1-1-2012

Effectiveness of an online personalized feedback intervention for young adult problem drinkers

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EFFECTIVENESS OF AN ONLINE PERSONALIZED FEEDBACK INTERVENTION
FOR YOUNG ADULT PROBLEM DRINKERS

by

Tracey L. Rocha

A Dissertation
Submitted to the University at Albany, State University of New York
in Partial Fulfillment of
the Requirements for the Degree of
Doctor of Philosophy

School of Education
Department of Educational & Counseling Psychology
2012

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ACKNOWLEDGMENTS

Although this dissertation is filed under my name, completing this journey would not have been possible without the assistance from many. To my co-chair, Dr. Matthew Martens: I have learned immeasurable amounts from your guidance, mentorship, and example. I am thankful for your patience and personal commitment to seeing me through this process and your ability to see me as I am. Despite the distance, you have always been my advisor and I will appreciate that gift always. To my co-chair, Dr. Myrna Friedlander: I am indebted to you for your dedication and efficiency, and I would not be where I am without your tireless efforts throughout graduate school. You generously took me under your wing when I needed your support, and you brought clarity to my work. I am honored to have had your mentorship and guidance. To my committee member, Dr. James Murphy: Your kindness has been pivotal for many years – first, mentoring my research experiences and graduate applications; later, providing the idea and encouragement for my dissertation research; and finally, offering invaluable expertise and suggestions. You are a consummate professional. To the faculty who provided me with a tremendous education, especially Dr. Richard Haase, who encouraged theoretical and statistical rigor in my early drafts. I am thankful for my study participants, who gave their time and candor to make this dissertation possible.

I appreciate my parents’ sacrifice and diligence, which demonstrated to me the value of education and fostered in me a love of learning. To my dad, Daniel Rocha: I finally finished that paper I’ve been writing. You have given so much to see my dreams come true. If I am able to have half the positive effect on others as you do on the people around you every day, I will be a successful psychologist. I am thankful to my brothers,
Danny and Cory, and to the rest of the Rochas, Pereiras, and Phelons, for always believing in me.

To the Amoeba and CPY Superstars: I am honored to have learned with and from such unique and dedicated people. You helped me to celebrate every small success and gain confidence after every setback. You inspire me to be a better person and professional. I thank Li-Ling and Shannon for endless and emphatic support, no matter what the situation. My home is always yours, purple couches optional. To my dearest friends, Louisa, editor extraordinaire, and Amanda, constant cheerleader: You are family as much as you are friends, and your love and support bolsters me across time and distance. And my thanks to Luna and Swayze, who remind me of the important daily tasks: food, sleep, exercise, play, and companionship.

To my husband, David Phelon: Graduate school brought me to you, and you brought me through. Your calmness, patience, generosity, and humor turn challenges into joys. Your culinary prowess has nourished me for many a long night at my laptop. Not only a supportive husband, you gave editorial advice and provided invaluable excel expertise to allow me to create my feedback sheets with a few clicks. Your unwavering support for finishing what I started no matter the challenge to our relationship is one of the greatest gifts you have given me.

Finally, I dedicate this work in memory of my mother, Rose Mary Rocha, whose unconditional love and support is the foundation of my achievements. I hope you are smiling.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>List of Tables and Figures</td>
<td>vii</td>
</tr>
<tr>
<td>Abstract</td>
<td>viii</td>
</tr>
<tr>
<td>Chapter 1: Statement of the Problem and Review of Literature</td>
<td>1</td>
</tr>
<tr>
<td>Emerging Adulthood and the Transition to Adulthood</td>
<td>6</td>
</tr>
<tr>
<td>Alcohol Use during Emerging Adulthood and the Transition to Adulthood</td>
<td>8</td>
</tr>
<tr>
<td>Social Norms</td>
<td>15</td>
</tr>
<tr>
<td>Brief Motivational Interventions</td>
<td>17</td>
</tr>
<tr>
<td>Hypotheses</td>
<td>28</td>
</tr>
<tr>
<td>Significance of Study</td>
<td>30</td>
</tr>
<tr>
<td>Chapter 2: Method</td>
<td>32</td>
</tr>
<tr>
<td>Participants</td>
<td>32</td>
</tr>
<tr>
<td>Design</td>
<td>39</td>
</tr>
<tr>
<td>Treatment Conditions</td>
<td>40</td>
</tr>
<tr>
<td>Instruments</td>
<td>41</td>
</tr>
<tr>
<td>Daily Drinking Questionnaire</td>
<td>41</td>
</tr>
<tr>
<td>Brief Young Adult Alcohol Consequences Questionnaire</td>
<td>42</td>
</tr>
<tr>
<td>Drinking Norms Rating Form</td>
<td>44</td>
</tr>
<tr>
<td>Protective Behaviors Strategies Scale</td>
<td>45</td>
</tr>
<tr>
<td>Comprehension check</td>
<td>47</td>
</tr>
<tr>
<td>Salience of feedback</td>
<td>47</td>
</tr>
<tr>
<td>Demographic questionnaire</td>
<td>47</td>
</tr>
</tbody>
</table>
Appendix I: Demographic Questionnaire ................................. 121
Appendix J: Advertisements .................................................. 123
Appendix K: Screening Consent Form ................................. 125
Appendix L: Informed Consent Form ................................. 127
Appendix M: Informed Consent Form - Alternate Procedures .......... 129
List of Tables and Figures

Figure 1. Flow of Participants According to CONSORT Guidelines __________ 34

Table 1. Demographic Characteristics of the Sample (N = 276) ____________ 35

Table 2. Means, Standard Deviations, Internal Consistency, Skewness, and Kurtosis for Continuous Measures ________________________________ 57

Table 3. Bivariate Correlations among Study Variables _________________ 59

Table 4. Alcohol Use and Alcohol-Related Problems by Confirmation Survey Completion________________________________________________ 61

Table 5. Summary of Hierarchical Multiple Regression Analysis of Age, Gender, Treatment Condition, and the Age X Treatment Condition Interaction Predicting Alcohol Use ___________________________________________ 62

Table 6. Alcohol Use and Alcohol-Related Problems by Treatment Group and Time ________________________________________________________ 64

Table 7. Summary of Hierarchical Multiple Regression Analysis of Age, Gender, Treatment Condition, and the Age X Treatment Condition Interaction Predicting Alcohol-Related Problems ___________________________ 65
Abstract

This study investigated the effectiveness of a two-component, personalized feedback intervention for reducing alcohol use among adults, aged 18-35, who meet criteria for problem drinking. All recruitment and intervention procedures were conducted over the internet. The study compared the effects of personalized social norms feedback alone, to social norms feedback plus feedback about the individual’s level of risk and harm, and to an educational intervention (control group). The interaction of age with the effectiveness of each component of the intervention was also examined.

Participants were 276 young adults, with a mean age of 25.38 years, who responded to internet advertisements and met criteria for problem drinking. The study used a randomized, three-group, repeated-measures experimental design with alcohol use and alcohol-related problems assessed at a one-month follow-up. All follow-up participants (53.3%) significantly reduced their alcohol use and alcohol-related problems. Results also indicated no differences between the control and experimental conditions at follow up, and age did not moderate the outcomes.

The results demonstrated the feasibility of using the internet to reach a varied population of young adult problem drinkers outside a college setting who may otherwise not be reached for secondary prevention efforts. Participants’ qualitative reactions and recollection of the feedback at baseline and follow up suggested that either the hypothesized differences were not found because normative feedback was salient for participants who received personalized feedback, or participants may not have accurately recalled the information provided. The results also suggested that young adult problem
drinkers may respond to relatively little educational or normative information delivered online using an anonymous procedure.

