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Understanding Alcohol Use Trajectories from Adolescence to Young Adulthood: A Bioecological Approach

Jacqueline A. Bonsu
University of Kentucky, jabonsu@gmail.com
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UNDERSTANDING ALCOHOL USE TRAJECTORIES
FROM ADOLESCENCE TO YOUNG ADULTHOOD:
A BIOECOLOGICAL APPROACH

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DISSERTATION

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A dissertation submitted in partial fulfillment of the
requirements for the degree of Doctor of Philosophy in the
College of Arts & Sciences at the University of Kentucky

By

Jacqueline Adobia Bonsu

Lexington, Kentucky

Director: Richard Milich, Ph.D., Provost's Distinguished Service Professor of Psychology

Lexington, Kentucky

2016

ABSTRACT OF DISSERTATION

UNDERSTANDING ALCOHOL USE TRAJECTORIES
FROM ADOLESCENCE TO YOUNG ADULTHOOD:
A BIOECOLOGICAL APPROACH

The current study sought to better understand how alcohol use patterns develop over the transition to young adulthood by taking a bioecological approach in examining the joint influence of contextual and individual factors on drinking behaviors. Using a longitudinal design to include many factors that likely play key roles in this highly sensitive developmental period (e.g., peer norms, social activities, personality traits, access and exposure to substances), both mean levels of these variables and their change over time were considered in relation to alcohol use trajectories (AUTs). Participants were 525 students ages 18 to 25 recruited from the introductory psychology subject pool, who completed a larger battery of self-report measures and a structured interview assessing substance use annually for three years. Using Derefinko et al.'s (in press) group-based AUTs developed from the substance use interviews, individual differences and contextual factors were used to describe each AUT group and to determine what combination of factors predisposes one to membership in particular AUT groups using multinomial logistic regression analyses. Results indicated that, separately, each contextual and individual difference factor impacted the probability of drinking in some significant fashion; however, when examined together from a bioecological approach and with potential moderators, only a few key associations remained. Findings indicated that sensation seeking, enhancement motives, peer drinking, peer binge drinking, and access to a fake ID were significantly associated with shifting out of the Nil-to-Low AUT group. Evidence for significant moderating effects was also found for sensation seeking and peer drinking, sensation seeking and perceived peer approval of drinking, and lack of premeditation and peer binge drinking. Implications for prevention and intervention efforts for adolescents and young adults are discussed.

KEYWORDS: Alcohol Use, Trajectories, Young Adulthood, Individual
Differences, Social Context

Jacqueline Adobia Bonsu

October 13, 2016

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By

Jacqueline Adobia Bonsu

Richard Milich, Ph.D.

Director of Dissertation

Mark T. Fillmore, Ph.D.

Director of Graduate Studies

October 13, 2016

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Chapter One: Introduction

Drinking Patterns in Adolescence and Emerging Adulthood

Young or emerging adulthood, the period from ages 18 to 25 (Arnett, 2000; Jackson, Sher, & Schulenberg, 2008), is ripe with developmental, environmental, and social changes that, taken together, likely increase alcohol use risk (Schulenberg & Maggs, 2002). This period overlaps with the college years, which are marked with the highest levels of alcohol consumption and problems as well as the highest prevalence of alcohol use disorders (Corbin, Iwamoto, & Fromme, 2011; Jackson, Sher, & Park, 2005). As the nature of the behavior itself changes over these periods, so the characteristics that determine long-term trajectories are also likely to change (Littlefield, Sher & Steinley, 2010; Jackson, Sher, & Park, 2005; Maggs & Schulenberg, 2004). As responsibilities and important decisions increase, supervision and external monitoring decrease; as residential and social environments change, so does pressure to be independent and successful. Thus, there is a critical need to identify risk factors during this transition and understand the processes and mechanisms through which patterns of hazardous drinking emerge.

While several distinct patterns of alcohol use are known to emerge over the course of adolescence, the preceding developmental period, less is known about how these trajectories continue though young adulthood. The most commonly identified trajectories across the literature include low or non-drinkers, individuals who consistently do not drink at all or do so in very small amounts; moderate or experimental drinkers, those who consistently engage in intermediate levels of drinking or briefly experiment with drinking then desist; and heavy drinkers, those who steadily increase from drinking in low to high quantities or frequencies or begin drinking at high levels and continue

doing so (Masten et al., 2009; Adams et al., in press). Notably, these trajectories appear to be relatively stable across time and are differentially associated with a variety of outcomes, including polysubstance use, alcohol use disorders, risky or unsafe sex, legal and academic trouble, as well as alcohol-related car accidents, injuries, and deaths (Dawson et el., 2004; Hersh & Hussong, 2006; Flory et al., 2004).

Individual Differences

With regard to predictors, impulsivity and its related facets have consistently been linked to substance use in young adulthood, as have drinking motives, drinking expectancies, aggression, and delinquent behavior (e.g., Adams et al., 2012; Corbin, Iwamoto & Fromme, 2011; Dick et al., 2010; Lejuez et al., 2010). Studies of associations between personality traits and alcohol use have often identified particular traits as risk factors for harmful use, including impulsivity. Impulsivity and its related facets, negative and positive urgency, lack of planning, lack of perseverance, and sensation seeking, have consistently been linked to substance use in young adulthood (e.g. Dick et al., 2010; Moeller & Dougherty, 2002; Lejuez et al., 2010). Novelty and sensation seeking traits have been associated with higher alcohol use in adolescents and during college, while early behavioral disinhibition predicted early onset of alcohol use in adolescents (Anderson et al., 2005). Emerging research has also found that impulsivity is bidirectionally associated with substance abuse, such that individuals' impulsive characteristics predicts higher rates of substance use and abuse, and engaging in high substance use and abuse predicts increases in impulsivity (Kaiser et al., 2016; Moeller & Dougherty, 2002). Additional risk factors for and correlates of alcohol use include motives, expectancies, aggression, delinquent behavior, family and peer norms, academic

performance, and social involvement (Adams et al., 2012; Chassin et al. 2002; Schulenberg et al., 1996; Tucker, Orlando, & Ellickson, 2003).

A Bioecological Approach

Bronfenbrenner's (2005) bioecological theory of human development asserts that human beings function as developing individuals within a multilevel ecological system. These interrelated levels produce dynamic changes across development such that the individual's characteristics operate as both predictors and products of development. Bronfenbrenner advocated examining outcomes and development as a function of personal characteristics, ongoing processes, the relevant context, and time, using what he termed the person-process-context-time, or PPCT, model. This provides a more comprehensive and realistic experimental model of how the outcomes occur throughout life. Further, this allows for the likely occurrence of multiple factors or dimensions effecting change at the same time.

In line with this theoretical model of research, tobacco researchers have recently led the efforts of incorporating these multiple dimensions of development in scientific inquiries (e.g., Cook, 2003; Wilcox, 2003). While much of the alcohol literature focuses on identifying various individual difference variables, or person characteristics, that contribute to alcohol use and abuse, or on exploring contextual factors in a singular fashion, this recent research on the development of tobacco use patterns in youth serves as an example that a more integrative approach is necessary in order to fully account for factors that determine behavior. Findings indicated that contextual factors, including peer use, norms, and availability and access to substances, influence whether youth initiate or increase in tobacco use directly, through exposure or modeling, and indirectly, through

moderating the roles of media influence, substance use motives, or particular individual characteristics on smoking behavior (Kobus, 2003; Wilcox, 2003). This expanded understanding of contributors to tobacco use would likely play an important role in identifying targets for reduction interventions and policies that would address both the direct and indirect pathways to tobacco use (Chaloupka, 2003). For example, policies that focus on limiting youth access to tobacco products in stores may have a limited effect on actual smoking behavior as youth likely will still have access through smoking peers or family members or by using fake IDs (Liang et al., 2003).

This transition to integrative approaches to studying substance use serves as a model for the current study. The current study seeks to continue the efforts of these tobacco researchers by adopting an ecological approach to understanding alcohol use patterns as a function of multiple dimensions of development, including personality, motives, expectancies, social contexts, and access to and availability of alcohol, that have been established as playing an important role during the transition from adolescence to adulthood (e.g., Kaiser et al., 2016; Littlefield, Sher & Steinley, 2010; Neighbors et al., 2007).

Preliminary Studies

A project originating from this same existing dataset examined the trajectory groups for alcohol, marijuana, and hard drug use over the same developmental period of interest of the proposed study – adolescence to emerging adulthood (Derefinko et al., in press). A pattern-centered approach to understanding the data specified a five-group trajectory model for alcohol use across this longitudinal period; namely Nil-To-Low users, Experimenters, Moderate users, Late-Onset High users, and Early-Onset High

users (see Figure 1.1). That trajectory model was utilized in the current study to examine the role of identified individual difference and contextual factor correlates.

In addition to identifying the five-group alcohol use trajectory model, Derefinko et al. (in press) also compared the groups based on personality and antisocial behavior variables. Results indicated that abstainers or minimal drinkers reported a generally adaptive pattern of traits and behaviors; namely, members of the Nil-to-Low group were highly conscientious individuals who were intentional, introverted, and averse to taking risks or engaging in deviant behavior. Both Early- and Late-Onset High drinkers, in contrast, tended to be more disagreeable, impulsive, and violent individuals.

Current Study

The current study sought to better understand how alcohol use patterns develop over the transition to young adulthood by taking a bioecological approach in examining the joint influence of contextual factors and individual differences on drinking behaviors. This study aimed not only to describe the AUT groups in terms of important risk factors and contexts, such as impulsivity, maladaptive drinking motives and expectancies, and exposure to frequent alcohol use, but also to examine how these factors increase or decrease one's likely trajectory during these formative years. This would expand upon Derefinko et al.'s findings by considering additional metacognitive (e.g., drinking motives and expectancies) and external factors (e.g., social norms, extracurricular activities, access to alcohol) and their additive and multiplicative effects on AUT group membership. In sum, this investigation aimed to examine how individual differences and contextual factors characterize and are associated with the trajectories of alcohol use over the transition from adolescence to young adulthood.

A longitudinal design seemed best suited to undertake this exploration as it was able to encompass many factors that likely play key roles in this highly sensitive developmental period, such as peer norms, social activities, personality traits, as well as access and exposure to substances. Young adults at a public university were recruited to the study as freshman and were assessed annually over a three-year period. This multiyear design was important in being able to capture the many potential developmental changes and allowed for specific examination of how these factors of interest interact over time in influencing drinking patterns. This study served as an important step in further understanding this critical developmental period in terms of the joint effects of these factors rather than separately exploring the influence of individual differences or context.

Study Aims and Hypotheses

The specific aims of this study were three-fold: (1) model contextual factors (e.g., peer use & norms, access to alcohol, Greek life status, living situation) and individual difference factors (e.g., impulsive personality traits, drinking motives, drinking expectancies) as both the mean level and the net change over the first three years of college, (2) examine how variations on identified contextual and individual difference factors affect the probability of membership in the established alcohol use trajectory (AUT) groups, and (3) examine how these contextual factors interact with individual difference factors in influencing drinking patterns.

Related hypotheses were as follows. Impulsivity, drinking motives and drinking expectancies will emerge as risk factors for heavier drinking patterns over time, as shown in previous literature. Furthermore, individuals with more access to alcohol or in

environments wherein alcohol use is more normative will also report higher levels of alcohol use. For example, individuals who report having easy access to alcohol or fake IDs to purchase alcohol will likely be in the high user trajectory groups, as will individuals with continued exposure to high peer drinking. The effects of risky contexts for problematic drinking trajectories may magnify the effects of impulsive personality traits and maladaptive drinking motives and expectancies. For instance, individuals reporting more favorable descriptive and injunctive social norms in addition to having high levels of social or conformity drinking motives and positive drinking expectancies will be more likely to be in high user AUT groups than their counterparts. Adaptive drinking norms and social engagement may buffer effects of risky individual differences. Individuals engaged in academic or non-Greek organizations or in peer groups with low drinking norms, will be associated with the nil-to-low use AUT group even if impulsivity or drinking motivation is high.

Figure 1.1 Derefinko et al.'s (in press) Alcohol Use Trajectories.

ALCOHOL TRAJECTORIES

- Group 1: Nil to Low Drinkers (27.3%)
- Group 2: Moderate Drinkers (31.2%)
- Group 3: Experimenters (13.5%)
- Group 4: Late Onset Heavy Drinkers (15.7%)
- Group 5: Early Onset Heavy Drinkers (12.3%)
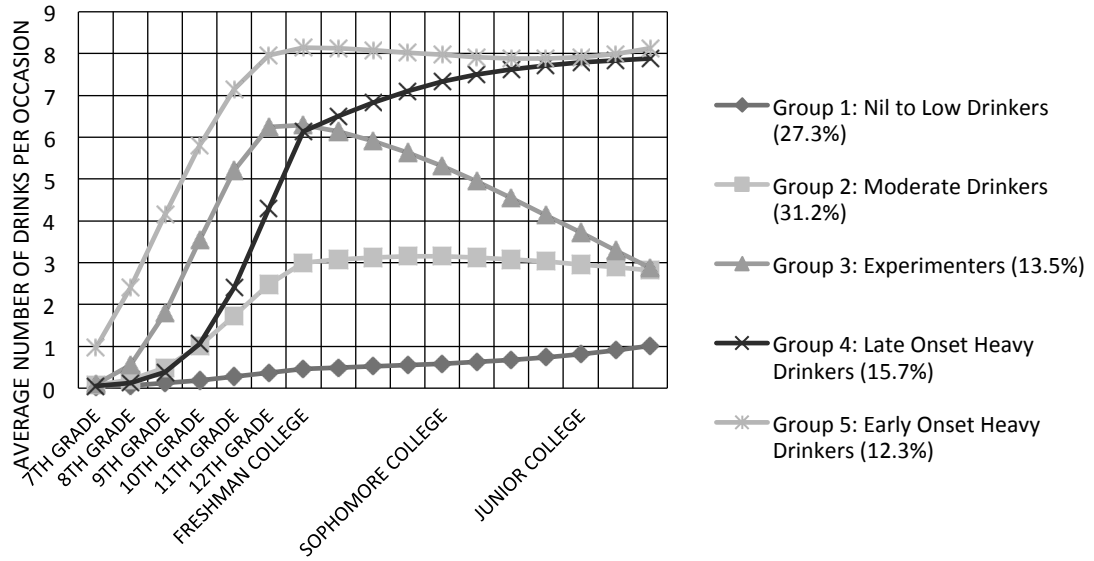
Chapter Two: Methods

Participants

The participants of this study included 525 18- to 26-year-old (*M*=18.94 years, *SD*=0.77) college students (48% male) from a public university in the south-central region of the United States. Participants were recruited in two cohorts, one year apart, from the introductory psychology research pool, to participate in the three wave longitudinal study. The sample was 81% Caucasian, 12% African-American, 3% Asian-American, 2% Hispanic-American, and 2% "Other" in ethnicity.

Screening Procedure

A screening questionnaire, which was administered during a mass screening in each introductory psychology classes during the first two weeks of the semester, was used in order to enhance the sample to capture a fuller range of externalizing behaviors and substance use by identifying "high risk" individuals based on their report of participating in delinquent behaviors during high school (Harford & Muthén, 2000; Kuperman et al., 2001). "High risk" participants were those with questionnaire scores in the top 25% for their gender and were specifically invited to participate in the study through an email invitation. Those oversampled using this screening procedure comprised 23.1% or the final sample, the remainder of which was comprised of individuals ordinarily recruited through the psychology research pool.

