson, T. F., & Kuo, M. (2002). Underage college student's drinking behavior, access to alcohol, and the influence of deterrence policies. *Journal of American College Health, 50,* 223– 236.

Wechsler, H., Kuo, M., Seibring, M., Nelson, T. F., & Lee, H. (2002). Trends in college binge drinking during a period of increased prevention efforts: Findings from 4 Harvard School of Public Health College Alcohol Study surveys: 1993–2001. *Journal of American College Health, 50,* 203– 217.

Wechsler, H., Nelson, T. F. (2008). What we have learned from the Harvard School of Public Health College Alcohol Study: Focusing attention on college student alcohol consumption and the environmental conditions that promote it. *Journal of Studies on Alcohol and Drugs 69(4)*: 481–490, 2008.

Weitzman, E.R. & Nelson, T.F. (2004) College student binge drinking and the "prevention paradox": Implications for prevention and harm reduction. *Journal of Drug Education*, 34**:** 247-266.

White, A. M., Kraus, C. L., & Swartzwelder, H. S. (2006). Many college freshmen drink at levels far beyond the binge threshold. *Alcoholism, Clinical and Experimental Research, 30,* 1006−1010.

White, H. R., Bates, M. E. & Johnson, V. (1990). Social reinforcement and alcohol consumption, in: COX, W. M. (Ed.) *Why People Drink: parameters of alcohol as a reinforcer* (New York, Gardner Press).

White, A., & Hingson, R., (2013). The Burden of Alcohol Use: Excessive Alcohol Consumption and Related Consequences Among College Students. *Alcohol Research: Current Reviews. 35(2),* 201-218.

White, H., McMorris, B., Catalano, R., Fleming, C., Haggerty, K., & Abbott, R. (2006). Increases in alcohol and marijuana use during the transition out of high school into emerging adulthood: The effects of leaving home, going to college, and high school protective factors. *Journal of Studies on Alcohol*, *67*, 810−822.

Wilcox, R. (2003). Applying contemporary statistical techniques. San Diego: Academic Press.

Wood, M. D., Read, J. P., Mitchell, R. E., & Brand, N. H. (2004). Do parents still matter? Parent and peer influences on alcohol involvement among recent high school graduates. *Psychology of Addictive Behaviors, 18*, 19−30.

Zamboanga, B., & Ham, L. (2008). Alcohol expectancies and context-specific drinking behaviors among female college athletes. *Behavior Therapy*, *39*(2), 162.

Zamboanga, B., Schwartz, S. , Ham, L. , Borsari, B. , & Van Tyne, K. (2010). Alcohol expectancies, pregaming, drinking games, and hazardous alcohol use in a multiethnic sample of college students. *Cognitive Therapy & Research*, *34*(2), 124-133.