Directions for future research investigating brief online interventions with young adult problem drinkers include assessing the validity of (a) measures of alcohol use, (b) alcohol-related problems, and (c) other alcohol-related behaviors for use in such research. It is also recommended to investigate injunctive norms, context specific drinking, and positive experiences related to alcohol use.
Chapter 1

Statement of the Problem and Review of Literature

Arnett (2000) proposed that emerging adulthood is a developmental stage distinct from adolescence and adulthood, beginning around age 18 and continuing into the mid-to late-20s. For many individuals, this developmental stage is characterized by instability and exploration and is associated with risk-taking behavior and substance use (Arnett, 2005). Data regarding the prevalence of alcohol use throughout the 20s (Substance Abuse and Mental Health Services Administration; SAMHSA, 2010) is consistent with Arnett’s view of emerging adulthood as a time of increased risk behaviors and substance use. Recent statistics show that prevalence of risky alcohol use tends to increase during the adolescent years, peaking between ages 21-25, with a decline in use among older age groups (SAMHSA, 2010). Notably, although addressing college student drinking is a national research priority (National Institute on Alcohol Abuse and Alcoholism; NIAAA, 2002), rates of “binge” drinking (defined as 5 or more drinks in one sitting) and frequent heavy drinking (i.e., binge drinking 5 or more days in the previous month) are nearly identical among full-time college students and 21-25 year olds in the general population: 42% and 16%, and 46% and 15%, respectively (SAMHSA, 2010).

The general purpose of the present study was to test the effectiveness of an online personalized feedback intervention for young adult problem drinkers. Motivational interventions (Miller & Rollnick, 2002) have been used effectively with college students to reduce alcohol use and related consequences (Larimer et al., 2007; Murphy et al., 2001; Neighbors, Larimer, & Lewis, 2004). These interventions are intended to address the first three steps of the self-regulation process: (a) receiving information from the
environment about one’s present status; (b) comparing the information to one’s goals, norms, and expectations; and (c) detecting consistency or discrepancy between the current and the desired state (Miller, Toscova, Miller, & Sanchez, 2000). When the individual detects consistency, he or she will likely continue the current behavior; when a discrepancy is detected, however, the person may become motivated to change his or her behavior. Problematic alcohol use may result from a breakdown in this self-regulatory process, which normally functions to protect an individual from harm.

Motivational interventions for college students typically include personalized feedback with normative comparisons based on self-reported drinking behavior, stating, for example, “You drink more than 75% of your peers.” This feedback initiates the self-regulation process by providing the student with correct information in Step 1 (i.e., normative drinking behavior) that leads to a new, more accurate comparison between current behavior to goals, norms, and expectations in Step 2 (e.g., Lewis, Neighbors, Oster-Aaland, Kirkeby, & Larimer, 2007; Neighbors et al., 2004). Theoretically, consideration of the personalized normative feedback in Step 2 prompts a discrepancy in Step 3, which motivates the student to change his or her drinking behavior.

Although the effect of social norms on college students’ alcohol use has been studied often (e.g., Borsari & Carey 2003; Pederson, LaBrie, & Lac, 2008), and personalized feedback with descriptive social norms has been demonstrated to be an effective intervention strategy (e.g., Neighbors, Lewis, Bergstrom, & Larimer, 2006), there is little information regarding how social norms influence the alcohol use of young adults who are not full-time college students, with only two previous studies specifically targeting young adults outside of a college setting for an alcohol use intervention.
It remains unclear whether providing normative feedback is effective at reducing alcohol use in this group.

Although forming relationships is an important developmental task for emerging adults, they tend to spend more leisure time alone than do people in any age group other than the elderly (Arnett, 2005). This paradox emphasizes the importance of gaining social approval during this developmental phase. Regardless of college status, individuals who have few long-term commitments to work or family must find ways to occupy their time and build social networks. For some, alcohol may be seen as a way to facilitate this process (Arnett, 2005). Thus, personalized social norms feedback may be more salient for younger adults, who are more concerned with social connections and group participation, than for older adults, who are likely to be more committed to adult roles such as marriage or career.

In addition to personalized social norms feedback, many motivational interventions that reduce alcohol use among college students also include feedback on personal risks and harms as a result of alcohol use (e.g., Collins, Carey, & Sliwinski, 2002; Murphy et al., 2004; White et al., 2006). According to emerging adulthood theory (Arnett, 1998), the achievement of adulthood in western cultures is characterized by the development of internal characteristics, such as accepting responsibility for oneself and making independent decisions. Behaving responsibly by avoiding driving after drinking or avoiding becoming intoxicated is often viewed as a marker of adulthood (Arnett, 2005) and may reflect the internalization of norms for acceptable adult behavior (Arnett, 2001). As individuals begin to solidify and commit to their adult identities, they may become more realistic and weigh the consequences of their actions more soberly. In contrast,
emerging adults may believe in their subjective invulnerability (Lapsley & Hill, 2010) to negative consequences regarding their alcohol use, believing that such consequences are unlikely to happen to them despite engaging in risky behavior (Arnett, 2005), or they may not fully consider consequences when choosing to drink. This reasoning is consistent with research that shows the higher order brain development related to inhibiting impulses continues to develop throughout the 20s (Pujol, Vendrell, Junqué, Martí-Vilalta, & Capdevila, 1993). Thus, interventions that present personal risks and harms should be more salient for those who have reached adulthood who, by virtue of their age, are more concerned with the consequences of risky behavior and biologically more capable of using this information to inhibit their impulses. The discrepancy created in Step 3 of the self-regulation process for adults is more likely to reflect a violation of their internalized adult identity than a normative comparison with peers. For emerging adults, on the other hand, information regarding their alcohol-related risks and harms may influence their drinking only to the extent that they believe the risks and harms are not normative for their social group, rather than because of an inherent dissonance with their self-concept.

In the current study, an internet-based screening and personalized feedback intervention was delivered using advertisements on a social networking site and a search engine, Facebook.com and Google.com, respectively, with non-college young adults. Non-college young adults were defined as individuals, aged 18-35, who were not full-time students at a four-year college or university. The first aim of the current study was to use internet-based procedures to target such individuals who may benefit from a brief motivational feedback intervention. This population may be at risk for problematic drinking, but they are unlikely to be reached by brief alcohol interventions typically
delivered in universities or health settings, thus a second aim of the study was to extend research on personalized feedback interventions for reducing alcohol use among college students (Agostinelli, Brown, & Miller, 1995; Murphy et al., 2004; Neighbors et al., 2004) and to assess the effectiveness of these interventions with non-college young adults.

Specifically, the first objective of the study was to test the effectiveness of an online feedback intervention in reducing alcohol use with non-college young adults. The second objective was to compare the effects of (a) social norms feedback alone, called personalized normative feedback, which is designed to correct individuals’ misperceptions of normative drinking, to (b) social norms feedback plus feedback about the individual’s level of risk and harm, i.e., personalized normative and drinking consequences feedback.

The third objective was to test the interaction of age with the effectiveness each component of the intervention. People in their early 20s may share similar developmental characteristics regardless of college attendance (Arnett, 2000); these characteristics include developmentally-associated deficits in social perceptions that put them at risk for addictive behaviors (Miller et al., 2000; Lapsley & Hill, 2010), e.g., an optimistic bias and sense of invulnerability due to lack of experience. In contrast, as individuals mature into adulthood, they are likely to have more proximal or existing personal goals such as marriage or parenthood (Staff et al., 2010), and to have developed new norms and expectations for their own behavior as well as a greater ability to inhibit impulses (Littlefield, Sher, & Steinley, 2010). Together, these attributes may contribute
to a motivation to change one’s drinking pattern in response to feedback about personal risks and harms.

Thus, it was reasoned that individuals emerging into adulthood would exhibit a greater reduction in alcohol use than relatively older adults after receiving personal normative feedback alone, in comparison to the control condition. In other words, increased age was expected to be associated with reduced effectiveness of this component of the intervention. Adults who are closer to age 35, on the other hand, were predicted to demonstrate a greater reduction in alcohol use than younger participants after receiving feedback that includes both social norms feedback and feedback about risks and harms. That is, increased age should amplify the effect of both components of the intervention in comparison to social norms feedback alone.