Procedure

Data collection occurred in individual sessions, lasting approximately 2.5 hours. As the study was longitudinal, participants were assessed annually for the first three years of college. At each session, participants first provided informed consent to participate in

the study and were briefly tested to ensure sobriety. Participants then completed a battery of self-report questionnaires and structured interviews. At the conclusion of the first session, participants received course credit and monetary compensation for their participation; for the second and third sessions, participants were only compensated monetarily. The study was approved by the Institutional Review Board (IRB) of the university and granted a Certificate of Confidentiality.

Measures

Alcohol Use Patterns.

      Trajectory groups. Participant trajectory groups were established in a previous study (Derefinko et al., in press) using data collected with the Life History Calendar (LHC; Caspi et al., 1996). This measure has been proven reliable as a method of obtaining retrospective data and valid as an indicator prospective behavior, including participants' alcohol use, with average kappas of 0.46-0.57 in longitudinal studies of substance use and outcomes (Flory et al., 2004; Miller, Lynam, Widiger, & Leukefeld, 2001). For the current study, participants filled out the LHC on the computer, with the assistance of a trained experimenter, about their drinking behaviors dating back to fall of 7th grade. Using participants' reported frequency and average amount of alcohol consumption, their average weekly alcohol use was computed and used to model the developmental trajectory groups from age 13 through the first three years of college. The derived groups included Nil-To-Low users, Experimenters, Moderate users, Late-Onset High users, and Early-Onset High users.

Individual difference factors.

Impulsive personality traits. The UPPS-P Impulsive Behaviors Scale (Lynam et al., 2006; Whiteside & Lynam, 2001; see Appendix E), a 59-item self-report inventory, was used to assess Positive Urgency (tendency to act rashly while experiencing positive affect), Negative Urgency (tendency to act rashly while experiencing negative affect), Sensation Seeking (tendency to enjoy/pursue novel experiences), (lack of) Premeditation (tendency to act without adequate consideration of potential outcomes), and (lack of) Perseverance (inability to follow through with boring or difficult tasks). Participants provided responses to items using a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). This measure demonstrated good internal consistency reliability, with Cronbach's alphas ranging from 0.82-0.86, and test-retest reliability, with Pearson correlations ranging from 0.58-0.80, across the three waves.

Drinking motives. The Drinking Motives Questionnaire (DMQ; Cooper, 1994; see Appendix C), a 25-item measure, was used to assess individuals' motives for alcohol use across four subscales (coping, enhancement, social, and conformity), which have been differentially associated with drinking frequency and problems (e.g., Adams et al. 2012). Participants indicated how often they engaged in alcohol use for provided reasons on a 5-point scale ranging from 1 (never/almost never) to 5 (almost always/always). Sample items for each subscale include: "to forget your worries," "because it's exciting," "to be sociable," and "so you won't feel left out," respectively. This measure demonstrated excellent internal consistency, with Cronbach's alphas ranging from 0.94-0.96, and mostly good test-retest reliability, with Pearson correlations ranging from 0.48-0.75 across the three waves.

Drinking expectancies. The Alcohol Expectancy Multi-Axial Assessment (AEMAX; Goldman & Darkes, 2004; see Appendix A), a 24-item measure, was used to assess individuals' global expectations for alcohol use across four expectancy factors, arousing, sedating, positive, and negative, which predict current and future drinking behavior. Participants were presented with the phrase "Drinking alcohol makes one…" and various one word choices to complete the sentence. Participants then rated their agreement with the completed phrase on a 5-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). This measure demonstrated good internal consistency, with Cronbach's alphas ranging from 0.84-0.86, and moderate test-retest reliability, with Pearson correlations ranging from 0.43-0.62, across the three waves.

Social context factors.

Peer alcohol use. The Peer Substance Use Questionnaire (see Appendix D; items in bold were analyzed in current study), a 126-item measure developed specifically for this project, was used to assess descriptive and injunctive peer drug use norms. Participants were asked to consider their three closest friends and report on each friend's use of various substances, including alcohol (e.g., on average, how often does he/she drink? Does he/she ever "binge" drink? [i.e., have five or more drinks in the course of an hour or two?]), as well as how each friend would feel if the participant used the substances (e.g., how harmful does he/she think drinking alcohol is? How does/would he/she feel about you drinking alcohol?). Responses for the three friends were significantly correlated ($p<0.05$). Responses for same items were averaged across the three friends, providing a single score for each item type. Of interest to the current study were endorsed drinking, average amount of alcohol consumed, endorsed binge drinking,

peers' perceived harmfulness of drinking, and peers' perceived approval of subject's drinking.

Social environment. The College Life Questionnaire (CLQ; see Appendix B; items in bold were analyzed in current study) is an 18-item measure developed specifically for this project in order to assess extracurricular activities, Greek life status, access to a fake ID, setting of alcohol use, and ease of access to alcohol. It should be noted that this measure was only administered one time, contemporaneously for the two cohorts. This means that, since their waves were staggered by a period of one year, these data were collected during wave 2 for cohort 1 but wave 1 for cohort 2.

Data Analyses

Standard descriptive analyses and an Analysis of Variance (ANOVA) were employed using SPSS statistical software to describe participants and compare means based on AUT group. Multinomial logistic regression (MLR) analyses were conducted using PROC CATMOD in SAS statistical software to predict probability of group trajectory membership based on contextual and individual difference factors. Though testing multiple relationships increases the likelihood of type I error, each variable in the model is theory-driven so it is acceptable to maintain alpha at the 0.05 level.

First, mean level and net change variables were computed and standardized to describe the patterns of individual differences and context for participants over the three years of data collection. Next, models examining the overall probability of AUT group membership in relation to the mean level and net change of each set of variables of interest (i.e., separate MLR models were computed for impulsivity, motives, social environment, etc. in order to avoid multicollinearity). Significant associations were

retained for a subsequent multivariate model of individual difference and contextual factor associations with AUT group membership. Finally, interactions between individual differences and contextual factors were examined by including moderation, or crossed, effects of each combination of individual difference and contextual factors in the multivariate model (i.e., significant impulsivity variables crossed with significant peer use and social environment variables). Again, significant associations were retained for a final bioecological model incorporating main and crossed effects of individual differences and contextual factors. In this way, backwards elimination was used to determine the most parsimonious models to maximize interpretability and minimize inflation of standard error, yielding the final model estimating the probability of AUT group membership as a function of individual differences, context, and their interactions.

Chapter Three: Results

Attrition

Of the 525 participants, 299 (57%) participated in all three waves of data

collection, 111 (21%) participated in two waves, and 115 (22%) participated in only one

wave. Analyses were conducted to determine whether attrition was related to

demographics or variables of interest. Discontinuing data collection was not significantly

associated with any individual difference variables, and was only associated with

contextual variables assessing ease of obtaining alcohol and participation in "other"

campus organizations (F=4.740, p=0.009; F=6.689, p=0.001, respectively). Given the

longitudinal nature of the study's variables of interest, only data from participants who

participated in at least two waves were included in analyses, resulting in a study sample

of 410 participants. Missing data for these participants were then imputed using the

PROC MI multiple imputation function in SAS statistical software, resulting in five

separate sets of complete data for the 410 participants. Model analyses were conducted

for each imputation data set and subsequently aggregated to produce the final results.

Aim 1: Modeling Contextual and Individual Difference Variables

All identified and computed variables were standardized (M=0.00, SD=1.00) such

that one unit on any predictor variable is equivalent to one standard deviation.

Descriptive statistics for each AUT group, including distributions, means and standard

deviations, are presented in Table 3.1.

Of the 410 participants included in the final study sample, 111 (27.1%) were

assigned to the Nil-to-Low AUT group, 126 (30.7%) to the Moderate group, 53 (12.9%)

to the Experimenters group, 69 (16.8%) to the Late-Onset High group, and 51 (12.4%) to

the Early-Onset High group. It should be noted that this group distribution differs only slightly from that of the full 525-participant sample utilized by Derefinko et al. (in press; e.g., 27.3, 31.2, 13.5, 15.7, and 12.3%, respectively).

In most cases, a significant general pattern of incrementally more maladaptive behavior or traits was observed across the AUT groups. For example, the mean level of negative urgency was highest for individuals in the Early-Onset High group, followed by the Late-Onset High, Experimenter, Moderate and Nil-to-Low groups. Early-Onset High drinkers tended to be the most impulsive, have the most maladaptive drinking expectancies and motives, and report the most drinking behavior and approval among their peers, membership in Greek organizations, ease of access to alcohol and access to a fake ID than individuals in other AUT groups, especially compared to those in the Nil-to-Low group.

Aim 2: Probability of AUT Group Membership Based on Identified Variables

Five separate MLR models were tested estimating the probability of AUT group membership for each individual difference and contextual factor (see Table 3.2 for relevant statistics; for brevity, variables that did not produce significant changes in AUT group membership at the $p<0.05$ level are not included in the text). In all cases, the Nil-to-Low group served as the reference category. For ease of exposition, odds-like quantities will be referred to as relative odds or probabilities, but it is to be understood that, strictly speaking, they are not simple odds or probabilities but ratios of the probability of being in a given group relative to the probability of being in the Nil-to-Low group.

Impulsivity. Of the five included forms of impulsivity modeled as ten variables to examine mean levels and net change over three years, positive urgency, sensation seeking, and lack of premeditation significantly influenced the probability of AUT membership in the following ways. A one-unit increase in mean levels of positive urgency, holding fixed the levels of all other impulsivity variables in the model, more than doubled the odds for membership in the Early-Onset High AUT. A one-unit increase in mean levels of lack of premeditation magnified the membership odds for all AUT groups, doubling the odds for the Early-Onset High and Experimenter groups. A one-unit increase in mean levels of sensation seeking magnified the membership odds for all AUT groups except the Moderate group, more than doubling the odds for the Late-Onset High group. A one-unit increase in net change in sensation seeking (e.g., overall difference in sensation seeking from the first year to the third year) was relevant only for *decreasing* the odds for membership in the Experimenters AUT group compared to the Nil-to-Low AUT group.

Drinking Motives. Being motivated to drink alcohol in hopes of obtaining social rewards and in order to enhance one's positive mood significantly affected the probability of being in certain AUT groups. A one-unit increase in mean levels of social motives, holding all other modeled variables at their means, was estimated to produce a more than five-fold increase in the odds for membership in the Early-Onset High group and more than double the odds for being in the Late-Onset High or Moderate groups. A one-unit increase in mean levels of enhancement motives was estimated to considerably multiply the AUT group membership odds for all AUT groups, most notably increasing the odds for Early-Onset High by a factor of 21.08. A one-unit increase in net change in

enhancement motives was relevant only for *decreasing* the odds for membership in the Experimenters AUT group compared to the Nil-to-Low AUT group.

Drinking Expectancies. Expecting alcohol to have arousing or negative effects was significantly associated with moving out of the Nil-to-Low AUT group. A one-unit increase in mean levels of arousing expectancies was estimated to multiply the odds of being in all AUT groups. A one-unit increase in mean levels of negative expectancies was estimated to *decrease* the odds of being in all AUT groups. A one-unit increase in net change in negative expectancies was relevant only for the Early-Onset High and Late-Onset High groups, more than doubling the associated odds.

Peer Alcohol Use. Of the five descriptive and injunctive drinking norms variables, peer drinking, binge drinking, and perceived approval of drinking were significantly associated with the probability of AUT group membership in the following ways. Regarding whether one perceived their three closest friends to drink alcohol at all, a one-unit increase in mean levels of peer drinkers was estimated to *decrease* the odds of being in the Moderate AUT group. It should be noted that the item was keyed such that *higher* scores meant *fewer* friends drank alcohol; therefore, this result actually signifies that the likelihood of being in the Moderate AUT group compared to the Nil-to-Low AUT group decreased the *less* one's close friends drink. A one-unit increase in perception of peer binge drinkers (e.g., higher values again mean that fewer friends are perceived binge drinkers) was estimated to decrease the odds of being in the Early-Onset High, Late-Onset High, and Experimenters groups. A one-unit increase in mean levels of perceived peer approval of drinking (e.g., *higher* scores indicate *stronger* perceived peer

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agreement with one's decision to drink alcohol) was estimated to multiply the odds for membership in the Early-Onset High and Late-Onset High groups.

Social Environment. Several aspects of the college social environment were significantly associated with the probability of AUT group membership. Participation in Greek organizations was estimated to multiply the AUT group membership odds for all AUT groups per one-unit increase. Participation in non-Greek/athletic organizations was estimated to *decrease* the odds of being in the Experimenters AUT group per one-unit increase. A one-unit increase in difficult access to alcohol was estimated to *decrease* the odds of being in the Early-Onset High and Late-Onset High AUT groups. A one-unit increase in distal drinking sites was estimated to multiply the odds of being in the Early-Onset High group and the Experimenters group. A one-unit increase in having a fake ID was estimated to multiply the AUT group membership odds for all AUT groups.

Bioecological Model of AUT Group Membership. One MLR model was tested estimating the probability of AUT group membership for all of the aforementioned individual difference and contextual variables identified as significant (see Table 3.3 for all relevant statistics). Probability of being in the Early-Onset High group increased with increasing mean levels of sensation seeking, enhancement motives, and access to a fake ID, and decreased when more friends were perceived as abstaining from drinking or binge drinking. Membership in the Late-Onset High group was more likely with increasing mean levels of sensation seeking and enhancement motives, and was less likely when more friends were perceived as abstaining from binge drinking. Probability of being in the Experimenters group increased with increasing mean levels of enhancement motives, and decreased when engaged in non-Greek/athletic organizations

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and when more friends were perceived as abstaining from drinking or binge drinking. Membership in the Moderate group was more likely with increasing mean levels of social motives, enhancement motives, and distal drinking sites, and was less likely when more friends were perceived as abstaining from drinking.

Aim 3: Interacting Effects on AUT Group Membership

In order to examine potential interactions between the various significant individual difference and contextual factors, three models were estimated to cross each of the three types of individual difference variables with both types of contextual variables (see Table 3.4). In a similar process as reported above, significant associations from these three models were retained for a final bioecological model, which highlighted the incremental predictive utility of several variables.

The effect that changing the mean levels of sensation seeking had on the probability of being in the Early-Onset High group was further moderated by changes in perceived peer approval of drinking and participation in non-Greek/athletic organizations. For example, when individuals were average on these two contextual factors, a one-unit increase in sensation seeking multiplied the relative probability of being in the Early-Onset High AUT group by an estimated factor of 10.10. However, when individuals were one-standard deviation increase in peer approval or in participation in non-Greek/athletic organizations, the effect of being one standard deviation above average in sensation seeking multiplied the probability of being in the Early-Onset High AUT group by a factor of 2.83 or 38.38, respectively. A significant interaction between mean levels of sensation seeking and participation in non-Greek/athletic organizations also moderated the probability of being in the Late-Onset High group in a similar fashion, changing the

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estimated odds-like quantity from 3.24 to 12.33; while a significant interaction between

mean levels of sensation seeking and perceived peer approval of drinking moderated the

probability of being in the Experimenters group, changing the estimated odds-like

quantity from 1.32 to 0.33. The effect of a one-unit increase in lack of premeditation on

being in the Late-Onset High and Moderate groups was significantly magnified by a one-

unit increase in friends perceived as abstaining from binge drinking (changing the

estimated odds-like quantities from 0.59 to 2.44 and 0.64 to 2.43, respectively). The

effect of a one-unit increase in lack of premeditation on being in the Experimenters group

was significantly diminished by a one-unit increase in difficult access to alcohol

(changing the estimated odds-like quantity from 1.93 to 0.89).

The effect of social motives on the probability of being in the Late-Onset High

group was diminished by one-unit increases in drinking site and perceived peer drinking

(changing the estimated odds-like quantity from 0.14 to 0.022 and 0.020, respectively).

The effect of arousing drinking expectancies on the probability of being in the Early-

Onset and Late-Onset High groups was diminished by a one-unit increase in difficult

access to alcohol (changing the estimated odds-like quantities from 25.42 to 8.90 and

2.12 to 1.04, respectively).

When these significant interactions were included in the bioecological model

described in Aim 2, the interactions that remained significant were the effect of sensation

seeking and perceived peer approval of drinking for the Experimenters group, and the

effect of lack of premeditation and difficult access to alcohol for the Late-Onset High and

Experimenters groups. The main effects that were significant in this final model included

net change in enhancement motives, and mean levels of sensation seeking, enhancement

motives, access to a fake ID, and perceived peer drinking and binge drinking (see Table 3.5).

Table 3.1. Descriptive Statistics by AUT Group [Mean (SD), Number (%)]

	Nil-to-Low (Group 1)	Moderate (Group 2)	Experi-menters (Group 3)	Late-Onset High (Group 4)	Early-Onset High (Group 5)	Total
N	111 (27.1%)	126 (30.7%)	53 (12.9%)	69 (16.8%)	51 (12.4%)	410
Male	53 (47.7%)	27 (21.4%)	25 (47.2%)	56 (81.2%)	39 (76.5%)	200 (51.2%)
Caucasian	73 (65.8%)	106 (84.1%)	48 (90.6%)	61 (88.4%)	45 (88.2%)	333 (81.2%)
Age	18.85 (0.54)	19.04 (1.03)	18.94 (0.48)	18.85 (0.42)	19.06 (1.01)	18.94 (0.77)
zPosUrg1	-0.43 (0.84)	-0.07 (0.95)	0.06 (0.98)	0.29 (0.95)	0.66 (1.06)	0.00 (1.00)
zPosUrg2	-0.01 (0.71)	-0.05 (0.77)	-0.24 (0.84)	0.15 (0.97)	0.18 (1.83)	0.00 (1.00)
zNegUrg1	-0.36 (0.97)	-0.03 (1.00)	0.14 (0.93)	0.17 (0.93)	0.50 (0.93)	0.00 (1.00)
zNegUrg2	-0.02 (0.89)	-0.08 (0.96)	-0.16 (0.81)	0.08 (1.09)	0.30 (1.27)	0.00 (1.00)
zSenSeek1	-0.46 (0.97)	-0.10 (0.90)	0.15 (1.00)	0.45 (0.77)	0.48 (1.10)	0.00 (1.00)
zSenSeek2	-0.06 (0.78)	0.07 (0.82)	-0.35 (0.73)	0.12 (0.55)	0.17 (1.99)	0.00 (1.00)
zPreMed1	-0.48 (0.89)	-0.09 (0.98)	0.32 (0.82)	0.31 (0.90)	0.51 (1.07)	0.00 (1.00)
zPreMed2	0.09 (0.90)	0.03 (0.81)	-0.20 (0.93)	0.00 (0.82)	-0.06 (1.68)	0.00 (1.00)
zPersev1	-0.13 (1.10)	-0.04 (1.00)	0.34 (0.82)	-0.01 (0.91)	0.03 (0.99)	0.00 (1.00)
zPersev2	0.09 (0.86)	-0.07 (1.04)	-0.01 (0.94)	-0.05 (0.96)	0.04 (1.26)	0.00 (1.00)
zSocMot1	-1.18 (0.97)	0.28 (0.61)	0.42 (0.46)	0.54 (0.49)	0.70 (0.48)	0.00 (1.00)
zSocMot2	0.24 (1.32)	0.02 (0.90)	-0.29 (0.90)	-0.16 (0.57)	-0.06 (0.86)	0.00 (1.00)
zEnhMot1	-1.17 (0.82)	0.19 (0.67)	0.43 (0.53)	0.62 (0.44)	0.79 (0.69)	0.00 (1.00)
zEnhMot2	0.14 (1.17)	0.03 (0.84)	-0.34 (0.79)	-0.05 (0.54)	0.03 (1.46)	0.00 (1.00)
zCopMot1	-0.79 (0.77)	0.13 (0.84)	0.36 (0.94)	0.29 (0.93)	0.64 (0.92)	0.00 (1.00)
zCopMot2	0.07 (0.80)	0.05 (1.20)	-0.34 (0.88)	-0.10 (0.70)	0.20 (1.21)	0.00 (1.00)
zConfMot1	-0.55 (0.78)	0.18 (1.11)	0.23 (0.90)	0.17 (0.89)	0.28 (0.93)	0.00 (1.00)
zConfMot2	0.01 (0.92)	0.06 (1.26)	-0.17 (0.69)	-0.18 (0.80)	0.26 (0.89)	0.00 (1.00)
zArouExp1	-0.66 (0.95)	-0.03 (0.94)	0.26 (0.82)	0.42 (0.77)	0.69 (0.82)	0.00 (1.00)
zArouExp2	-0.13 (1.16)	-0.10 (0.87)	0.02 (0.97)	0.26 (0.74)	0.15 (1.17)	0.00 (1.00)
zSedExp1	0.16 (1.06)	0.12 (0.92)	-0.02 (0.94)	-0.13 (0.90)	-0.44 (1.11)	0.00 (1.00)
zSedExp2	0.02 (0.89)	-0.26 (0.89)	0.22 (0.81)	0.10 (0.81)	0.23 (1.58)	0.00 (1.00)
zPosExp1	-0.36 (1.20)	0.06 (0.89)	0.05 (0.85)	0.27 (0.89)	0.21 (0.85)	0.00 (1.00)
zPosExp2	0.01 (1.17)	-0.14 (0.93)	0.07 (0.80)	0.08 (0.80)	0.14 (1.16)	0.00 (1.00)
zNegExp1	0.13 (1.14)	-0.02 (0.98)	0.01 (0.89)	-0.06 (0.79)	-0.16 (1.05)	0.00 (1.00)

zNegExp2	-0.13 (1.06)	-0.14 (0.90)	0.12 (1.06)	0.22 (0.77)	0.22 (1.21)	0.00 (1.00)
zPSUQdrink1	0.95 (1.23)	-0.20 (0.71)	-0.46 (0.49)	-0.41 (0.50)	-0.54 (0.36)	0.00 (1.00)
zPSUQdrink2	-0.26 (1.61)	0.13 (0.68)	0.08 (0.54)	0.06 (0.61)	0.07 (0.52)	0.00 (1.00)
zPSUQavg1	-1.00 (0.77)	0.00 (0.80)	0.52 (0.78)	0.56 (0.69)	0.88 (0.47)	0.00 (1.00)
zPSUQavg2	0.15 (1.37)	-0.12 (0.90)	-0.14 (0.67)	0.18 (0.79)	-0.13 (0.70)	0.00 (1.00)
zPSUQbinge1	0.80 (0.51)	0.13 (0.88)	-0.48 (0.77)	-0.55 (0.70)	-0.83 (1.24)	0.00 (1.00)
zPSUQbinge2	0.09 (0.61)	-0.05 (1.08)	0.09 (0.60)	-0.13 (0.57)	0.01 (1.88)	0.00 (1.00)
zPSUQharm1	0.51 (1.12)	0.00 (0.83)	-0.42 (0.92)	-0.31 (0.81)	-0.26 (0.97)	0.00 (1.00)
zPSUQharm2	-0.16 (1.28)	0.07 (0.91)	0.04 (0.81)	0.05 (0.83)	0.07 (0.88)	0.00 (1.00)
zPSUQaprv1	-0.79 (1.02)	0.05 (0.82)	0.32 (0.66)	0.43 (0.68)	0.68 (0.94)	0.00 (1.00)
zPSUQaprv2	0.08 (1.16)	0.06 (0.92)	-0.24 (0.91)	0.02 (0.70)	-0.10 (1.19)	0.00 (1.00)
zGreek	-0.40 (0.66)	0.08 (1.00)	0.12 (1.09)	0.18 (1.02)	0.31 (1.21)	0.00 (1.00)
zEmployed	0.05 (0.89)	0.02 (0.84)	-0.16 (1.01)	-0.09 (0.80)	0.13 (1.63)	0.00 (1.00)
zStudGovt	-0.04 (0.89)	0.05 (1.09)	-0.21 (0.00)	0.29 (1.54)	-0.21 (0.00)	0.00 (1.00)
zSports	-0.04 (0.90)	-0.01 (0.96)	-0.11 (0.95)	0.12 (1.15)	0.07 (1.12)	0.00 (1.00)
zClubs	0.16 (0.92)	-0.01 (0.95)	-0.32 (1.14)	0.07 (1.01)	-0.10 (1.03)	0.00 (1.00)
zOtherOrgs	0.12 (0.99)	0.16 (0.98)	-0.42 (0.87)	-0.02 (0.99)	-0.20 (1.06)	0.00 (1.00)
zAccess	0.40 (1.12)	-0.04 (0.79)	-0.16 (1.08)	-0.14 (0.94)	-0.42 (0.91)	0.00 (1.00)
zFakeID	-0.34 (0.50)	-0.04 (0.89)	0.18 (1.06)	0.01 (1.02)	0.64 (1.51)	0.00 (1.00)
zSetting	-0.76 (1.02)	0.30 (0.79)	0.41 (0.69)	0.08 (0.85)	0.37 (0.98)	0.00 (1.00)

Table 3.2. Summary of MLR Analyses (by scale)

	Odds-Like Ratio (95% Confidence Interval) p-value			
	Group5 vs Group1	Group4 vs Group1	Group3 vs Group1	Group2 vs Group1
zPosUrg1	2.48 (1.37-4.48) 0.003	1.60 (0.96-2.66) 0.073	1.13 (0.65-1.97) 0.673	1.41 (0.92-2.17) 0.117
zPosUrg2	1.20 (0.64-2.27) 0.574	1.25 (0.69-2.28) 0.476	0.79 (0.46-1.36) 0.399	0.96 (0.63-1.45) 0.832
zNegUrg1	1.06 (0.60-1.88) 0.843	0.95 (0.58-1.54) 0.828	0.97 (0.56-1.69) 0.926	0.90 (0.59-1.38) 0.641
zNegUrg2	1.32 (0.77-2.25) 0.320	0.95 (0.57-1.59) 0.861	0.97 (0.55-1.73) 0.931	0.92 (0.60-1.42) 0.722
zSenSeek1	1.71 (1.08-2.71) 0.022	2.24 (1.47-3.44) <0.001	1.68 (1.10-2.57) 0.018	1.33 (0.99-1.78) 0.058
zSenSeek2	1.14 (0.56-2.30) 0.728	1.11 (0.63-1.96) 0.714	0.58 (0.35-0.98) 0.048	1.09 (0.75-1.60) 0.648
zPreMed1	2.04 (1.26-3.29) 0.004	1.80 (1.16-2.80) 0.009	2.00 (1.26-3.19) 0.003	1.42 (1.01-2.00) 0.046
zPreMed2	0.75 (0.48-1.17) 0.205	0.87 (0.58-1.32) 0.523	0.88 (0.56-1.39) 0.595	0.95 (0.67-1.33) 0.761
zPersev1	0.71 (0.46-1.09) 0.116	0.81 (0.55-1.20) 0.295	1.13 (0.75-1.69) 0.566	0.86 (0.63-1.17 0.338
zPersev2	0.98 (0.63-1.53) 0.944	0.83 (0.55-1.25) 0.381	0.86 (0.54-1.35) 0.511	0.85 (0.62-1.16) 0.308
zSocMot1	5.27 (1.40-19.81) 0.016	2.84 (1.20-6.74) 0.018	2.11 (0.85-5.24) 0.106	2.45 (1.33-4.50) 0.004
zSocMot2	0.77 (0.39-2.52) 0.456	0.71 (0.40-1.27) 0.252	0.87 (0.48-1.59) 0.660	0.92 (0.58-1.46) 0.722
zEnhMot1	21.08 (6.04-73.51) <0.001	15.72 (5.46-46.10) <0.001	11.74 (3.67-37.59) <0.001	4.54 (2.14-9.62) <0.001
zEnhMot2	0.79 (0.29-2.13) 0.649	0.71 (0.31-1.65) 0.440	0.41 (0.21-0.80) 0.010	0.75 (0.37-1.51) 0.432
zCopMot1	0.77 (0.37-1.59) 0.478	0.55 (0.27-1.13) 0.105	0.69 (0.35-1.39) 0.300	0.62 (0.34-1.13) 0.121
zCopMot2	0.77 (0.38-1.58) 0.481	0.75 (0.40-1.41) 0.374	0.65 (0.34-1.23) 0.190	0.80 (0.47-1.35) 0.399
zConfMot1	1.27 (0.74-2.17) 0.387	1.42 (0.86-2.35) 0.172	1.51 (0.89-2.56) 0.128	1.43 (0.93-2.18) 0.100