**Emerging Adulthood and the Transition to Adulthood**

Emerging adulthood (Arnett, 2000) has its roots in Erikson’s (1968) theory of identity development. Although Erikson generally depicted identity development as a task of adolescence, he also described it as an extended period of exploration through early adulthood for individuals in industrialized societies. The current phenomenon of prolonged identity exploration is suggested by the increased age of first marriage seen since 1970 (U.S. Census, 2011) and by popular terms like *quarterlife crisis* (Robbins & Wilner, 2001). Individuals in their 20s tend to change jobs frequently (Fuller, 2008), and financial independence may take some time to achieve.

As a group, emerging adults have substantially greater heterogeneity in educational, occupational, residential, and marital status than any other age group; demographically, nothing is normative for this age group (Arnett, 2000). Many emerging
adults are free from accountability to parents and relatively free from adult responsibilities like marriage and parenthood. Moreover, emerging adults who have not yet found a career path may lack investment or commitment to their jobs. The simultaneous lack of social accountability and responsibility experienced by many emerging adults allows them to spend more time exploring their identities before “settling down” into adult roles (Arnett, 2000). This exploration is reflected in the high degree of instability that characterizes emerging adults: they tend to move, change jobs, and shift in and out of romantic relationships frequently (Arnett, 2005). These changes emphasize the role of friendships and peer groups as a source of normative behavior in this age group, perhaps more so than the increased responsibility that arises when adults form long-term commitments to job or family.

Although emerging adulthood begins at age 18 for most individuals, defining the transition to the adulthood stage is more difficult. Research on characteristics that define a person as an “adult” indicates that most individuals endorse individualistic characteristics such as accepting responsibility for consequences, deciding on personal beliefs and values, and financial independence as necessary criteria for achieving adulthood (Arnett, 2001). Other commonly endorsed characteristics of adulthood are compliance with behavioral norms to avoid risk-taking behavior, such as driving while intoxicated or unsafe sexual practices, e.g., unprotected sex or multiple partners (Arnett, 2001). Arnett found that these characteristics of adulthood were endorsed similarly by individuals aged 13-55. Collectively, these endorsements suggest that individuals who view themselves as adults tend to take more responsibility for their actions and weigh the potential consequences of their actions more carefully.
In the present study, an upper cutoff of 35 years was used as the age by which most young adults likely consider themselves to be adults and the transition to adulthood is most likely complete. In results reported by Arnett (2000), fewer than 40% of individuals between 18-25 years responded “yes” to the question “Do you feel that you have reached adulthood?” and more than 50% responded “yes and no.” The rate of those who responded “yes” rose to almost 70% for individuals between ages 26-35. Thus, the current study included people at the beginning of the stage of emerging adulthood (18) when they are uncertain of their identity as adults, as well people at ages by which most individuals (26-35) consider themselves to be adults. In this way, the age range aimed to encompass people throughout all stages of the transition to adulthood.

Alcohol Use during Emerging Adulthood and the Transition to Adulthood

**Epidemiological data.** Individuals who range in age from late adolescence through young adulthood are known to have the highest rates of heavy episodic drinking and frequent heavy alcohol use, as compared to other age groups in the general population (SAMHSA, 2010). Rates of “binge” drinking (defined as 5 or more drinks in one sitting, including heavy drinkers) are highest among 21-25 year olds (46%), followed by 26-29 year olds (39%). According to SAMHSA, these rates were similar but higher than the rate of binge drinking among college-age individuals in the general population (age 18-20; 33%). The 46% prevalence of binge drinking among 21-25 year olds is also similar to that of full-time college students aged 18-22 (42%). Individuals between ages 21-25 also report higher rates of frequent heavy drinking (i.e., binge drinking 5 or more days in the previous month; 15%) than any other age group, and this rate is similar to the percentage of college students who report heavy drinking (16%). In comparison, 35% of
30-34 year olds and 29% of 35-39 year olds report binge drinking, and rates of heavy alcohol use are 9% and 8% for each group, respectively.

Other research indicates that while frequency of binge drinking declines after age 25, the peak amount of alcohol consumed while drinking does not decline until after age 30 (Chan, Neighbors, Gilson, Larimer, & Marlatt, 2007). This research suggests that many individuals in their late 20s engage in the same risky drinking as their younger counterparts, although less frequently. Additionally, although full-time college students are at higher risk for problem drinking than their same-aged peers, rates of binge drinking and heavy alcohol use among people aged 21-25 are similar to rates found among full-time college students.

Although many individuals consider heavy drinking during late adolescence and young adulthood as a temporary, developmentally-appropriate phase without adverse long-term consequences (Schulenberg & Maggs, 2002), heavy drinking often leads to serious immediate consequences to drinkers and others around them. A series of reports from a nationally representative epidemiological survey indicate that young adults are at an elevated risk for negative consequences as a result of heavy alcohol use (Chou et al., 2005; Chou et al., 2006; Grant et al., 2006). Rates of alcohol abuse and dependence tend to be highest between ages 18-29, and rates tend to decrease among each successively older age group (Grant et al., 2006). The relationships between age and declining rates of abuse and dependence were significant across all groups, except that rates of alcohol abuse did not significantly differ between 18-29 and 30-44 year olds (Grant et al., 2006). Risks for a variety of dangerous driving practices associated with alcohol use are highest among 18-29 year olds (SAMHSA, 2010). The rates for (a) drinking while driving, (b)
driving while intoxicated, (c) riding as a passenger with a driver who drank too much, and (d) drinking as a passenger are inversely associated with age, particularly among males (Chou et al., 2006). In contrast to an overall decline in rates of driving after drinking, the rates among young adults aged 18-25 have remained stable between waves of data collection in 1991-1992 and 2001-2002 (Chou et al., 2005).

Although college student drinking and its consequences have garnered much attention in the literature (e.g., NIAAA, 2002), emerging adults who are beyond college age (a) appear to engage in heavy drinking at rates similar to those of college students (O’Malley & Johnston, 2002), (b) may experience negative consequences from drinking (Grant et al., 2006), and (c) may engage in dangerous alcohol-related behaviors that put others at risk for serious injury (Chou et al., 2005; 2006). Despite an overall trend toward maturing out of problem drinking, a large percentage (40-70%) of individuals may continue drinking heavily past their early 20s (Jackson, Sher, Gotham, & Wood, 2001). Additionally, men are at particular risk of increasing their drinking and drinking heavily into their mid-20s, regardless of college attendance (Bingham, Shope, & Tang, 2005).

**Longitudinal data.** Research on several longitudinal samples has documented changes in alcohol use across the 20s. Schulenberg, O’Malley, Bachman, Wadsworth and Johnston (1996), for example, analyzed four biennial waves of data on alcohol use, beginning when participants were high school seniors. Participants ranged in age from 18-24 and were from a nationally representative sample. Through the analysis of drinking trajectories, the authors found that about half of the sample engaged in frequent binge drinking at some time point. Only about 20% of individuals matured out of frequent binge drinking by age 24. Other subsets of participants comprising 30% of the
total sample, though, continued frequent binge drinking through the mid-20s: a “chronic”
group that maintained frequent binge drinking, an “increased” subset that increased the
frequency of binge drinking over time, and a subset that showed no discernible pattern of
frequent binge drinking over time. Men with greater educational attainment were
significantly more likely to continue their heavy drinking, whereas women with greater
educational attainment were more likely to be in the “fling” trajectory and decrease their
drinking by age 24. However, women with less educational attainment were more likely
to increase or maintain frequent binge drinking. Both men and women who were not
married were more likely to continue or increase frequent binge drinking. Parental
financial support, perhaps indicating a lack of independence, was associated with
increased binge drinking. Notably, no single trajectory encompassed a majority of
participants, although most individuals maintained their level of binge drinking across
assessments. Similarly, Sher and Gotham (1999) reported on a 7-year longitudinal study
of a cohort of first-year college students. These authors found evidence for four
trajectories of alcohol use disorders (AUD) through the mid-20s that included late-onset
and chronic patterns of AUDs. Related longitudinal research suggested that a decrease in
drinking followed the role transition of marriage, supporting a role socialization effect
rather than a role selection effect (Staff et al., 2010), and indicating that individuals who
marry later may continue similar patterns of heavy drinking later into adulthood. Overall,
these results indicate that, for many individuals, binge drinking and problematic alcohol
use continue past the college age and the maturing out process may occur after age 24.

Social groups may influence changes in alcohol use over time. Bartholow, Sher,
and Krull (2003) examined heavy alcohol use after college as a function of fraternity and
sorority involvement in college. There was a significant drop in heavy drinking for male fraternity members who were most associated with the Greek system (the heaviest drinkers) from senior year to three years later; the decline was less dramatic for other students in the sample. The decline in drinking patterns for fraternity members was reduced when peer norms were taken into account, suggesting that peer influences play a role in emerging adult drinking after college and affect the maturing out process during the early 20s. That is, fraternity members developed new peer norms after leaving college that were more consistent with norms for others of the same age, whereas other students continued drinking at elevated levels for several years post-college.

Normative personality changes associated with the development of self-regulation in young adulthood may also be related to variable changes in alcohol use during the 20s. Littlefield, Sher, and Wood (2009) reported results from additional longitudinal data of first-year college students who were assessed on seven occasions over 16 years until they were age 35. Analyses suggested that psychological maturation, indicated by normative reductions in impulsivity and neuroticism, corresponded to reductions in problematic alcohol involvement, indicated by declining rates of negative consequences and symptoms of alcohol dependence. Marriage or parenthood did not affect the relationship between personality changes and problematic alcohol use, but those participants who were married and/or had children demonstrated steeper declines than other participants in both personality variables and problematic alcohol use over time.

Additional analyses of the same group of participants used mixture modeling to identify different trajectories of impulsivity and alcohol use over time (Littlefield, Sher, & Steinley, 2010). Results indicated five trajectories of declining impulsivity, including
a “developmentally limited” group that initially exhibited high levels of impulsivity and displayed a steep decline by age 25; this group also reduced their alcohol use significantly by age 25. In contrast, two groups that maintained relatively high levels of impulsivity across time displayed “developmentally lagged” reductions in alcohol use after the age of 25.

Deficits in coping and self-regulation may be another explanation for the delay in the process of maturing out of heavy drinking. In an analysis of changes in alcohol use and reasons for drinking over seven biennial waves of data of 18-30 year-olds, beginning when participants were high school seniors (Patrick & Schulenberg, 2011), latent growth modeling was used to assess associations between changes in alcohol use and changes in reasons for drinking over time. Despite an overall decline in binge drinking after age 22, drinking to escape one’s problems was related to a tendency to continue binge drinking between ages 22 and 30. In contrast, drinking to get high and drinking because of boredom were most associated with increased binge drinking trajectories between ages 18 and 22. Drinking to relax was the only reason which increased in prevalence after age 22 and it had the smallest relationship with the decline in binge drinking after age 22. Drinking to relax has a weaker relationship with continued binge drinking than other reasons for drinking and may contribute to the maturing out process. These results suggest that a subset of young adults with poor coping skills and poor-self regulation may continue drinking heavily well past the early 20s.

Costanzo et al. (2007) examined patterns of alcohol use in a diverse community sample that ranged in age from 18 to 30 and were re-assessed 10 years later. Mixture modeling revealed two latent classes of participants who differed on all psychological
variables, particularly in levels of hostility, depressive symptoms, and anxiety; the two groups represented psychologically well-adjusted and distressed participants. For the psychologically adjusted group, heavy drinking tended to decline in the early 20s; for the psychologically distressed portion of the sample, the decline occurred later, and this group tended to drink more throughout the longitudinal study. The authors hypothesized that psychological vulnerability compromises the self-regulatory process typically associated with the development of increased responsibilities in adulthood. Thus, even when problematic alcohol use is viewed as a time-limited developmental disorder (e.g., Schulenberg et al., 1996), factors like psychological adjustment may affect how some individuals mature out of the disorder (Costanzo et al., 2007). For the relatively older adults in the current study, who were screened for heavy drinking, the motivational intervention directly addressed the theoretically proposed deficits in self-regulation by providing information about the participant’s engagement in behaviors inconsistent with expectations for responsible adult behavior.

In a longitudinal sample of problem drinkers ages 18-25 who were either in treatment or not seeking treatment at baseline, Delucchi, Matzger, and Weisner (2008) found that overall volume of drinking declined through the third assessment year ($M = 24$ years) and leveled off after that. Binge drinking rates did not decline significantly, however, and a heavy-alcohol using social network was positively related to binge drinking rates. Even in this sample of problem drinkers, overall use declined with age, although binge drinking did not. It is possible that the decline in drinking after college age observed in other heavy drinking samples (e.g., Bartholow et al., 2003) and in epidemiological studies (SAMHSA, 2010) reflects a decrease in the frequency of heavy
drinking due to the socialization effect of roles such as having a full-time job; these same individuals may continue engaging in less frequent, but risky binge drinking episodes for a longer period of time because the developmental transition to adulthood remains incomplete.

Together, longitudinal studies on alcohol use in emerging adulthood point to a decline in drinking during the early 20s for some individuals; however, the rate and pattern of changes in alcohol use are not uniform, and many individuals continue drinking heavily into the late 20s. Alcohol use continues to be a problem for many young adults, yet tests of the theoretical assumptions and practical implications of intervening with such individuals are scarce. The current study addressed this gap in research regarding alcohol use interventions with emerging and young adults.

Social Norms

Descriptive social norms refer to the knowledge of what most people do (Cialdini, Reno, & Kallgren, 1990). In contrast to descriptive norms, injunctive social norms refer to whether behavior is morally approved, i.e., what people believe should be done or not done (Cialdini et al., 1990). Both types of norms may influence behavior simultaneously, although they motivate behavior in different ways.

Descriptive norms may contribute the most to determining behavior during times of ambiguity (Lapinski & Rimal, 2005). Indeed, ambiguity is an appropriate descriptor for the period of emerging adulthood, with its distinguishing feature of uncertain normative behavior in many domains (Arnett, 2000). Individual peer groups may have varied norms for all types of behavior, including drinking, which may inaccurately reflect the overall norms for emerging adults and may influence individuals’ drinking behavior.
(e.g., fraternity or sorority members; Larimer, Turner, Mallett, & Geisner, 2004). For non-college young adults, work-based drinking networks may contribute to inaccurate norms and increased alcohol use (Martin, Roman, & Blum, 1996). A motivational intervention may be effective for emerging adults by providing these individuals with accurate descriptive information regarding normative behavior and thereby correcting their misperceptions about how much others drink.

Identity theory (Christensen, Rothgerber, Wood, & Matz, 2004) suggests that when a person considers himself or herself an adult, he or she will have invoked identification with a group (i.e., adults) that is expected to hold certain norms of responsibility and reduced risk taking (Arnett, 2001). This identification should lead to a greater discrepancy between the information provided in the feedback intervention and their goals and expectations for themselves as adults. Motivational interventions for college students have been described as accelerating the normal developmental process to “mature out” of drinking (Marlatt et al., 1998). This suggestion may apply more accurately to young adults who have moved out of emerging adulthood; as they develop an adult identity, they activate the influence of the applicable injunctive social norms. Behavior that was once perceived as normal or expected for them due to their youth is now a violation of their identity as adults. Although not a direct test of the influence of injunctive norms, feedback that reflects continued risk-taking behavior and resulting consequences should create a greater discrepancy for young adults as they get older and develop their adult identities. According to the self-regulation process (Miller et al., 2000), such a discrepancy should motivate these young adults to change their risk-taking behavior.
**Brief Motivational Interventions**

Motivational interventions (Miller & Rollnick, 2002), shown to be an effective treatment for alcohol use disorders (e.g., Project MATCH Research Group, 1997), have been modified for problematic college student drinking (Dimeff, Baer, Kivlahan, & Marlatt, 1999). The following section reviews the research on the effectiveness of motivational interviewing, brief interventions, and feedback-only interventions for the treatment of alcohol use disorders.