zConfMot2	1.36 (0.86-2.41) 0.298	0.91 (0.54-1.54) 0.726	0.94 (0.55-1.61) 0.814	1.11 (0.71-1.74) 0.639
zArouExp1	10.09 (4.68-21.76) <mark><0.001</mark>	5.92 (3.08-11.36) <mark><0.001</mark>	4.96 (2.70-9.09) <mark><0.001</mark>	3.09 (1.94-4.93) <mark><0.001</mark>
zArouExp2	0.58 (0.28-1.20) 0.146	0.90 (0.45-1.78) 0.761	0.69 (0.35-1.38) 0.302	0.64 (0.37-1.13) 0.133
zSedExp1	0.64 (0.30-1.35) 0.246	0.97 (0.53-1.79) 0.927	1.03 (0.57-1.85) 0.920	1.58 (0.92-2.70) 0.099
zSedExp2	1.01 (0.47-2.15) 0.983	0.81 (0.38-1.73) 0.592	1.25 (0.63-2.49) 0.519	0.58 (0.32-1.06) 0.088
zPosExp1	1.19 (0.58-2.45) 0.633	1.25 (0.64-2.44) 0.512	0.97 (0.53-1.77) 0.914	1.16 (0.72-1.87) 0.529
zPosExp2	1.07 (0.46-2.46) 0.874	0.86 (0.41-1.80) 0.688	1.02 (0.47-2.22) 0.968	1.30 (0.76-2.26) 0.366
zNegExp1	0.33 (0.17-0.66) <mark>0.002</mark>	0.30 (0.16-0.53) <mark><0.001</mark>	0.37 (0.20-0.68) <mark>0.001</mark>	0.33 (0.20-0.56) <mark><0.001</mark>
zNegExp2	2.36 (1.08-5.16) <mark>0.038</mark>	2.52 (1.27-4.97) <mark>0.010</mark>	1.49 (0.80-2.80) 0.212	1.73 (0.92-3.26) 0.105
zPSUQdrink1	0.42 (0.14-1.30) 0.143	0.51 (0.23-1.12) 0.096	0.46 (0.20-1.03) 0.061	0.39 (0.22-0.67) <mark><0.001</mark>
zPSUQdrink2	0.89 (0.41-1.95) 0.771	1.55 (0.89-2.70) 0.121	1.10 (0.58-2.12) 0.768	1.57 (0.96-2.56) 0.081
zPSUQavg1	3.77 (0.95-14.95) 0.075	2.05 (0.69-6.03) 0.208	2.09 (0.82-5.35) 0.126	1.73 (0.89-3.36) 0.109
zPSUQavg2	0.56 (0.29-1.09) 0.089	1.11 (0.62-1.98) 0.735	0.68 (0.37-1.25) 0.217	0.70 (0.42-1.16) 0.171
zPSUQbinge1	0.19 (0.07-0.55) <mark>0.006</mark>	0.24 (0.09-0.63) <mark>0.014</mark>	0.29 (0.14-0.60) <mark>0.002</mark>	0.63 (0.33-1.21) 0.180
zPSUQbinge2	1.16 (0.43-3.11) 0.768	0.78 (0.34-1.78) 0.568	0.92 (0.43-1.95) 0.829	0.74 (0.44-1.24) 0.273
zPSUQharm1	1.35 (0.71-2.54) 0.360	0.84 (0.48-1.47) 0.536	0.75 (0.41-1.35) 0.340	1.07 (0.67-1.69) 0.780
zPSUQharm2	1.51 (0.65-3.47) 0.351	1.38 (0.68-2.81) 0.383	1.19 (0.64-2.23) 0.582	1.40 (0.81-2.40) 0.236
zPSUQaprv1	3.00 (1.49-6.03) <mark>0.002</mark>	1.89 (1.03-3.47) <mark>0.043</mark>	1.73 (0.93-3.21) 0.084	1.40 (0.88-2.23) 0.158
zPSUQaprv2	1.33 (0.62-2.83) 0.470	1.22 (0.60-2.51) 0.587	0.90 (0.45-1.82) 0.776	1.41 (0.81-2.46) 0.231

zGreek	2.38 (1.38-4.10) <mark>0.002</mark>	1.97 (1.20-3.22) <mark>0.008</mark>	2.25 (1.21-4.18) <mark>0.015</mark>	1.77 (1.12-2.80) <mark>0.015</mark>
zEmployed	0.89 (0.58-1.36) 0.577	0.79 (0.54-1.16) 0.227	0.77 (0.52-1.14) 0.197	0.95 (0.69-1.29) 0.724
zStudGovt	0.31 (0.02-4.05) 0.375	1.27 (0.89-1.82) 0.188	0.38 (0.04-3.61) 0.397	1.11 (0.78-1.57) 0.563
zSports	0.98 (0.66-1.44) 0.908	1.02 (0.73-1.43) 0.898	0.79 (0.51-1.22) 0.297	0.94 (0.68-1.29) 0.693
zClubs	0.74 (0.42-1.31) 0.312	0.88 (0.58-1.36) 0.571	0.71 (0.40-1.24) 0.238	0.75 (0.50-1.11) 0.159
zOtherOrgs	0.67 (0.43-1.05) 0.083	0.77 (0.53-1.11) 0.165	0.55 (0.34-0.90) <mark>0.021</mark>	1.02 (0.74-1.42) 0.884
zAccess	0.54 (0.35-0.82) <mark>0.004</mark>	0.68 (0.50-0.94) <mark>0.019</mark>	0.71 (0.48-1.03) 0.077	0.82 (0.62-1.07) 0.136
zFakeID	2.92 (1.72-4.98) <mark><0.001</mark>	1.63 (1.00-2.67) 0.052	2.12 (1.21-3.73) <mark>0.012</mark>	1.52 (0.95-2.44) 0.085
zSetting	2.27 (1.44-3.57) <mark><0.001</mark>	1.90 (1.29-2.79) <mark>0.002</mark>	2.81 (1.73-4.57) <mark><0.001</mark>	2.65 (1.86-3.76) <mark><0.001</mark>

Table 3.3. Summary of Bioecological MLR Analysis

	Group5 vs Group1	Group4 vs Group1	Group3 vs Group1	Group2 vs Group1
zPosUrg1	1.80 (0.86-3.77) 0.121	0.93 (0.48-1.80) 0.828	0.69 (0.34-1.40) 0.309	0.92 (0.52-1.62) 0.764
zSenSeek1	2.30 (1.14-4.67) 0.022	2.95 (1.57-5.54) <0.001	1.88 (0.96-3.68) 0.068	1.60 (0.95-2.71) 0.080
zSenSeek2	1.60 (0.44-5.81) 0.498	1.46 (0.55-3.87) 0.460	0.66 (0.29-1.49) 0.323	1.34 (0.64-2.81) 0.446
zPreMed1	1.17 (0.52-2.63) 0.703	1.22 (0.60-2.49) 0.586	1.70 (0.85-3.43) 0.136	1.22 (0.69-2.14) 0.493
zSocMot1	1.95 (0.51-7.49) 0.332	1.83 (0.64-5.29) 0.264	1.52 (0.50-4.58) 0.459	2.12 (1.01-4.45) 0.048
zEnhMot1	5.76 (1.38-24.07) 0.018	5.72 (1.71-19.07) 0.006	5.67 (1.62-19.86) 0.010	2.98 (1.30-6.84) 0.013
zEnhMot2	0.71 (0.23-2.19) 0.567	0.48 (0.24-0.92) 0.031	0.34 (0.18-0.63) <0.001	0.58 (0.35-0.94) 0.032
zArouExp1	1.82 (0.61-5.48) 0.301	1.53 (0.62-3.79) 0.366	1.10 (0.51-2.38) 0.812	0.92 (0.46-1.80) 0.800
zNegExp1	0.56 (0.23-1.32) 0.193	0.67 (0.29-1.53) 0.347	0.91 (0.40-2.09) 0.832	1.05 (0.54-2.06) 0.885
zNegExp2	1.27 (0.59-2.74) 0.545	1.49 (0.87-2.55) 0.150	1.01 (0.53-1.93) 0.970	0.89 (0.55-1.46) 0.656
zPSUQdrink1	0.29 (0.11-0.75) 0.011	0.44 (0.19-1.03) 0.064	0.44 (0.20-0.97) 0.043	0.47 (0.27-0.83) 0.009
zPSUQbinge1	0.16 (0.06-0.46) 0.002	0.23 (0.09-0.58) 0.007	0.26 (0.12-0.54) <0.001	0.59 (0.34-1.05) 0.075
zPSUQaprv1	1.03 (0.49-2.18) 0.940	1.04 (0.54-2.03) 0.900	1.09 (0.52-2.25) 0.824	0.87 (0.50-1.50) 0.610
zGreek	1.55 (0.71-3.40) 0.271	1.49 (0.72-3.06) 0.281	1.58 (0.68-3.66) 0.294	1.37 (0.74-2.54) 0.323
zOtherOrgs	0.66 (0.35-1.23) 0.194	0.76 (0.44-1.31) 0.326	0.52 (0.28-0.96) 0.040	1.10 (0,68-1.77) 0.699
zAccess	0.71 (0.37-1.37) 0.310	0.99 (0.61-1.60) 0.964	0.91 (0.53-1.56) 0.735	0.93 (0.63-1.38) 0.731
zFakeID	2.49 (1.02-6.09) 0.047	1.49 (0.65-3.46) 0.349	1.83 (0.72-4.69) 0.209	1.77 (0.76-4.14) 0.190
zSetting	1.29 (0.61-2.72) 0.509	1.06 (0.58-1.94) 0.843	1.62 (0.86-3.05) 0.141	1.81 (1.13-2.90) 0.013

Table 3.4. Summary of MLR Analyses (by scale) of Crossed Effects

	Group5 vs Group1	Group4 vs Group1	Group3 vs Group1	Group2 vs Group1
zPosUrg1	4.48 (0.58-34.93) 0.152	1.93 (0.34-11.10) 0.462	1.56 (0.19-12.45) 0.679	1.67 (0.31-8.89) 0.553
zSenSeek1	10.10 (0.71-141.54) 0.096	3.24 (0.53-19.91) 0.217	1.32 (0.22-8.07) 0.765	1.50 (0.45-5.00) 0.513
zSenSeek2	1.13 (0.15-8.37) 0.907	1.44 (0.30-6.96) 0.648	0.52 (0.08-3.49) 0.501	2.23 (0.52-9.50) 0.278
zPreMed1	0.56 (0.07-4.79) 0.599	0.59 (0.13-2.77) 0.509	1.93 (0.24-15.230) 0.536	0.64 (0.16-2.54) 0.526
zPSUQdrink1	0.09 (0.02-0.40) 0.002	0.17 (0.05-0.64) 0.012	0.21 (0.05-0.94) 0.047	0.18 (0.07-0.51) 0.002
zPSUQbinge1	0.04 (0.01-0.22) <0.001	0.07 (0.02-0.29) <0.001	0.07 (0.02-0.33) <0.001	0.32 (0.09-1.15) 0.082
zPSUQaprv1	2.00 (0.63-6.33) 0.238	1.64 (0.64-4.20) 0.300	1.72 (0.55-5.38) 0.354	1.07 (0.46-2.48) 0.882
zGreek	1.38 (0.40-4.78) 0.611	1.09 (0.32-3.72) 0.891	1.12 (0.27-4.70) 0877	1.17 (0.36-3.79) 0.796
zOtherOrgs	0.66 (0.30-1.43) 0.291	0.85 (0.44-1.65) 0.635	0.49 (0.22-1.11) 0.086	1.12 (0.59-2.12) 0.731
zAccess	0.37 (0.14-1.03) 0.063	0.58 (0.29-1.17) 0.137	0.73 (0.34-1.58) 0.433	0.61 (0.33-1.14) 0.130
zFakeID	4.43 (0.90-21.85) 0.076	2.72 (0.55-13.41) 0.230	3.64 (0.68-19.60) 0.145	2.18 (0.47-10.15) 0.331
zSetting	1.63 (0.58-4.60) 0.358	1.56 (0.60-4.05) 0.365	2.30 (0.72-7.34) 0.172	3.51 (1.36-9.04) 0.017
zPosUrg1* zPSUQdrink1	0.39 (0.08-1.78) 0.224	0.78 (0.28-2.21) 0.641	1.24 (0.34-4.52) 0.742	0.53 (0.23-1.24) 0.149
zSenSeek1* zPSUQdrink1	1.49 (0.31-7.29) 0.620	0.78 (0.28-2.18) 0.630	0.50 (0.16-1.54) 0.232	0.95 (0.49-1.86) 0.885
zSenSeek2* zPSUQdrink1	0.86 (0.14-5.09) 0.864	0.96 (0.25-3.75) 0.956	2.51 (0.56-11.24) 0.235	2.74 (0.91-8.22) 0.078
zPreMed1* zPSUQdrink1	0.63 (0.15-2.54) 0.514	0.96 (0.25-3.75) 0.956	0.60 (0.18-2.00) 0.406	0.57 (0.28-1.18) 0.131
zPosUrg1* zPSUQbinge1	0.79 (0.14-4.38) 0.792	0.44 (0.13-1.55) 0.204	0.49 (0.11-2.21) 0.366	1.07 (0.31-3.72) 0.919
zSenSeek1* zPSUQbinge1	0.63 (0.16-2.45) 0.503	0.61 (0.19-1.94) 0.403	0.62 (0.18-2.11) 0.447	0.60 (0.20-1.85) 0.385

zSenSeek2* zPSUQbinge1	1.58 (0.15-17.23) 0.717	2.31 (0.54-9.90) 0.273	1.72 (0.39-7.68) 0.481	2.21 (0.60-8.25) 0.253
zPreMed1* zPSUQbinge1	1.98 (0.41-9.63) 0.456	4.14 (1.09-15.76) 0.039	5.64 (0.91-35.13) 0.082	3.79 (1.08-13.32) 0.042
zPosUrg1* zPSUQaprv1	0.53 (0.13-2.11) 0.366	0.37 (0.13-1.07) 0.068	0.94 (0.28-3.19) 0.926	0.44 (0.18-1.11) 0.092
zSenSeek1* zPSUQaprv1	0.28 (0.08-0.91) 0.035	0.62 (0.22-1.77) 0.380	0.25 (0.08-0.74) 0.016	0.97 (0.43-2.70) 0.946
zSenSeek2* zPSUQaprv1	1.65 (0.54-5.04) 0.379	1.11 (0.47-2.62) 0.806	2.12 (0.72-6.25) 0.182	1.22 (0.61-2.44) 0.581
zPreMed1* zPSUQaprv1	0.92 (0.28-3.09) 0.897	1.40 (0.62-3.17) 0.413	0.84 (0.24-2.96) 0.790	1.08 (0.49-2.38) 0.845
zPosUrg1* zGreek	1.42 (0.37-5.49) 0.613	1.71 (0.50-5.85) 0.393	1.25 (0.36-4.38) 0.729	1.35 (0.45-4.07) 0.599
zSenSeek1* zGreek	0.88 (0.28-2.76) 0.829	0.95 (0.35-2.53) 0.915	0.99 (0.40-2.44) 0.985	0.95 (0.42-2.16) 0.910
zSenSeek2* zGreek	0.90 (0.27-3.02) 0.861	0.90 (0.27-2.92) 0.855	0.84 (0.23-3.11) 0.799	1.10 (0.42-2.90) 0.842
zPreMed1* zGreek	0.38 (0.12-1.18) 0.097	0.49 (0.18-1.33) 0.160	0.65 (0.22-1.96) 0.444	0.51 (0.20-1.30) 0.159
zPosUrg1* zOtherOrgs	0.66 (0.29-1.47) 0.309	0.59 (0.29-1.18) 0.137	0.57 (0.20-1.58) 0.297	0.61 (0.32-1.16) 0.139
zSenSeek1* zOtherOrgs	3.80 (1.49-9.65) 0.006	2.40 (1.06-5.41) 0.038	2.22 (0.85-5.77) 0.113	1.43 (0.77-2.67) 0.256
zSenSeek2* zOtherOrgs	1.71 (0.61-4.83) 0.311	1.57 (0.70-3.52) 0.274	1.48 (0.58-3.76) 0.415	1.41 (0.68-2.92) 0.354
zPreMed1* zOtherOrgs	2.27 (0.81-6.40) 0.135	1.76 (0.80-3.84) 0.167	1.72 (0.61-4.85) 0.317	1.58 (0.71-3.50) 0.281
zPosUrg1* zAccess	0.88 (0.30-2.55) 0.815	0.75 (0.38-1.49) 0.408	1.00 (0.48-2.06) 0.999	0.85 (0.47-1.52) 0.576
zSenSeek1* zAccess	1.91 (0.56-6.44) 0.303	0.98 (0.47-2.02) 0.950	1.66 (0.67-4.12) 0.284	1.23 (0.72-2.09) 0.456
zSenSeek2* zAccess	1.78 (0.59-5.38) 0.309	1.03 (0.44-2.39) 0.949	1.68 (0.68-4.16) 0.269	0.90 (0.44-1.86) 0.784
zPreMed1* zAccess	1.08 (0.34-3.39) 0.900	0.56 (0.30-1.05) 0.069	0.46 (0.21-0.99) 0.048	0.61 (0.32-1.16) 0.137
zPosUrg1* zFakeID	3.67 (0.37-36.70) 0.292	4.42 (0.50-39.10) 0.206	4.59 (0.47-44.51) 0.213	3.80 (0.51-28.37) 0.213
zSenSeek1* zFakeID	0.26 (0.05-1.36) 0.118	0.29 (0.06-1.36) 0.121	0.25 (0.05-1.21) 0.091	0.31 (0.07-1.28) 0.107