**Effectiveness of motivational interventions.** Since the first book on Motivational Interviewing (MI) was published (Miller & Rollnick, 1991), adaptations of MI (AMIs) have been widely researched, although to date no study has examined the effect of “pure” MI (i.e., as conceived by the authors) without manualized guidelines (e.g., in Walters, Vader, Harris, Field, & Jouriles, 2009) or additional components (e.g., feedback). Meta-analyses including as many as 72 clinical trials (Hettema, Steele, & Miller, 2005) demonstrated that AMIs are generally as effective as other interventions and superior to placebo controls for treating addictive behaviors (Burke, Arkowitz, & Menchola, 2003; Dunn, Deroo, & Rivara, 2001; Hettema et al., 2005; Hettema & Hendricks, 2010; Jensen et al., 2011). Effect sizes of AMIs on various alcohol use outcomes were generally in the small to medium range (Burke et al., 2003; Dunn et al., 2001; Hettema et al., 2005; Hettema & Hendricks, 2010; Jensen et al., 2011), according to Cohen’s (1992) criteria. AMIs have demonstrated an effect on drinking behavior (e.g., quantity or frequency) as well as negative consequences from drinking (Burke et al., 2003).
Although AMIs exhibit effectiveness comparable to other forms of treatment, such as cognitive-behavioral therapy, AMIs often generate such an effect with fewer sessions (Burke et al., 2003; Project MATCH Research Group, 1997) and single sessions as short as 10 minutes have been found effective (Kulesza, Apperson, Larimer, & Copeland, 2010). Although MI was originally conceived as a supplement to enhance the effectiveness of more traditional forms of treatment for substance abuse, its effectiveness as a stand-alone, lower-dose treatment has led to the development of brief, structured interventions for a variety of health behaviors.

Moyer, Finney, Swearingen, and Vergun (2002) conducted a meta-analysis examining brief AMIs for alcohol use problems. These authors outlined several characteristics that typically distinguish brief alcohol interventions from other interventions, including having a goal of harm reduction or reduced drinking rather than abstinence, targeting non-dependent drinkers rather than dependent drinkers, and addressing motivational issues associated with changing drinking habits. Compared to control conditions in non-treatment seeking populations, brief interventions generated small to medium effect sizes across time. Notably, heterogeneity in some outcomes at longer time periods was accounted for by the inclusion of participants with severe drinking problems.

Moyer et al. (2002) described such severe problems as “harmful” drinking, compared to a moderate level of alcohol problems they termed “hazardous” drinking, and suggested that brief interventions are most appropriate for hazardous drinkers who are in danger of developing more serious alcohol problems. Gender was investigated as a potential moderator of outcome, but results indicated no gender-based variation in
outcome (Moyer et al., 2002). In sum, research has demonstrated that brief interventions are effective in reducing alcohol use among problem drinkers who are unlikely to seek treatment, although more severe alcohol problems may indicate more intensive interventions.

**Brief motivational interventions with college students.** In a meta-analysis of brief alcohol interventions with college students, Carey, Scott-Sheldon, Carey, and DeMartini (2007) found that, overall, these interventions generated small to medium effects on quantity and frequency of alcohol consumption. Effect sizes for the effect on alcohol-related problems were small and varied. Several characteristics influenced the effect of these interventions on alcohol related problems. Namely, (a) face-to-face interventions and (b) interventions that included normative feedback resulted in greater reductions in negative consequences at follow-up assessments than did computer/mailed interventions or interventions targeting heavy drinkers.

Effects on alcohol consumption tended to appear soon after the intervention, but the effect size diminished over time (Carey et al., 2007). Such results are typically understood as controls “catching up” and reducing their drinking over time, rather than participants in the intervention condition increasing their drinking. Meanwhile, effects on alcohol-related problems took longer to appear and continued into long-term follow-ups (Carey et al., 2007). As individuals maintain their reduced drinking over time, they may also experience reductions in related problems. These patterns highlight the developmental nature of alcohol use and suggest that brief motivational interventions may speed up the developmental process that moves individuals towards safer alcohol use.
Cronce and Larimer (2011) reviewed studies evaluating individual-level interventions with college students and found that brief, personalized, individual motivational feedback interventions and stand-alone feedback interventions generated the most consistent support for effectiveness. These interventions have been effective with high-risk groups such as freshmen, fraternity and sorority members, athletes, and students who were mandated to receive an intervention after an alcohol-related infraction, as well as non-mandated high-risk drinkers and primary care patients. The authors suggested that investigating mediating and moderating factors influencing intervention effectiveness, understanding the effects of the intervention components, and establishing the long-term efficacy of the interventions are important future directions for outcome research.

**Brief motivational interventions in medical settings.** Several reviews and meta-analyses have been conducted to assess the effectiveness of brief alcohol interventions for adults in medical settings (e.g., Ballesteros, Duffy, Querejeta, Arino, & Gonzalez-Pinto, 2004; Bertholet, Daeppen, Wietlisbach, Fleming, & Burnand, 2005; Havard, Shakeshaft, & Sanson-Fisher, 2007; Kaner et al., 2009). Brief alcohol interventions in these settings evolved out of motivational interventions, although they vary in the extent to which they include motivational components. Similar to brief interventions with college students, these interventions are typically secondary prevention efforts (Kaner et al., 2009), in which patients are screened for problematic alcohol use and targeted for a brief intervention.

Kaner et al. (2009) conducted the most recent meta-analysis, which incorporated many of the trials of brief alcohol interventions in primary care or emergency settings
that were previously examined by Ballesteros et al. (2004) and Bertholet et al. (2005). The three analyses concluded that patients who received a brief alcohol intervention significantly reduced their alcohol use after six months to one year. Heterogeneity in study outcomes suggested that the interventions are more effective for men than for women (Kaner et al., 2009). Additional intervention dosage resulted in greater reductions in drinking, but this result was not statistically significant, and as few as 5 to 15 minutes were sufficient to effect a change in drinking. The authors noted that few of the studies included young adults, highlighting the fact that young adults who are not in an academic setting tend not to be targeted for alcohol interventions.

**Feedback interventions with college students.** Although the accumulation of studies and meta-analyses indicate that AMIs are effective interventions for a variety of problematic behaviors, including heavy alcohol use, less is understood about the mechanism through which MI works (Dunn et al., 2001; Hettema et al., 2005). Providing feedback is not a characteristic of MI per se (Miller & Rollnick, 2002), but rather is one component of the theoretical formulation of MI’s function of motivating an individual to change (Miller, Sovereign, & Krege, 1988). Feedback is often a component of AMIs, but it can also be a stand-alone treatment. Feedback used with college students typically includes personal alcohol consumption and comparison to gender-specific norms; most, but not all, studies also included information regarding consequences, risk factors, and didactic information (Walters & Neighbors, 2005).