zSenSeek2* zFakeID	1.45 (0.12-18.02) 0.774	1.43 (0.12-17.24) 0.777	1.48 (0.11-20.63) 0.774	1.02 (0.09-11.38) 0.988
zPreMed1* zFakeID	1.09 (0.32-3.69) 0.886	0.75 (0.23-2.47) 0.637	0.92 (0.26-3.20) 0.895	0.82 (0.26-2.54) 0.725
zPosUrg1* zSetting	0.56 (0.18-1.74) 0.318	1.41 (0.55-3.63) 0.482	1.13 (0.43-2.96) 0.807	1.25 (0.60-2.61) 0.555
zSenSeek1* zSetting	1.38 (0.53-3.59) 0.508	1.15 (0.54-2.46) 0.719	1.53 (0.66-3.52) 0.319	0.72 (0.38-1.35) 0.306
zSenSeek2* zSetting	0.34 (0.06-1.74) 0.208	0.78 (0.27-2.24) 0.648	0.44 (0.09-2.10) 0.323	0.97 (0.44-2.14) 0.946
zPreMed1* zSetting	0.56 (0.19-1.66) 0.293	0.78 (0.34-1.82) 0.570	0.77 (0.22-2.66) 0.678	1.09 (0.53-2.27) 0.810
zSocMot1	1.08 (0.00-514.84) 0.980	0.14 (0.01-1.69) 0.127	3.58 (0.15-85.33) 0.432	0.63 (0.09-4.18) 0.633
zEnhMot1	844.55 (2.44-291960.90) 0.028	116.10 (6.25-2158.32) 0.002	22.59 (0.72-709.38) 0.086	10.31 (0.97-109.08) 0.064
zEnhMot2	6.31 (0.59-67.65) 0.130	1.42 (0.21-9.39) 0.721	0.24 (0.03-2.05) 0.210	0.78 (0.18-3.43) 0.748
zPSUQdrink1	0.22 (0.05-1.00) 0.050	0.56 (0.19-1.66) 0.299	0.41 (0.12-1.37) 0.148	0.43 (0.19-0.97) 0.041
zPSUQbinge1	0.15 (0.04-0.57) 0.007	0.16 (0.05-0.46) 0.001	0.11 (0.03-0.38) <0.001	0.46 (0.20-1.06) 0.072
zPSUQaprv1	1.17 (0.31-4.42) 0.820	0.87 (0.30-2.58) 0.807	0.83 (0.26-2.64) 0.750	0.69 (0.25-1.85) 0.458
zGreek	1.03 (0.27-3.94) 0.963	0.87 (0.27-2.82) 0.822	1.38 (0.40-4.72) 0.613	1.01 (0.36-2.84) 0.981
zOtherOrgs	0.53 (0.21-1.34) 0.180	0.77 (0.36-1.65) 0.495	0.31 (0.11-0.87) 0.028	0.97 (0.51-1.83) 0.922
zAccess	0.35 (0.11-1.09) 0.074	0.80 (0.46-1.41) 0.450	0.48 (0.21-1.10) 0.086	0.69 (0.43-1.12) 0.130
zFakeID	8.13 (1.35-48.87) 0.025	4.71 (0.84-26.32) 0.082	3.27 (0.60-17.73) 0.171	3.08 (0.63-15.18) 0.168
zSetting	1.19 (0.35-4.04) 0.777	1.33 (0.55-3.26) 0.528	2.49 (0.77-8.05) 0.136	2.72 (1.10-6.68) 0.036
zSocMot1* zPSUQdrink1	0.73 (0.04-15.13) 0.843	0.14 (0.02-0.85) 0.033	0.62 (0.08-4.78) 0.651	0.45 (0.16-1.27) 0.134
zEnhMot1* zPSUQdrink1	8.76 (0.41-188.030 0.166	6.65 (0.96-46.05) 0.057	2.72 (0.33-22.35) 0.354	1.38 (0.40-4.77) 0.612

zEnhMot2* zPSUQdrink1	5.46 (0.81-36.68) 0.090	2.14 (0.53-8.73) 0.297	1.99 (0.50-8.02) 0.339	1.28 (0.48-3.44) 0.624
zSocMot1* zPSUQbinge1	0.62 (0.08-4.66) 0.645	1.03 (0.13-8.39) 0.980	2.57 (0.27-24.65) 0.425	1.62 (0.45-5.83) 0.461
zEnhMot1* zPSUQbinge1	0.24 (0.01-4.29) 0.336	0.42 (0.04-3.86) 0.445	0.57 (0.07-4.74) 0.602	0.70 (0.15-3.28) 0.653
zEnhMot2* zPSUQbinge1	1.63 (0.28-9.53) 0.588	1.59 (0.41-6.15) 0.502	0.66 (0.14-3.20) 0.610	1.14 (0.34-3.78) 0.834
zSocMot1* zPSUQaprv1	1.33 (0.17-10.23) 0.781	0.43 (0.05-3.85) 0.464	1.86 (0.39-8.90) 0.439	1.21 (0.52-2.81) 0.654
zEnhMot1* zPSUQaprv1	0.44 (0.04-4.49) 0.487	1.67 (0.29-9.68) 0.570	0.41 (0.08-2.16) 0.297	0.62 (0.18-2.15) 0.460
zEnhMot2* zPSUQaprv1	3.28 (0.84-12.73) 0.088	1.63 (0.54-4.86) 0.386	1.91 (0.57-6.44) 0.301	1.80 (0.58-5.61) 0.325
zSocMot1* zGreek	1.06 (0.09-11.91) 0.963	0.63 (0.10-3.79) 0.615	0.23 (0.03-2.05) 0.196	0.37 (0.05-2.52) 0.330
zEnhMot1* zGreek	0.93 (0.08-10.54) 0.956	1.82 (0.21-15.71) 0.588	1.83 (0.21-16.26) 0.589	1.71 (0.34-8.63) 0.519
zEnhMot2* zGreek	1.03 (0.22-4.79) 0.968	0.74 (0.16-3.49) 0.706	0.64 (0.17-2.41) 0.513	0.64 (0.17-.2.38) 0.515
zSocMot1* zOtherOrgs	0.79 (0.08-7.74) 0.842	0.88 (0.17-4.48) 0.876	3.89 (0.62-24.62) 0.152	1.31 (0.33-5.15) 0.706
zEnhMot1* zOtherOrgs	1.27 (0.19-8.48) 0.809	0.79 (0.13-4.62) 0.795	0.22 (0.04-1.34) 0.109	0.82 (0.21-3.21) 0.779
zEnhMot2* zOtherOrgs	0.74 (0.21-2.62) 0.649	0.87 (0.21-3.69) 0.858	0.57 (0.18-1.76) 0.343	0.80 (0.31-2.08) 0.659
zSocMot1* zAccess	0.77 (0.09-6.39) 0.807	0.67 (0.13-3.48) 0.647	1.65 (0.35-7.74) 0.528	0.77 (0.26-2.31) 0.647
zEnhMot1* zAccess	2.49 (0.16-39.53) 0.529	0.90 (0.20-4.05) 0.897	1.39 (0.21-9.43) 0.741	1.03 (0.40-2.68) 0.948
zEnhMot2* zAccess	1.04 (0.40-2.70) 0.944	1.36 (0.57-3.25) 0.484	1.44 (0.67-3.11) 0.359	1.20 (0.60-2.43) 0.604
zSocMot1* zFakeID	0.67 (0.06-7.29) 0.747	0.98 (0.12-7.81) 0.987	0.62 (0.07-5.82) 0.675	0.95 (0.15-6.05) 0.958
zEnhMot1* zFakeID	0.38 (0.05-3.10) 0.365	0.43 (0.04-5.13) 0.519	1.89 (0.24-14.76) 0.548	0.93 (0.19-4.63) 0.932
zEnhMot2* zFakeID	3.59 (0.74-17.33) 0.115	4.03 (0.70-23.27) 0.135	3.05 (0.52-17.70) 0.228	2.11 (0.42-10.51) 0.375
zSocMot1* zSetting	1.18 (0.15-9.01) 0.875	0.16 (0.04-0.69) ==0.014==	0.57 (0.10-3.08) 0.515	0.76 (0.26-2.21) 0.615

zEnhMot1* zSetting	1.72 (0.30-9.98) 0.547	3.47 (0.96-12.53) 0.058	1.50 (0.34-6.58) 0.594	1.78 (0.62-5.12) 0.293
zEnhMot2* zSetting	1.11 (0.27-4.45) 0.888	1.06 (0.35-3.21) 0.922	1.49 (0.50-4.46) 0.478	1.58 (0.65-3.85) 0.326
zArouExp1	25.42 (0.94-686.55) 0.069	2.12 (0.54-8.31) 0.284	2.93 (0.69-12.32) 0.144	1.44 (0.45-4.64) 0.543
zNegExp1	0.82 (0.03-20.43) 0.909	1.36 (0.40-4.56) 0.620	0.58 (0.15-2.19) 0.418	1.18 (0.45-3.12) 0.735
zNegExp2	0.37 (0.05-2.69) 0.336	0.88 (0.19-4.08) 0.869	0.60 (0.11-3.21) 0.556	0.84 (0.32-2.23) 0.728
zPSUQdrink1	0.16 (0.03-0.98) 0.056	0.34 (0.13-0.93) 0.040	0.36 (0.12-1.07) 0.074	0.45 (0.11-1.88) 0.310
zPSUQbinge1	0.01 (0.00-0.11) <0.001	0.04 (0.01-0.31) 0.009	0.04 (0.00-0.31) 0.010	0.19 (0.01-3.86) 0.319
zPSUQaprv1	2.19 (0.70-6.82) 0.177	1.57 (0.59-4.22) 0.371	1.18 (0.49-2.85) 0.714	0.95 (0.39-2.30) 0.906
zGreek	0.66 (0.19-2.25) 0.510	0.90 (0.25-3.28) 0.874	0.62 (0.23-1.73) 0.364	0.85 (0.29-2.48) 0.770
zOtherOrgs	0.59 (0.24-1.46) 0.259	0.55 (0.27-1.14) 0.110	0.34 (0.15-0.75) 0.008	0.76 (0.32-1.82) 0.548
zAccess	0.60 (0.28-1.29) 0.190	0.83 (0.28-2.49) 0.745	0.49 (0.24-1.01) 0.055	0.82 (0.38-1.80) 0.626
zFakeID	4.48 (1.55-12.96) 0.006	1.67 (0.60-4.60) 0.325	2.78 (1.02-7.60) 0.049	1.73 (0.56-5.36) 0.351
zSetting	2.75 (0.92-8.18) 0.072	1.99 (0.84-4.70) 0.124	3.35 (1.26-8.87) 0.021	2.77 (0.70-10.92) 0.189
zArouExp1* zPSUQdrink1	0.80 (0.12-5.27) 0.818	0.62 (0.13-2.85) 0.551	0.58 (0.22-1.53) 0.273	0.81 (0.32-2.03) 0.654
zNegExp1* zPSUQdrink1	1.14 (0.28-4.66) 0.852	1.53 (0.59-3.99) 0.382	1.51 (0.55-4.14) 0.429	0.92 (0.43-2.00) 0.843
zNegExp2* zPSUQdrink1	0.75 (0.22-2.62) 0.656	1.03 (0.32-3.31) 0.963	1.87 (0.83-4.21) 0.132	1.44 (0.66-3.14) 0.359
zArouExp1* zPSUQbinge1	0.97 (0.10-9.35) 0.979	0.31 (0.07-1.43) 0.146	0.42 (0.09-1.97) 0.282	0.31 (0.03-2.78) 0.334
zNegExp1* zPSUQbinge1	1.10 (0.21-5.73) 0.912	1.49 (0.51-4.30) 0.465	0.84 (0.26-2.73) 0.769	1.48 (0.56-3.96) 0.432
zNegExp2* zPSUQbinge1	0.95 (0.27-3.37) 0.935	1.14 (0.36-3.63) 0.827	1.00 (0.31-3.24) 0.994	1.63 (0.47-5.63) 0.450

zArouExp1* zPSUQaprv1	0.45 (0.08-2.67) 0.389	0.37 (0.13-1.05) 0.067	0.38 (0.12-1.14) 0.086	0.71 (0.24-2.06) 0.539
zNegExp1* zPSUQaprv1	1.35 (0.43-4.20) 0.609	1.60 (0.67-3.85) 0.294	1.58 (0.66-3.77) 0.306	0.89 (0.42-1.88) 0.757
zNegExp2* zPSUQaprv1	1.97 (0.50-7.66) 0.348	1.06 (0.37-3.01) 0.914	0.85 (0.36-2.05) 0.726	1.15 (0.56-2.33) 0.706
zArouExp1* zGreek	1.24 (0.29-5.24) 0.770	0.73 (0.18-2.95) 0.668	0.87 (0.33-2.32) 0.784	0.62 (0.19-1.96) 0.425
zNegExp1* zGreek	2.07 (0.74-5.83) 0.171	2.07 (0.98-4.99) 0.056	1.10 (0.45-2.70) 0.836	1.40 (0.62-3.12) 0.417
zNegExp2* zGreek	0.57 (0.22-1.49) 0.251	0.65 (0.15-2.77) 0.573	0.54 (0.21-1.44) 0.227	0.93 (0.43-2.01) 0.858
zArouExp1* zOtherOrgs	0.36 (0.10-1.33) 0.141	0.81 (0.25-2.64) 0.735	0.68 (0.30-1.51) 0.343	0.79 (0.35-1.75) 0.558
zNegExp1* zOtherOrgs	1.36 (0.65-2.84) 0.418	1.28 (0.56-2.93) 0.564	1.14 (0.58-2.23) 0.702	1.27 (0.64-2.53) 0.490
zNegExp2* zOtherOrgs	1.11 (0.42-2.94) 0.834	1.33 (0.58-3.02) 0.499	0.81 (0.41-1.59) 0.536	0.93 (0.44-1.94) 0.845
zArouExp1* zAccess	0.35 (0.13-0.97 ==0.048==	0.49 (0.28-0.86) ==0.014==	0.90 (0.48-1.69) 0.736	0.86 (0.43-1.73) 0.678
zNegExp1* zAccess	1.63 (0.39-6.74) 0.518	1.33 (0.58-3.08) 0.501	0.84 (0.41-1.72) 0.639	1.07 (0.57-2.01) 0.838
zNegExp2* zAccess	1.20 (0.42-3.38) 0.743	1.23 (0.54-2.77) 0.624	0.83 (0.43-1.59) 0.573	1.13 (0.62-2.04) 0.689
zArouExp1* zFakeID	0.57 (0.17-1.93) 0.366	1.64 (0.43-6.27) 0.477	0.81 (0.29-2.26) 0.684	1.41 (0.52-3.83) 0.507
zNegExp1* zFakeID	1.99 (0.54-7.30) 0.302	1.27 (0.33-4.92) 0.733	2.14 (0.61-7.46) 0.235	1.53 (0.43-5.43) 0.512
zNegExp2* zFakeID	0.94 (0.31-2.86) 0.910	0.91 (0.29-2.93) 0.882	0.80 (0.24-2.70) 0.728	0.82 (0.27-2.46) 0.726
zArouExp1* zSetting	0.89 (0.20-4.01) 0.876	1.25 (0.56-2.79) 0.590	1.77 (0.62-5.03) 0.293	1.47 (0.69-3.14) 0.328
zNegExp1* zSetting	1.44 (0.54-3.81) 0.466	0.95 (0.46-1.97) 0.894	0.94 (0.43-2.03) 0.873	0.86 (0.41-1.82) 0.696
zNegExp2* zSetting	1.09 (0.40-2.97) 0.863	0.73 (0.38-1.39) 0.336	1.16 (0.57-2.38) 0.683	1.09 (0.52-2.27) 0.818