Personal feedback interventions (PFIs) have been shown to reduce drinking in the absence of other intervention elements (Lewis et al., 2007; Neighbors et al., 2004). The change in drinking behavior after a PFI was found to be greater than a control
intervention for volunteer college students (Agostinelli et al., 1995; Neighbors et al., 2004; Walters, Brown, & Miller, 2000) as well as for college students who were mandated for an alcohol-related intervention (White et al., 2006). The effects of PFIs have been similar to the effect of in-person interventions (Murphy et al., 2004; White et al., 2006). Additionally, the feedback component of brief interventions may be more influential than the motivational component of these interventions for college student drinkers (Juárez, Walters, Daugherty, & Radi, 2006) and is a critical component of motivational interventions (Walters et al., 2009). The normative component of feedback interventions seems to reduce drinking through changes in perceived drinking norms (Larimer & Cronce, 2007; Neighbors et al., 2004). Feedback interventions seem to affect drinks per week and frequency of heavy episodic drinking more than reductions in peak blood alcohol content (BAC), drinks per episode, or drinking problems (Agostinelli et al., 1995; Collins et al., 2002; Neighbors et al., 2010; Walters et al., 2000). There is some support, however, that interventions targeted to a relevant social group (e.g., intercollegiate athletes) may lead to a reduction in high risk drinking as measured by peak blood alcohol content (Martens, Kilmer, Beck, & Zamboanga, 2010). As seen in the epidemiological literature (Chan et al., 2007; 2009), frequency of binge drinking seems to be the first developmentally-associated reduction in alcohol use, pointing to the reasoning that motivational interventions can speed up the process of maturing out of problematic drinking.

**Feedback interventions with young adults.** Two studies targeted high-risk young adults outside university settings using feedback interventions that produced contradictory results. Monti et al. (2007) compared an in-person, brief motivational
intervention (BMI) to a PFI with young adults, aged 18-24, who were recruited from a hospital emergency department. Follow-up assessments (6 and 12 months after the intervention) indicated that the BMI was more effective than the PFI in reducing alcohol consumption at both time points, although both conditions had some reduction in alcohol-related problems. No control group was included in the design, however. The authors did not examine the interaction of problem severity with the outcome, as had been done in previous analyses of brief interventions (Moyer et al., 2002). Young adults recruited from the emergency department may include individuals on the more severe end of the spectrum of problematic alcohol use, particularly because many participants were included who had recently had a serious alcohol-related event.

In contrast, Doumas and Hannah (2008) examined an internet-based assessment and intervention conducted with young adults, aged 18-24, in a workplace. These authors found no differences between feedback only and feedback plus a 15-minute one-on-one intervention. Both groups reduced their weekend drinking, drinking to intoxication, and peak drinking more so than controls. Problem drinkers benefited more from the interventions, although problem drinkers were differentiated from non-problem drinkers based on a cutoff of at least one heavy drinking day in the past two weeks, a weak criterion for problem drinking. It seems logical that people with no identifiable problem with drinking cannot improve in a meaningful way, when compared to people who are drinking enough to experience consequences. As problem severity increases, however, brief interventions may be less effective, although there are no clear guidelines for the point at which this transition may occur.
Feedback interventions with adults. Several studies have targeted adults in the general population for feedback interventions. Wild, Cunningham and Roberts (2006) examined the efficacy of mailing brief personalized assessment-feedback to interested drinkers recruited from the general public through calls to a randomly-generated sample of phone numbers. Compared to controls, among participants identified as problem drinkers at baseline, after six months the intervention group reduced the quantity consumed per occasion compared to controls, with no differences for non-problem drinkers and no effect on drinking frequency for any participants. Overall, the intervention had no effect on the alcohol use of non-problem drinkers.

Several limitations are notable, however. The control participants did not receive any educational materials, limiting information about the effect of the personalized nature of the feedback materials sent to the intervention participants. In addition, the feedback was presented in a self-help manner (the participants calculated their alcohol use), so that it was impossible to know how actively the participants completed the booklet in order to receive the maximal intervention dose. For example, 20% to 25% of participants incorrectly answered whether they received the intervention pamphlet. From a public health perspective, the study suggests that an intervention targeting the general public can have some effect without an iatrogenic effect on non-problem drinkers, but such research does little to further our understanding of how or why the intervention was effective. Additionally, the authors called for further research that assesses alcohol use more thoroughly (i.e., more than one item).

Sobell et al. (2002) mailed feedback interventions or drinking guidelines to heavy drinkers who had responded to a newspaper advertisement. Both groups significantly
reduced their drinking after one year, and there were no between-group differences. In contrast to Wild et al.’s (2006) study, Sobell et al. provided the control group with general educational materials of similar length to the personalized feedback. Also, the assessment was much longer than the assessment in similar studies, lasting approximately two hours. The similar outcomes between groups suggest that the personalized nature of the feedback is not necessary for adult drinkers. However, the effect of the personalization may be difficult to distinguish from the lengthy assessment, during which both groups spent considerable time reflecting on their drinking. Additionally, the longer, one-time follow-up limits our understanding of how the interventions worked; for example, participants who received the personalized intervention may have reduced their alcohol use sooner than did controls. Although this study did suggest that a brief, non-contact intervention can have a significant effect on behavior for up to a year, the lack of between-group differences make it impossible to eliminate alternative explanations for participants’ reduction in alcohol use.

Cunningham, Humphreys, Koski-Jannes and Cordingley (2005) found some support for the effect of an internet-only intervention on decreased alcohol use after three months, and provision of additional mailed self-help materials appeared to increase the effectiveness of the intervention. Similarly, Koski-Jannes, Cunningham, Tolonen, and Bothas (2007) presented normative feedback to a Finnish sample that participated in an online screening and self-selected to participate in the follow up study. After three months, participants exhibited a significant reduction in alcohol use, weekly drinks, number of drinks on last occasion, and number of problems. Neither study was a robust assessment of feedback interventions with adults, however, due to small sample sizes
(Cunningham et al., 2005), the absence of control groups, and a minimal assessment of alcohol-related consequences (Cunningham et al., 2005; Koski-Jannes et al., 2007).

Cunningham, Wild, Cordingly, Van Mierlo, and Humphreys (2009) demonstrated more robust support for the short-term effects of an internet-only feedback intervention conducted with adults who participated in a telephone screening for alcohol use and agreed to participate in an online follow-up study. Results indicated that the internet-based feedback intervention resulted in greater reductions in participants’ alcohol use after three and six months as compared with a control group that received a mailed description of the type of information that may be provided in a self-help intervention; however, the effects of the intervention faded at the 12-month follow-up (Cunningham, Wild, Cordingly, Van Mierlo, & Humphreys, 2010).

Thus, it appears that interventions that target adults or young adults outside of a college setting have suggested the effectiveness of PFIs in the short term, with some limitations. For example, contrary to many other studies, Monti et al. (2007) found that in comparison to an in-person intervention, PFI was less effective at reducing alcohol use, yet had a similar effect on the reduction of alcohol problems. This study, however, included in-person components for all participants and may have reached young adults with more severe problems with alcohol use than did previous studies that sampled the general population. Sobell et al. (2002) suggested that adults may need less personalized information to reduce their drinking. The lengthy assessment in Sobell et al., however, may have amplified participants’ response to the educational intervention used for the controls. Interestingly, these authors described their study as facilitating self-change and “natural recovery” (p. 938).
**Moderating factors.** Recently, researchers have begun to explore factors that influence the effectiveness of feedback interventions with implications for the hypothesized interaction. Carey, Hensen, Carey, and Maisto (2007), for example, examined characteristics of heavy drinking college students that interacted with the effect of a BMI. Results showed that greater readiness to change, higher levels of self-regulation, and less engagement in social comparison independently predicted reductions in drinking for all participants regardless of treatment condition (i.e., BMI, “enhanced” BMI, or assessment only). This finding suggests that college students with characteristics that are more “adult” were more likely to reduce drinking with or without an intervention, perhaps due to assessment procedures initiating the self-regulation process. Furthermore, self-regulation, social comparison, and future time perspective significantly interacted with BMI. Specifically, individuals who were high in social comparison were more likely to maintain or increase their drinking in the control condition, and BMIs essentially counteracted this tendency. Participants who were low in future time perspective actually responded better to the BMI, perhaps because they did not typically consider the consequences of their actions. The latter result may contradict the hypothesized interaction in the current study, as older adults may be expected to have greater future time perspective. However, the older adults who continue to drink in a manner similar to younger adults can also be considered to have a delayed maturational process (Costanzo et al., 2007; Littlefield et al., 2010). In this way, they may be the older counterparts to participants who were low in future time perspective.