Table 3.5. Summary of Final Bioecological MLR Analysis

	Group5 vs Group1	Group4 vs Group1	Group3 vs Group1	Group2 vs Group1
zPosUrg1	1.82 (0.76-4.37)	0.95 (0.45-2.02)	0.62 (0.28-1.37)	0.84 (0.45-1.59)
	0.180	0.892	0.241	0.599
zSenSeek1	4.32 (1.28-14.59)	3.67 (1.52-8.91)	2.46 (0.88-6.90)	1.52 (0.63-3. 67)
	0.023	0.004	0.091	0.357
zSenSeek2	0.91 (0.13-6.20)	0.95 (0.30-2.98)	0.52 (0.11-2.39)	1.61 (0.74-3.49)
	0.929	0.934	0.413	0.236
zPreMed1	0.60 (0.18-2.05)	0.77 (0.33-1.78)	1.76 (0.71-4.36)	1.08 (0.57-2.07)
	0.421	0.533	0.226	0.809
zSocMot1	3.79 (0.30-48.02)	1.60 (0.46-5.61)	1.76 (0.44-7.01)	1.81 (0.76-4.31)
	0.305	0.460	0.422	0.181
zEnhMot1	6.97 (1.04-46.77)	8.38 (1.94-36.25)	7.71 (1.77-33-49)	3.29 (0.64-16.98)
	0.058	0.009	0.011	0.198
zEnhMot2	0.73 (0.27-1.98)	0.45 (0.23-0.87)	0.29 (0.15-0.59)	0.60 (0.22-1.66)
	0.535	0.018	<0.001	0.352
zArouExp1	2.55 (0.79-8.17)	1.73 (0.66- 4.54)	1.21 (0.47-3.09)	0.93 (0.43-2.02)
	0.128	0.278	0.694	0.848
zNegExp1	0.66 (0.22-1.99)	0.77 (0.28-2.09)	0.91 (0.30-2.78)	1.14 (0.46-2.78)
	0.469	0.610	0.868	0.783
zNegExp2	1.19 (0.33-4.31)	1.34 (0.74-2.43)	0.90 (0.41-1.95)	0.82 (0.46-1.45)
	0.798	0.341	0.789	0.502
zPSUQdrink1	0.18 (0.05-0.67)	0.32 (0.12-0.83)	0.33 (0.11-1.02)	0.43 (0.10-1.90)
	0.012	0.019	0.059	0.300
zPSUQbinge1	0.12 (0.04-0.34)	0.21 (0.09-0.51)	0.26 (0.10-0.63)	0.74 (0.29-1.91)
	<0.001	<0.001	0.003	0.537
zPSUQaprv1	1.10 (0.44-2.78)	0.98 (0.45-2.12)	0.92 (0.37-2.31)	0.88 (0.45-1.74)
	0.847	0.956	0.860	0.712
zGreek	2.21 (0.76-6.47)	1.80 (0.66-4.88)	1.64 (0.56-4.79)	1.55 (0.61-3.94
	0.152	0.251	0.370	0.360
zOtherOrgs	0.62 (0.31-1.26)	0.79 (0.42-1.51)	0.56 (0.27-1.20)	1.15 (0.62-2.13)
	0.189	0.485	0.144	0.660
zAccess	0.40 (0.14-1.13)	0.64 (0.32-1.30)	0.56 (0.26-1.23)	0.76 (0.33-1.76)
	0.104	0.230	0.165	0.531
zFakeID	3.25 (1.14-9.23)	1.89 (0.72-4.95)	2.34 (0.78-7.01)	1.95 (0.60-6.31)
	0.032	0.198	0.138	0.280
zSetting	0.89 (0.38-2.11)	1.02 (0.50-2.11)	1.57 (0.71-3.49)	1.70 (0.90-3.21)
	0.792	0.951	0.269	0.105

zSenSeek1* zPSUQaprv1	0.36 (0.06-2.04) 0.281	0.68 (0.31-1.51) 0.350	0.36 (0.15-0.85) 0.023	0.87 (0.46-1.61) 0.650
zSenSeek1* zOtherOrgs	2.37 (0.95-5.89) 0.077	1.73 (0.76-3.92) 0.205	1.74 (0.85-3.56) 0.141	1.28 (0.71-2.32) 0.416
zPreMed1* zPSUQbinge1	1.00 (0.34-2.99) 0.996	1.36 (0.57-3.33) 0.489	2.09 (0.76-5.75) 0.167	1.81 (0.72-4.59) 0.223
zPreMed1* zAccess	1.07 (0.41-2.79) 0.894	0.54 (0.32-0.94) 0.032	0.54 (0.30-0.96) 0.039	0.74 (0.34-1.64) 0.471
zSocMot1* zPSUQdrink1	1.02 (0.14-7.40) 0.986	0.61 (0.21-1.80) 0.372	0.85 (0.23-3.16) 0.806	0.66 (0.33-1.29) 0.237
zSocMot1* zSetting	1.39 (0.39-4.93) 0.614	0.44 (0.16-1.21) 0.113	0.72 (0.24-2.11) 0.548	0.79 (0.39-1.56) 0.494
zArouExp1* zAccess	0.70 (0.26-1.87) 0.478	0.66 (0.40-1.08) 0.098	0.89 (0.47-1.72) 0.740	0.95 (0.52-1.76) 0.878

Chapter Four: Discussion

Conclusions and Implications

The main goal of the current project was to improve the understanding of alcohol use patterns from adolescence through young adulthood. While the existing literature has identified important predictors of harmful alcohol use, including facets of impulsivity, drinking motives and expectancies, social norms and involvement, aggression and delinquency, and academic performance, less is known about how these factors jointly contribute to the development of a particular long-term alcohol use trajectory (Adams et al., 2012; LaBrie et al., 2010; Lejuez et al., 2010; Schulenberg et al., 1996; Tucker, Orlando, & Ellickson, 2003). Further, this study aimed to contribute a broader, bioecological understanding of these potential associations by jointly considering the influence of individual, process, and context characteristics on outcomes, as well as considering interactive or moderating effects of these characteristics on each other in their association with alcohol use outcomes. Such an examination is a novel contribution to the literature, especially in its consideration of how these individual difference and social context variables interact to moderate changes regarding which AUT group one may fall in.

First, this study sought to understand the general characteristics of individuals in each of the five established AUT groups. It was hypothesized that individuals engaged in higher levels of alcohol use would also be higher on the observed risk factors. In fact, findings were consistent with hypotheses and exiting literature that link impulsivity and risky drinking motives/expectancies with high rates of alcohol consumption (e.g., Kaiser et al., 2016; Lejuez et al., 2010; Littlefield, Sher & Steinley, 2010). In general,

individuals in AUT groups characterized by higher levels of alcohol use were also characterized by higher levels of impulsivity, higher descriptive peer norms, and injunctive peer norms more approving of alcohol use. These individuals also endorsed greater access and exposure to alcohol use, and participation in Greek organizations, where alcohol use may be a normative social behavior (Jackson, Sher & Park, 2005).

In order to determine the possible influence of these traits and contexts on AUT group membership, the current study subsequently examined how increases on these variables changed ones likelihood of being in a particular AUT group relative to the Nil-to-Low group. Findings demonstrated that incremental changes among these characteristics affected the likelihood of being in a group characterized by alcohol use, rather than being in the Nil-to-Low group. Of note, in the factor-specific models, the characteristics that were significant for lower use groups typically were also significant for subsequent groups, resulting in progressively lager numbers of significant variables for each AUT group (e.g., Moderate=8, Experimenter=12, Late-Onset High=12, Early-Onset High=14). However, when these significant variables were then analyzed as a unitary, bioecological model, the number of variables decreased markedly. This pattern highlights the utility of the bioecological model. Specifically, this demonstrates that constructs that have, on their own, been identified as important predictors of alcohol use outcomes may be accounting for variance that may be incrementally or more specifically accounted for by other concurrently occurring variables that were not included in the original models. In accordance with bioecological theory, the variables in this study were examined concurrently specifically because none of them appears in isolation in nature.

Rather, the approach of this study allows us to better understand how alcohol use trajectories develop as a result of a complex constellation of factors.

Support was also found for the hypothesized direction of effects to distinguish among risk and protective factors. Specifically, while participating in Greek organizations was associated with a decreased likelihood of membership in the Nil-to-Low group, participating in non-Greek or athletic organizations was associated with an increased likelihood of being in the Nil-to-Low group. Similarly, having ready access to a fake ID was associated with a decreased likelihood of being in the Nil-to-Low group, while perceiving greater general difficulty in obtaining alcohol was associated with an increased likelihood of membership in the Nil-to-Low group. In the bioecological model, the most consistent protective factors for all groups were having a greater number of close friends who did not engage in drinking and/or binge drinking. In each case, these variables increased the likelihood of remaining in the Nil-to-Low group. For the Experimenters, participation in organizations that were not athletic or Greek also served as a protective factor in a similar fashion. This may provide some understanding for the processes described by Derefinko et al. (in press). These researchers noted that the drinking patterns of this particular group escalated prior to college matriculation then deescalated by the end of the junior year of college, and surmised that this is likely an effect of "age and responsibility...allowing the individual to balance priorities over time." It is possible that having a social circle that does not engage in much alcohol use and being involved in extracurricular activities contributes to this balance of priorities and attenuates their brief foray into drinking.

For the higher use groups, Early- and Late-Onset High, Derefinko et al. (in press) speculated about continued and increasing risk during the college transition that lead to maintenance or escalation, respectively. From the bioecological model of the current study, mean levels of both sensation seeking and enhancement motives operate as risk factors, increasing the likelihood of shifting out of the Nil-to-Low groups and into these two high use groups. However, access to a fake ID also acts as a risk factor for Early-Onset High users, perhaps contributing to the further maintenance of this maladaptive behavior. Similarly, having a greater number of close friends who do not engage in binge drinking protected against shifting into these two groups by increasing the likelihood of remaining in the Nil-to-Low group. For Early-Onset users, however, having more friends who do not engage in even non-binge drinking also operated in the aforementioned protective manner; alternatively, it could be said that having more friends who *do* engage in sub-binge-level drinking shifts individuals *into* the Early-Onset High group. Therefore, it might be the case that individuals who initiate drinking early are at risk of maintaining this behavior in the presence of peers who drink at *any* level; Late-Onset users are only at risk in the presence of peers who drink to problematic levels while peers who drink in lesser amounts have no discernable impact. Overall, the emergence of the aforementioned risk and protective factors offers a promising glimpse into potential targets for intervention.

Finally, considering how individual and contextual factors interact to alter the probabilities of AUT group membership was of special interest for the current study. Consistent with hypotheses, a few of the examined combined effects did notably moderate the effects of impulsivity in the final bioecological model. That sensation

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seeking and perceived peer approval of drinking interact to attenuate the overall effect of either factor on its own for the Experimenters makes intuitive sense given the aforementioned conceptualization by Derefinko et al. Namely, the impact of higher levels of sensation seeking would be less pronounced in the context of disapproving friends for individuals who are in a descending pattern of drinking and attending to greater responsibilities and commitments. The effects of difficult access to alcohol and lack of premeditation work in concert to attenuate the risk of shifting out of the Nil-to-Low group. This may be the case because if individuals are less likely to think through their choices and plan ahead, they may also be less likely to devise strategies for overcoming the difficulty of accessing alcohol. Overall, the presence of these important moderating effects demonstrates the need for multifaceted approaches to prevention and intervention efforts to reduce harmful alcohol use during the transition to young adulthood.

The cumulative findings of this study have important clinical implications for designing interventions that target particular risk factors, such as impulsivity, motives, and expectancies, or increase the availability of protective factors, such as nondrinking peers and structured organizations or clubs. Clarification of how these factors may interact to affect risk can be used in wider policy decisions regarding, for example, regulating the social activities of Greek organizations to change the norms of that environment, or limiting access to alcohol by toughening the associated mandates and implementing better mechanisms to detect fake IDs or individuals purchasing alcohol for minors. As policymakers, counselors, and researchers better understand the characteristics that lead to adverse drinking patterns, this behavior can be more effectively addressed.

Limitations and Future Directions

This study represents an important step towards cultivating a fuller understanding of patterns and trends in alcohol use and the related risk factors and correlates. One limitation of the current project is that the period from adolescence to young adulthood is a large developmental period that invariably includes other changes and factors that may not be observed or included in the current study design. However, it should be noted that, if results of the current study suggest important associations between the measured factors and alcohol use patterns, future work should be conducted that determines and includes other potential variables of interest to account more fully for changes in this behavior of interest. Another potential limitation is, as noted in the Methods chapter, this study examined 410 participants, a subset of the main project sample of 525, due to attrition. As such, it is possible that the associations identified in the current sample may only be limited to this subset and not generalize to the full sample. However, the aforementioned attrition analyses showed that it is unlikely that differences in duration of participation in this study affected the variables of interest.

Additionally, all data, including descriptive and injunctive peer norms, were reported by a single informant. While this may reflect effects of social desirability, retrospective biases, and source effects, the current methodology has been repeatedly used and deemed informative, reliable and valid (e.g., Miller, Flory, Lynam, & Leukefeld, 2003). With respect to peer norms, the absence of actual peer report about their own drinking behaviors and attitudes may be considered a methodological limitation; however, this approach is widely accepted and used (e.g., Borsari & Carey, 2001; LaBrie et al., 2010; Neighbors et al., 2007). In fact, when data have been collected

from adolescents and the friends about whom they report, research has found that, while subjects tend to overestimate their peers' drinking behavior and attitudes, these overestimated perceived norms contribute robustly to subjects' own drinking behavior. In turn, these findings have contributed to norm feedback interventions that have shown notable reductions in drinking behavior (Borsari & Carey, 2001).