Research with adults also supports the hypothesized interaction of age with the effectiveness of each component of the personalized feedback intervention. Koski-
Jannes and Cunningham (2001) surveyed adults about their interest in receiving a feedback intervention and found that younger participants tended to prefer feedback that contained normative information. This result suggests that younger adults are more interested in social comparison, so that the normative information is likely to be highly salient for them. In contrast, Walters and Woodall (2003) found that adults in a workplace reduced their drinking in response to a feedback intervention. This reduction was mediated by increased awareness of the level of risk associated with their alcohol consumption. Although the sample was small, limiting the generalizability of the results, this finding suggested that the personal consequences portion of feedback tends to be salient for older adults.

**Hypotheses**

The research reviewed above indicates that many of adults between the ages of 20 and 30 drink in problematic ways that put them at risk for experiencing negative consequences due to their alcohol use. Despite considerable research support for motivational interventions, many at-risk individuals are not associated with university or medical settings that offer screening and brief intervention efforts. Furthermore, due to the relative lack of research in this area with adults, there is little information about the effective components of feedback interventions for adults (Cunningham, Khadjesari, Bewick, & Piper, 2010; Cunningham & Van Mierlo, 2009).

Prior literature reviewers called for the use of novel procedures (Kaner et al., 2009; Moyer et al., 2002) in order to reach moderately problematic drinkers who may benefit from a brief motivational intervention. The use of commonly used websites is one way to reach risky drinkers who are unlikely to be targeted by other means. For
example, a recent search of the Facebook advertisement targeting function indicated that there were over 80 million users between the ages of 18 and 35, more than 5 million of whom are not current college students, who list drinking-related interests such as “drinking,” “beer,” “wine,” or “liquor.” Thus the primary goal of the study is to use internet-based procedures to target such young adult risky drinkers for a brief motivational feedback intervention.

Relative to the second goal of the study to test the effectiveness of a motivational intervention disseminated online, it was hypothesized that the two components of the intervention (i.e., personalized normative feedback [PNF] and personalized normative plus drinking feedback [PNF+PDF]) would reduce participants’ alcohol use at a one-month follow up assessment. Relative to the third goal of the study, no research has directly tested the relative effectiveness of different feedback components. Due to the increased “dosage” of personalized feedback, it was hypothesized that the combination of social norms feedback and feedback regarding individual risks and harms (i.e., the PNF+PDF intervention) would reduce participants’ subsequent alcohol use more so than personalized normative feedback alone (PNF).

With regard to the fourth goal of the study, regarding the interaction of age with treatment condition, because youth is associated with ambiguity regarding normative behavior and strong identification with peer groups, social norms are highly salient for influencing the behavior of younger adults (Arnett, 2005). Transitioning into adulthood is associated with roles that carry expectations for more responsible behavior, like marriage or parenthood. Thus, it was hypothesized that age would moderate the effectiveness of the motivational intervention such that (a) the PNF intervention alone
would be more effective among younger participants, whereas (b) PNF+PDF would be more effective among participants who are relatively older.

**Significance of the Study**

The current study expands the literature on alcohol interventions in several ways. First, only two studies have specifically targeted young adults outside a college setting for a brief alcohol intervention (Doumas & Hannah, 2008; Monti et al., 2007). This population is noted to be largely absent from the intervention literature (Kaner et al., 2009). Second, no study has attempted to use social networking sites, e.g., Facebook, to reach problem drinkers. This method has the potential to reach large numbers of individuals for secondary prevention with small investments of time and money by researchers and clinicians. Third, the present study also explored the short-term effects of feedback interventions on alcohol-related problems, which has exhibited contrasting results in similar studies with college students (e.g., Agostinelli et al., 1995; Collins et al., 2002; Walters et al., 2000) and adults (e.g., Cunningham et al., 2005; Monti et al., 2007; Wild et al., 2006).

The hypothesized intervention outcomes would demonstrate the feasibility of using social networking sites and would extend the findings of previous research with college students to the general population of young adults. Null results would suggest that differences between college students and non-college individuals warrant further investigation. Finally, the study assessed the relative impact of two feedback components, increasing knowledge about whether one component or both are necessary for the intervention to be successful.
Additionally, the current study tested several assumptions about the developmental stage of emerging adulthood. A significant interaction effect would support the theory of emerging adulthood in two ways. First, a significant interaction would lend support for the influence of social norms on the behavior of emerging adults. Second, a significant interaction would support the proposition that internal characteristics, such as accepting responsibility for consequences, deciding on personal beliefs and values, and compliance with behavioral norms to avoid risk-taking behavior (Arnett, 2001) are markers for the transition to adulthood and social norms are less salient as individuals mature. On the other hand, nonsignificant results would suggest that at least in relation to alcohol use, emerging adults do not differ from relatively older adults in the salience of social norms or injunctive norms to avoid risk taking behaviors.
Chapter 2

Method

The present study examined the effectiveness of online feedback interventions among young adult problem drinkers. Specifically, the study examined the interaction of age and various interventions on reducing participants’ alcohol use and alcohol-related problems in a one month follow up.

Participants

Volunteers were young adults between the ages of 18 and 35 years who responded to an advertisement on a social networking site, Facebook.com, or to an advertisement on a search engine, google.com, to participate in a study on “thinking about your drinking.” This recruitment phrase was chosen to minimize resistance (Sobell et al., 2002). Online advertisements were chosen in order to reach young adults who are not in a college or university setting.

Inclusion criteria. Full-time college students were excluded, although part-time students were eligible to participate. This population of non-traditional students has not been sampled in previous intervention studies on alcohol reduction.

Only adults who engaged in problematic alcohol use (defined below) were included in the sample. Interested volunteers were screened for inclusion using the Alcohol Use Disorders Identification Test (AUDIT; Saunders, Aasland, Babor, De La Fuente, & Grant, 1993). A cutoff score of 8 was used (potential range of 0 to 40), as this value is typical for indicating problem drinking (Kokotailo et al., 2004). Because men typically drink more than women and suggested limits for low-risk drinking are often gender-specific (NIAAA, 2010), cutoff scores of 8 for men and 6 for women was used.
(e.g., Martens, Cimini et al., 2007). That is, only individuals who score at or above these scores were invited to participate in the study.

**Characteristics of sample.** Baseline participants included 276 young adults who responded to an online advertisement, provided their email addresses, met the inclusion criteria described above, and completed the screening and baseline surveys. A total of 959 screening surveys were completed, with 214 additional incomplete questionnaires. Three hundred thirty-two individuals completed a screening survey but did not provide their email addresses to participate in the remainder of the study; 62 individuals provided their email addresses and were invited to participate but did not complete the baseline survey. A number of individuals who provided their email addresses were excluded because they were under age 18 \((n = 4)\), were above the age cutoff of 35 \((n = 58)\), did not provide their age \((n = 7)\) or did not meet the minimum alcohol use criteria \((n = 237)\). Additional details about participant flow are provided in Figure 1.