Another potential limitation is that, in all analyses, the nil-to-low group was used as the source of comparison, which could be conceptualized as the ideal or target group. However, some level or experimentation of drinking may be acceptable for this population, so future studies may consider first examining the influence of AUT on long-term adjustment outcomes (i.e., substance use disorders, other extreme risky behaviors, DUIs, psychopathology) in order to better identify an appropriate comparison group. For example, it may well be the case that the Experimenters have the best balance of college experience and long-term adjustment and would thereby serve as a more relevant comparison. While research on this has been mixed, there is some evidence that moderate alcohol consumption is associated with concurrent and/or long-term social satisfaction, positive well-being, and general life satisfaction (Massin, 2014; Molnar, 2009; Murphy, 2005). Future studies may benefit from expanding analyses to examine and compare probabilities of group membership when a moderate use group is used as the reference group, in addition to or instead of a nil-to-low use group. At matriculation to college, Experimenters and Late-Onset users are drinking at the same levels but diverge thereafter, and Early- and Late-Onset users enter college drinking at different levels then converge at high levels by the second year of college. Given that, it may also be informative to use the Late-Onset High group as the reference to further understand these

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diverging and converging patterns of use.

Summary

The goals of the current study were to develop a better understanding of established alcohol use trajectory groups, identify factors associated with membership in these groups from a bioecological approach, and identify potential moderators. Results indicated that changes in levels of sensation seeking, enhancement motives, peer drinking, peer binge drinking, and access to a fake ID significantly affected the likelihood of shifting out of the Nil-to-Low group. Further, support was found for moderating effects between sensation seeking and perceived peer approval of drinking, and lack of premeditation and access to alcohol. These results point to several important factors that could be incorporated into targeted prevention and intervention efforts.

Appendix A: Alcohol Expectancy Multi-Axial Assessment (AEMAX)

This questionnaire is about the effects of alcohol. Please determine how much you believe each of the words below completes the phrase "Drinking alcohol makes one..." Whether or not you have had an actual drinking experience yourself, you are to answer according to what you believe, regardless of what other people might think.

Drinking alcohol makes one …

		Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree
1.	Horny	1	2	3	4	5
2.	Egotistical	1	2	3	4	5
3.	Sick	1	2	3	4	5
4.	Woozy	1	2	3	4	5
5.	Sociable	1	2	3	4	5
6.	Attractive	1	2	3	4	5
7.	Sleepy	1	2	3	4	5
8.	Dangerous	1	2	3	4	5
9.	Lustful	1	2	3	4	5
10.	Arrogant	1	2	3	4	5
11.	Nauseous	1	2	3	4	5
12.	Dizzy	1	2	3	4	5
13.	Outgoing	1	2	3	4	5
14.	Appealing	1	2	3	4	5
15.	Tired	1	2	3	4	5
16.	Deadly	1	2	3	4	5
17.	Erotic	1	2	3	4	5
18.	Cocky	1	2	3	4	5
19.	Ill	1	2	3	4	5
20.	Light-headed	1	2	3	4	5
21.	Social	1	2	3	4	5
22.	Beautiful	1	2	3	4	5
23.	Drowsy	1	2	3	4	5
24.	Hazardous	1	2	3	4	5

Appendix B: College Life Questionnaire (CLQ)

	0	1	2	3	4	5	6	7	8
1) Where did you live this semester?		Home with family	Campus dorm/ apartment						
2) This semester, were you part of a Greek organization?	No	Yes							
3) This semester, did you have a job?	No	Yes							
4) If yes, was it part-time or full-time?		Part-time	Full-Time						
5) This semester, what type of job did you have?		Retail	On Campus	Sales	Restaurant /Bar	Other			
6) This semester, did you withdraw from school or drop below part-time status?	No	Yes							
7) This semester, did you participate in any of these campus activities?									
8) Student government	No	Yes							
9) Varsity/ intercollegiate sports	No	Yes							
10) Study abroad	No	Yes							
11) Student clubs/ organizations	No	Yes							
12) Other organizations	No	Yes							
13) This semester, did you travel?	No	Yes							
14) This semester did you do any volunteer work?	No	Yes							
15) This semester, what was your grade point average (GPA) (e.g. 3.66)?									
16) Please rate the level of ease with which you feel that you could obtain alcohol this semester.		Very Easy	Easy	Uncertain	Hard	Very Hard			
17) This semester, did you have access to a fake ID?	No	Yes							
18) If you drink alcohol, where do you usually go to drink this semester?		Don't Drink	At home in my dorm or campus apt	At home in my off campus housing	At my family's home	At a friend's dorm or campus apt	At friend's off campus apt	At bars or night clubs	At school sponsored events

Appendix C: Drinking Motives Questionnaire (DMQ)

The following is a list of reasons people sometimes give for drinking alcohol. Thinking of all the times you drink, please indicate how often you would say that you drink for each of the following reasons.

I drink…

		Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree
1.	To forget my worries	1	2	3	4	5
2.	Because my friends pressure me to drink	1	2	3	4	5
3.	Because it helps me enjoy a party	1	2	3	4	5
4.	Because it helps me when I feel depressed or nervous	1	2	3	4	5
5.	To be sociable	1	2	3	4	5
6.	To cheer up when I am in a bad mood	1	2	3	4	5
7.	Because I like the feeling	1	2	3	4	5
8.	So that others won't kid me about not drinking	1	2	3	4	5
9.	I drink... Because it's exciting	1	2	3	4	5
10.	To get high	1	2	3	4	5
11.	Because it makes social gatherings more fun	1	2	3	4	5
12.	To fit in with a group I like	1	2	3	4	5
13.	Because it gives me a pleasant feeling	1	2	3	4	5
14.	Because it improves parties and celebrations	1	2	3	4	5
15.	Because I feel more self-confident and sure of myself	1	2	3	4	5
16.	To celebrate a special occasion with friends	1	2	3	4	5
17.	To forget about my problems	1	2	3	4	5
18.	Because it's fun	1	2	3	4	5
19.	To be liked	1	2	3	4	5
20.	So I won't feel left out	1	2	3	4	5
21.	To know myself better	1	2	3	4	5
22.	Because it helps me be more creative and original	1	2	3	4	5
23.	To understand things differently	1	2	3	4	5
24.	To expand my awareness	1	2	3	4	5
25.	To be more open to experiences	1	2	3	4	5

Appendix D: Peer Substance Use Questionnaire

In the following questionnaire, you will be asked about your closest friends and their use of various substances. Please answer as honestly as possible.

	1	2	3	4	5	6	7
1) Please enter the initials of your closest friend.							
2) What is this friend's gender?	Male	Female					
3) What is the nature of your relationship with this person?	Best Friend	Friend	Significant Other	Parents	Siblings	Other	
4) How many hours per week (168 hrs. equals a week) do you generally spend with this person?	0-6 hrs/week	7-12 hrs/week	13-18 hrs/week	19-24 hrs/week	25-72 hrs/week	73-168 hrs/week	
5) How important do you consider this friend?	Somewhat important in my life	Very Important	The most important person in my life				
6) How long have you known this person?	Less than 1 month	1-3 months	Less than 1 year	1-3 years	More than 3 years		
7) Now you will be asked about this friend's use of cigarettes.							
8) Does this person smoke cigarettes?	Yes	No					
9) How many packs per day does he/she smoke?	Just a few (1-4)	About half a pack (5-14)	About a pack (15-24)	About 1 1/2 packs (25-34(	About 2 packs (35-44)	More than 2 packs (45+)	
10) How harmful does he/she think smoking is?	Not at all harmful	Somewhat harmful	Very harmful				
11) How does/would he/she feel about you smoking?	He/she would strongly disagree with my decision	He/she would disagree with my decision	He/she would neither agree nor disagree with my decision	He/she would agree with my decision	He/she would strongly agree with my decision		
12) Now you will be asked about this friend's use of alcohol.							
13) Does this person drink alcohol?	Yes	No					
14) On average, how often does he/she drink?	Less than once a month	About once or twice a month, never in large amounts	About once or twice a month, sometimes in large amounts	About once or twice a week, always in large amounts	About once or twice a week, always in large amounts	Almost everyday, never in large amounts	Almost everyday, sometimes in large amounts
15) Does he/she ever "binge" drink? (i.e., have five or more drinks in the course of an	Yes	No					

hour or two?)							
16) How harmful does he/she think drinking alcohol is?	Not at all harmful	Somewhat harmful	Very harmful				
17) How does/would he/she feel about you drinking alcohol?	He/she would strongly disagree with my decision	He/she would disagree with my decision	He/she would neither agree nor disagree with my decision	He/she would agree with my decision	He/she would strongly agree with my decision		
18) Now you will be asked about this friend's use of marijuana.							
19) Does he/she smoke marijuana?	Yes	No					
20) On average, how often does he/she use marijuana?	Only once or twice ever	1-2 times a month	1-2 times a week	Almost everyday	Several times a day		
21) How much does he/she smoke at a time	1-2 hits	2-4 hits	4-8 hits	8+ hits			
22) How harmful does he/she think marijuana is?	Not at all harmful	Somewhat harmful	Very harmful				
23) How does/would he/she feel about you using marijuana?	He/she would strongly disagree with my decision	He/she would disagree with my decision	He/she would neither agree nor disagree with my decision	He/she would agree with my decision	He/she would strongly agree with my decision		
24) Now you will be asked about this friend's use of amphetamines (i.e., meth, speed, Ritalin, diet pills).							
25) Does he/she use amphetamines?	Yes	No					
26) On average, how often does he/she use amphetamines?	Only once or twice ever	1-2 times a month	1-2 times a week	Almost everyday	Several times a day		
27) On average, how much does he/she use at a time?	1 pill, line, line, hit or less	2 pills, lines, hits	3 pills, lines, hits	4 pills, lines, hits	5 pills, lines, hits	6 or more pills, lines, hits	
28) How harmful does he/she think using amphetamines is?	Not at all harmful	Somewhat harmful	Very harmful				
29) How does/would he/she eel about you using amphetamines?	He/she would strongly disagree with my decision	He/she would disagree with my decision	He/she would neither agree nor disagree with my decision	He/she would agree with my decision	He/she would strongly agree with my decision		
30) Now you will be asked about this friend's use of all other illegal drugs (e.g. ecstasy, acid, cocaine, club drugs).							
31) Does this person use any other illegal substances?	Yes	No					
32) Does your friend use non-	Yes	No					

alcohol depressants (e.g. Barbiturates, Librium, Seconal, Sleeping Pills, Tranquilizers, Valium, Xanax, etc)?						
33) Does your friend use cocaine or crack?	Yes	No				
34) Does your friend use opioids (e.g. codeine, darvon, demoral, dilaudid, methadone, morphine, opium, percodan, talwin)?	Yes	No				
35) Does your friend use inhalants (e.g. Glue, Toluene, Gasoline, Paint, Paint Thinner)?	Yes	No				
36) Does your friend use hallucinogens (e.g. DMT, LSD, Mescaline, Mushrooms, Peyote, Psilocybin)?	Yes	No				
37) Does your friend use Ecstasy/MDMA?	Yes	No				
38) Does your friend use club drugs (e.g. GHB, Ketamine, Rohypnol)?	Yes	No				
39) On average, how often does he/she use these drugs?	Only once or twice ever	1-2 times a month	1-2 times a week	Almost everyday	Several times a day	
40) On average, how much does he/she use at a time?	1 pill, line, line, hit or less	2 pills, lines, hits	3 pills, lines, hits	4 pills, lines, hits	5 pills, lines, hits	6 or more pills, lines, hits
41) How harmful does he/she think using illegal drugs is?	Not at all harmful	Somewhat harmful	Very harmful			
42) How does/would he/she feel about you using illegal drugs?	He/she would strongly disagree with my decision	He/she would disagree with my decision	He/she would neither agree nor disagree with my decision	He/she would agree with my decision	He/she would strongly agree with my decision	
43) Please enter the initials of your second closest friend. (Repeat items 1-43 for second and third closest friend)						

Appendix E: UPPS-P Impulsive Behaviors Scale

Following are a number of statements that describe ways in which people act and think. For each statement, please indicate how much you agree or disagree with the statements. Be sure to indicate your agreement or disagreement for every statement following.

		Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree
1.	I have a reserved and cautious attitude toward life.	1	2	3	4	5
2.	I have trouble controlling my impulses.	1	2	3	4	5
3.	I generally seek new and exciting experiences and sensations.	1	2	3	4	5
4.	I generally like to see things through to the end.	1	2	3	4	5
5.	When I am very happy, I can't seem to stop myself from doing things that can have bad consequences.	1	2	3	4	5
6.	My thinking is usually careful and purposeful.	1	2	3	4	5
7.	I have trouble resisting my cravings (for food, cigarettes, etc.).	1	2	3	4	5
8.	I'll try anything once.	1	2	3	4	5
9.	I tend to give up easily.	1	2	3	4	5
10.	When I am in a great mood, I tend to get into situations that could cause me problems.	1	2	3	4	5
11.	I am not one of those people who blurt out things without thinking.	1	2	3	4	5
12.	I often get involved in things I later wish I could get out of.	1	2	3	4	5
13.	I like sports and games in which you have to choose your next move very quickly.	1	2	3	4	5
14.	Unfinished tasks really bother me.	1	2	3	4	5
15.	I like to stop and think things over before I do them.	1	2	3	4	5
16.	When I feel bad, I will often do things I later regret in order to make myself feel better now.	1	2	3	4	5

17.	I would enjoy water skiing.	1	2	3	4	5
18.	Once I get going on something I hate to stop.	1	2	3	4	5
19.	I tend to lose control when I am in a great mood.	1	2	3	4	5
20.	I don't like to start a project until I know exactly how to proceed.	1	2	3	4	5
21.	Sometimes when I feel bad, I can't seem to stop what I am doing even though it is making me feel worse.	1	2	3	4	5
22.	I quite enjoy taking risks.	1	2	3	4	5
23.	I concentrate easily.	1	2	3	4	5
24.	When I am really ecstatic, I tend to get out of control.	1	2	3	4	5
25.	I would enjoy parachute jumping.	1	2	3	4	5
26.	I finish what I start.	1	2	3	4	5
27.	I tend to value and follow a rational, "sensible" approach to things.	1	2	3	4	5
28.	When I am upset I often act without thinking.	1	2	3	4	5
29.	Others would say I make bad choices when I am extremely happy about something.	1	2	3	4	5
30.	I welcome new and exciting experiences and sensations, even if they are a little frightening and unconventional.	1	2	3	4	5
31.	I am able to pace myself so as to get things done on time.	1	2	3	4	5
32.	I usually make up my mind through careful reasoning.	1	2	3	4	5
33.	When I feel rejected, I will often say things that I later regret.	1	2	3	4	5
34.	Others are shocked or worried about the things I do when I am feeling very excited.	1	2	3	4	5
35.	I would like to learn to fly an airplane.	1	2	3	4	5
36.	I am a person who always gets the job done.	1	2	3	4	5
37.	I am a cautious person.	1	2	3	4	5
38.	It is hard for me to resist acting	1	2	3	4	5

	on my feelings.					
39.	When I get really happy about something, I tend to do things that can have bad consequences.	1	2	3	4	5
40.	I sometimes like doing things that are a bit frightening.	1	2	3	4	5
41.	I almost always finish projects that I start.	1	2	3	4	5
42.	I often make matters worse because I act without thinking when I am upset.	1	2	3	4	5
43.	Before I get into a new situation I like to find out what to expect from it.	1	2	3	4	5
44.	I often make matters worse because I act without thinking when I am upset.	1	2	3	4	5
45.	When overjoyed, I feel like I can't stop myself from going overboard.	1	2	3	4	5
46.	I would enjoy the sensation of skiing very fast down a high mountain slope.	1	2	3	4	5
47.	Sometimes there are so many little things to be done that I just ignore them all.	1	2	3	4	5
48.	I usually think carefully before doing anything.	1	2	3	4	5
49.	When I am really excited, I tend not to think of the consequences of my actions.	1	2	3	4	5
50.	In the heat of an argument, I will often say things that I later regret.	1	2	3	4	5
51.	I would like to go scuba diving.	1	2	3	4	5
52.	I tend to act without thinking when I am really excited.	1	2	3	4	5
53.	I always keep my feelings under control.	1	2	3	4	5
54.	When I am really happy, I often find myself in situations that I normally wouldn't be comfortable with.	1	2	3	4	5
55.	Before making up my mind, I consider all the advantages and	1	2	3	4	5

	disadvantages.					
56.	I would enjoy fast driving.	1	2	3	4	5
57.	When I am very happy, I feel like it is ok to give in to cravings or overindulge.	1	2	3	4	5
58.	Sometimes I do impulsive things that I later regret.	1	2	3	4	5
59.	I am surprised at the things I do while in a great mood.	1	2	3	4	5

References

Adams, Z. W., Kaiser, A. J., Lynam, D. R., Charnigo, R. J., & Milich, R. (2012).

 Drinking motives as mediators of the impulsivity-substance use relation:

 Pathways for negative urgency, lack of premeditation, and sensation

 seeking. *Addictive Behaviors, 37,* 848–855.

Anderson, K. G., Smith, G. T., McCarthy, D. M., Fischer, S. F., Fister, S., Grodin, D.,

 Boerner, L. M., & Hill, K. (2005). Elementary School Drinking: The Role of

 Temperament and Learning. *Psychology of Addictive Behaviors*, *19*(1), 21–27.

Arnett, J. J. (2000). Emerging adulthood: A theory of development from the late teens

 through the twenties. *American Psychologist, 55,* 469–480.

Bonsu, J. A., Adams, Z., Milich, R., Keller, P., & Smith, G. T. (in prep). High school

 peer crowd affiliation and alcohol use in college: Mediating effects of friends'

 drinking.

Borsari, B., & Carey, K. B. (2001). Peer influences on college drinking: A review of the

 research. *Journal of Substance Abuse, 13,* 391−424.

Bronfenbrenner, U. (2005). *Making Human Being Human: Bioecological Perspectives*

 On Human Development. Thousand Oaks, CA: Sage Publications, Inc.

Caspi, A., Moffitt, T., Thornton, A., & Freedman, D. (1996). The life history calendar: A

 research and clinical assessment method for collecting retrospective event-history

 data. *International Journal of Methods in Psychiatric Research*, *6*(2), 101–114.

Chaloupka, F. J. (2003). Contextual factors and youth tobacco use: Policy linkages.

 Addiction, 98(Suppl. 1), 147–149.

Charnigo, R., Kryscio, R., Bardo, M. T., Lynam, D., & Zimmerman, R. S. (2011). Joint
modeling of longitudinal data in multiple behavioral change. *Evaluation & the
Health Professions. 34*(2), 181–200.

Chassin, L., Pitts, S. C., & Prost, J. (2002). Binge drinking trajectories from adolescence
to emerging adulthood in a high-risk sample: Predictors and substance abuse
outcomes. *Journal of Consulting and Clinical Psychology, 70*, 67–78.

Cook, T. D. (2003). The case for studying multiple contexts simultaneously. *Addiction,
98*(Suppl. 1), 151–155.

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

Corbin, W. R., Iwamoto, D. K., & Fromme, K. (2011). Broad social motives, alcohol use,
and related problems: Mechanisms of risk from high school through college.
Addictive Behaviors, *36*(3), 222–230.

Dawson, D. A., B. F. Grant, et al. (2004). Another look at heavy episodic drinking and
alcohol use disorders among college and noncollege youth. *Journal of Studies on
Alcohol, 65*(4): 477–488.

Derefinko, K. J., Charnigo, R. J., Peters, J. R., Adams, Z. W., Milich, R., & Lynam, D. R.
(in press). Substance use trajectories from early adolescence through the transition
to college. *Journal of Studies on Alcohol and Drugs*.

Dick, D. M., Smith, G. T., Olausson, P., Mitchell, S. H., Leeman, R. F., O'Malley, S. S.,
& Sher, K. (2010). Understanding the construct of impulsivity and its relationship
to alcohol use disorders. *Addiction Biology, 15*, 217–226.

Flory, K., Lynam, D., Milich, R., Leukefeld, C., & Clayton, R. (2004). Early adolescent through young adult alcohol and marijuana use trajectories: Early predictors, young adult outcomes, and predictive utility. *Development and Psychopathology, 16*, 193–213.

Goldman**,** M. S., & Darkes, J. (2004). Alcohol Expectancy Multiaxial Assessment: A Memory Network-Based Approach. *Psychological Assessment, 16,* 2004. 4–15.

Harford, T.C. & Muthén, B. (2000). Adolescent and young adult antisocial behavior and adult alcohol use disorders: a fourteen-year prospective follow-up in a national survey. *Journal of Studies on Alcohol, 61,* 524–528.

Hersh, M. A., & Hussong, A. M. (2006). High school drinker typologies predict alcohol involvement and psychosocial adjustment during acclimation to college. *Journal of Youth and Adolescence, 35*, 741–754.

Jackson, K. M., Sher, K. J., & Park, A. (2005). Drinking among College Students. In M. Galanter, M. Galanter (Eds.), *Recent developments in alcoholism: Volume 17. Alcohol problems in adolescents and young adults* (pp. 85–117). New York, NY US: Kluwer Academic/Plenum Publishers.

Jackson, K.M., Sher, K.J., & Schulenberg, J.E. (2008). Conjoint developmental trajectories of young adult substance use. *Alcoholism-Clinical and Experimental Research, 32*(5)*,* 723–737.

Jones, B. J., & Nagin, D. S. (2007) Advances in group-based trajectory modeling and an SAS procedure for estimating them. *Sociological Methods & Research, 35*(4), 542–571.

Kaiser, A., Bonsu, J.A., Charnigo, R.J., Milich, R., & Lynam, D.R. (2016). Impulsive

    personality and alcohol use: Bidirectional relations over one year. *Journal of*

    Studies on Alcohol and Drugs, 77(3), 473-482.

Kobus, K. (2003). Peers and adolescent smoking. *Addiction*, *98*(Suppl. 1), 105–122.

Kuperman, S. Schlosser, S.S., Kramer, J.R., Bucholz, K., Hesselbrock, V., Reich, T., &

    Reich, W. (2001). Developmental sequence from disruptive behavior diagnosis to

    adolescent alcohol dependence. *American Journal of Psychiatry, 158,* 2022–2026.

LaBrie, J. W., Hummer, J. F., Neighbors, C., & Larimer, M. E. (2010). Whose opinion

    matters? The relationship between injunctive norms and alcohol consequences in

    college students. *Addictive Behaviors*, *35*(4), 343-349.

Lejuez, C. W., Magidson, J. F., Mitchell, S. H., Sinha, R., Stevens, M. C., de Wit, H.

    (2010). Behavioral and biological indicators of impulsivity in the development of

    alcohol use, problems, and disorders. *Alcoholism: Clinical and Experimental*

    Research, 34(8), 1334–1345.

Liang, L., Chaloupka, F., Nichter, M. & Clayton, R. (2003) Prices, policies and youth

    smoking. *Addiction*, *98*(Suppl. 1), 105–122.

Littlefield, A. K., Sher, K. J., & Steinley, D. (2010). Developmental trajectories of

    impulsivity and their association with alcohol use and related outcomes during

    emerging and young adulthood I. *Alcoholism: Clinical and Experimental*

    Research, 34(8), 1409–1416.

Lynam, D. R., Smith, G. T., Whiteside, S. P., & Cyders, M. A. (2006). *The UPPS-P:*

    Assessing five personality pathways to impulsive behavior (Technical Report).

    West Lafayette, IN: Purdue University.

Maggs, J. L., & Schulenberg, J. E. (2004). Trajectories of alcohol use during the

transition to adulthood. *Alcohol Research & Health, 28*(4), 195–201.

Massin, S., & Kopp, P. (2014). Is life satisfaction hump-shaped with alcohol

consumption? Evidence from Russian panel data. *Addictive Behaviors*, *39*(4),

803-810.

Masten, A. S., Faden, V. B., Zucker, R. A., & Spear, L. P. (2009). A developmental

perspective on underage alcohol use. *Alcohol Research and Health, 32*(1), 3–15.

Miller, J. D., Lyman, D. R., Widiger, T. A., & Leukefeld, C. (2001). Personality

disorders as extreme variants of common personality dimensions: Can the five

factor model adequately represent psychopathy?. *Journal of personality, 69*(2),

253-276.

Moeller, F., & Dougherty, D. M. (2002). Impulsivity and substance abuse: What is the

connection? *Addictive Disorders & Their Treatment*, *1*(1), 3–10.

Molnar, D. S., Busseri, M. A., Perrier, C. K., & Sadava, S. W. (2009). A longitudinal

examination of alcohol use and subjective well-being in an undergraduate

sample. *Journal of Studies on Alcohol and Drugs*, *70*(5), 704-713.

Mullins, U. L., Bonsu, J. A., Charnigo, R. J., Derefinko, K. J., Lorch, E. P., Milich, R., &

Lynam, D. R. (under review). Tobacco, alcohol, and marijuana use during the

transition to college: Associations with trait impulsivity.

Murphy, J. G., McDevitt-Murphy, M. E., & Barnett, N. P. (2005). Drink and be merry?

Gender, life satisfaction, and alcohol consumption among college students.

Psychology of Addictive Behaviors, *19*(2), 184-191.

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.

Schulenberg, J., & Maggs, J. L. (2002). A developmental perspective on alcohol use and heavy drinking during adolescence and the transition to young adulthood. *Journal of Studies on Alcohol, Suppl. 14,* 54–70.

Schulenberg, J., Wadsworth, K. N., O'Malley, P. M, Bachman, J. G., & Johnston, L D. (1996). Adolescent risk factors for binge drinking during the transition to young adulthood: Variable- and pattern-centered approaches to change. *Developmental Psychology, 32*(4), 65–74.

Tucker, J.S., Orlando, M., & Ellickson, P. L. (2003). Patterns and correlates of binge drinking trajectories from early adolescence to young adulthood. *Health Psychology, 22*(1), 79–87.

Whiteside, S. P. & Lynam, D. R. (2001). The Five Factor Model and impulsivity: Using a structural model of personality to understand impulsivity. *Personality and Individual Differences, 30*, 669–689.

Wilcox, P. (2003) An ecological approach to understanding youth smoking trajectories: problems and prospects. *Addiction*, *98*(Suppl. 1), 57–77.

CURRIVULUM VITAE

JACQUELINE ADOBIA BONSU

EDUCATION

8/2010 - 12/2012	**University of Kentucky (UK)** Master of Science, Clinical Psychology, *with specialization in Children at Risk* Advisor: Richard Milich, Ph.D. Master's Thesis: *Do High School Peer Crowd Affiliation and Peer Alcohol Use Predict Alcohol Use During College?*
8/2006 - 5/2010	**University of North Carolina at Chapel Hill** Bachelor of Science, Psychology, *with Distinction, with Highest Honors* Minor: Spanish for the Professions Advisor: Mitch Prinstein, Ph.D. Honors Thesis: *The Role of Ethnicity in Peer Influence to Drink Alcohol*

CLINICAL POSITIONS

2015 - 2016	**Child & Adolescent Behavioral Health (C&A), Canton, OH** *Doctoral Psychology Intern*
2014 - 2015	**Jesse G. Harris, Jr. Psychological Services Center, University of Kentucky** *Assistant Director*
2011 - 2015	**Jesse G. Harris, Jr. Psychological Services Center, University of Kentucky** *Therapist*
2012 - 2014	**Child & Adolescent Trauma Treatment & Training Institute (CATTTI), Lexington, KY** *Practicum Therapist; Clinical Assistant Therapist*
2013	**Healthy Relationships, Salvation Army, Lexington, KY** *Co-leader*
2012 - 2013	**UK Outpatient Psychiatry, University of Kentucky** *Assessment Practicum Clinician*
2012	**Going for Goals Group, Jesse Clark Middle School**, Lexington, KY *Co-leader*
2012	**Dr. Katherine Stone, Psychological Services** *Practicum Therapist*
2012	**Parenting Group, Share Center**, Lexington, KY *Co-leader*
2011 - 2012	**Amend Psychological Services** *Practicum Therapist*

TEACHING POSITIONS

2014 - 2015	**PSC Center Assistant Supervision (PSY 399)**, Professor: David Susman, Ph.D. *Teaching Assistant*
2014	**Introduction to Psychology (PSY 100)**, Professor: Andrea Friedrich, Ph.D. *Teaching Assistant*
2013	**Cognitive Assessment Practicum (PSY 631)**, Professor: Gregory T. Smith, Ph.D. *Teaching Assistant*

RESEARCH POSITIONS

2010 - 2016	**Center for Drug Abuse Research and Translation (CDART), University of Kentucky** *Research Assistant*
2014	**Adolescent Risk Behavior Research, University of Kentucky** *Research Assistant*
2009 - 2010	**innovation, Research & Training, Durham, NC** *Research Assistant*
2009 - 2010	**Peer Relations Lab, Department of Psychology, University of North Carolina at Chapel Hill** *Research Assistant*; *Honors Student*
2009	**UNC Neuroscience Hospital, Center of Excellence for Research & Treatment of Bipolar Disorder (CERT-BD) , University of North Carolina at Chapel Hill** *Research Assistant*

SCHOLASTIC & PROFESSIONAL AWARDS & HONORS

2010 - 2013	*Lyman T. Johnson Fellowship*, University of Kentucky
2010 - 2012	*Graduate Student Travel Award*, University of Kentucky
2007 - 2009	*Dean's List*, University of North Carolina at Chapel Hill
2006 - 2009	*Academic Achievement Award*, University of North Carolina at Chapel Hill

PROFESSIONAL PUBLICATIONS

Bonsu, J. A., Milich, R., Keller, P., & Adams, Z. (in preparation). Effects of high school peer crowd affiliation and current peer alcohol use on alcohol use during college.

Bailey, U. L., **Bonsu, J.A**., Charnigo, R., & Milich, R. (in preparation). Examining the role of personality, peers, and the transition to college on alcohol use.

Derefinko, K. J., Charnigo, R., Milich, R., **Bonsu, J. A**., & Lynam, D. R. (2015). Experience sampling as a strategy to explore the link between substance use and trait impulsivity. Manuscript submitted for publication.

Kaiser, A., **Bonsu, J.A**., Charnigo, R.J., Milich, R., & Lynam, D.R. (2016). Impulsive personality and alcohol use: Bidirectional relations over one year. *Journal of Studies on Alcohol and Drugs, 77*(3), 473-482.