The mean age of the final baseline sample was 25.38 years \((SD = 4.47)\), with 142 \(51.4\%\) between the ages of 18 and 25 and 134 between the ages of 26 and 35. The majority of participants were female \(52.2\%\) and white \(82.6\%\), and the largest percentage of participants were college educated \(25.7\%\), and single/never married \(48.6\%\). The complete demographic characteristics of the sample are outlined in Table 1. A qualitative review of the occupations listed by baseline participants suggested varied representation across educational levels and socioeconomic status, including labor, construction, and mechanical \((n = 27)\), professional and engineering \((n = 29)\), retail and food service \((n = 38)\), human services and childcare \((n = 16)\), healthcare \((n = 6)\), business and finance \((n = 27)\), technology and design \((n = 13)\), military and government \((n = 6)\),
**Figure 1**

*Flow of Participants According to CONSORT Guidelines (Ladd, McCrady, Manuel, & Campbell, 2010)*

- **Enrollment**
  - Assessed for eligibility ($n = 988$)
    - Incomplete screening surveys ($n = 214$)
  - Excluded ($n = 699$)
    - Did not provide email address ($n = 332$)
    - Did not complete baseline survey ($n = 62$)
    - Did not meet age criteria ($n = 68$)
    - Did not meet alcohol use criteria ($n = 237$)
    - Other (e.g., incomplete baseline survey) ($n = 13$)

- **Allocation**
  - Randomized ($n = 276$)
    - Allocated to PNF ($n = 89$)
      - Completed confirmation survey ($n = 34$)
    - Allocated to PNF+PDF ($n = 98$)
      - Completed confirmation survey ($n = 30$)
    - Allocated to Control ($n = 89$)
      - Completed confirmation survey ($n = 48$)

- **Follow up**
  - Did not complete follow up survey ($n = 39$)
  - Did not complete follow up survey ($n = 51$)
  - Did not complete follow up survey ($n = 39$)

- **Analysis**
  - Analyzed ($n = 50$)
  - Analyzed ($n = 47$)
  - Analyzed ($n = 50$)
Table 1

Demographic Characteristics of the Total Sample (N = 276), Completers (n = 147), and Non-Completers (n = 129)

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<th>Non-completers</th>
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Table 1, continued

Demographic Characteristics of the Total Sample (N = 276), Completers (n = 147), and Non-Completers (n = 129)

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<th>Completers (n = 147)</th>
<th>Non-Completers (n = 129)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Some college</strong></td>
<td>58</td>
<td>21.1</td>
<td>24</td>
</tr>
<tr>
<td><strong>Two-year /Associate’s degree</strong></td>
<td>20</td>
<td>7.3</td>
<td>8</td>
</tr>
<tr>
<td><strong>Four-year /Bachelor’s degree</strong></td>
<td>71</td>
<td>25.8</td>
<td>49</td>
</tr>
<tr>
<td><strong>Some graduate/professional school</strong></td>
<td>34</td>
<td>12.4</td>
<td>27</td>
</tr>
<tr>
<td><strong>Graduate/professional degree</strong></td>
<td>38</td>
<td>13.8</td>
<td>31</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td>7</td>
<td>2.5</td>
<td>3</td>
</tr>
</tbody>
</table>

Marital/relationship status

<table>
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<tr>
<th></th>
<th>Total Sample (N = 276)</th>
<th>Completers (n = 147)</th>
<th>Non-Completers (n = 129)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Single/never married</strong></td>
<td>134</td>
<td>48.6</td>
<td>68</td>
</tr>
<tr>
<td><strong>Living together/committed relationship</strong></td>
<td>82</td>
<td>29.7</td>
<td>45</td>
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<tr>
<td><strong>Married</strong></td>
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<td>18.8</td>
<td>30</td>
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<tr>
<td><strong>Divorced</strong></td>
<td>6</td>
<td>2.2</td>
<td>2</td>
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<tr>
<td><strong>Widowed</strong></td>
<td>1</td>
<td>0.4</td>
<td>1</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td>1</td>
<td>0.4</td>
<td>1</td>
</tr>
</tbody>
</table>
mental health care \((n = 10)\), education \((n = 25)\), administrative \((n = 13)\), and other \((n = 6;\) e.g., assistant brewer, freelance writer, disc jockey).

**Power analysis.** Power analyses were performed to estimate the sample size necessary to achieve the desired 80% power (Cohen, 1992) to detect significant results at the follow up assessment. In similar studies assessing the effect of a feedback intervention, baseline drinking has accounted for a large portion of the variance in drinking at follow up assessments, ranging from \(R^2 = .40\) (Cunningham et al., 2005) to \(R^2 = .78\) (Neighbors et al., 2004). The mean of these values, .59, was used to estimate the full model \(R^2\) in the power analysis. The full model had five predictors: baseline drinking, gender, condition, age, and the interaction of condition x age.

To estimate power, effect sizes were gathered from studies that examined the effect of a feedback intervention on alcohol use as compared to controls. As measured by \(\eta^2\), the median semi-partial effect size for PDF among college students is .05 (Agostinelli et al., 1995; Collins et al., 2002; Doumas, McKinley, & Book, 2009; Geisner, Neighbors, Lee, & Larimer, 2007; Juárez et al., 2006; Larimer et al., 2007; Walters et al., 2000, 2009), the median semi-partial effect size for PDF among adults was .025 (Doumas & Hannah, 2008; Sobell et al., 2002), and the median semi-partial effect size for PNF with college students was .02 (Bewick, Trusler, Mulhern, Barkham, & Hill, 2008; Lewis & Neighbors 2007; Lewis et al., 2007; Neighbors et al., 2004, 2006). Based on the smallest effect size, .02, a power analysis with three predictors in the full model (baseline drinking, gender, and condition) and two predictors in the restricted model indicated that 160 participants were needed to detect an effect for the intervention.
The effect size of the interaction between condition and age is unknown. Because the median effect size for interactions in the counseling psychology literature is .03 (Haase et al., 2005), this value was used to estimate the necessary power for the predicted interaction effect. Results showed that, for the full model (with 5 predictors) and a restricted model (with 4 predictors), 110 participants were needed to achieve 80% power to detect the predicted interaction. Thus, 160 participants were needed to detect all predicted outcomes.

In a survey of studies testing feedback delivered by mail or online (e.g., Doumas et al., 2009; Koski-Jannes et al., 2007; Kypri et al., 2004; Lewis et al., 2007; Lewis & Neighbors, 2007; Neighbors et al., 2004; Walters, Vader, & Harris, 2007), response rates up to 3 months follow up averaged 81.2%, with a low of 57.8% (Cunningham et al., 2005) and a high of 94% (Collins et al., 2002). Assuming approximately an 80% response rate at follow up, 200 participants were predicted to be needed for the baseline assessment in order to result in 160 participants with pre- and follow up data.

In the present study, 276 participants completed the baseline assessment. The follow up rate in the present study was 53.3%, resulting in 147 participants who completed at least half of the follow up assessment. A post-hoc power analysis on the interaction with 147 participants who completed both assessments revealed that the power to detect significant differences in all analyses in the current study was 52%, whereas the estimated power to detect significant differences with similar outcomes and 160 participants would be 56%. Thus, although the post-hoc power analysis suggests insufficient power to detect differences, increasing the sample size to 160 may have led
to spurious conclusions, i.e., a small effect that lacked clinical significance. Thus, it is unlikely that insufficient power adversely affected the results of the study.

**Design**

The study used a randomized three group, repeated-measures experimental design. Participants were randomly assigned to one of three conditions: (a) personalized normative feedback (PNF); (b) PNF plus personalized drinking feedback (PNF+PDF), which included the PNF plus additional feedback regarding the participant’s individualized risks and consequences from alcohol use; and (c) a control condition (C), which only included educational information about alcohol use. Participants in the control condition, however, completed the same pre- and follow-up assessments as did participants in the two treatment conditions. Information about the content of each of the three experimental conditions is provided below.

Age, the moderating variable, was defined as “emerging adults” (aged 18 to 25) versus “adults” (aged 26-35) for post-hoc analyses. The dependent variables were (a) total drinks per week and (b) level of alcohol problems. Alcohol use and alcohol-related problems were measured baseline and one-month follow up. Outcome analyses on alcohol-related problems were exploratory due to the limited effect exhibited by personalized feedback interventions on this outcome in short time periods. Quantity and frequency of alcohol use were measured using the Daily Drinking Questionnaire (DDQ; Collins, Parks, & Marlatt, 1985), which was used to compute the total drinks per week. Problems experienced in the past month as a result of alcohol use were assessed using the total score on the Brief Young Adult Alcohol Consequences Questionnaire (BYAACQ; Kahler, Strong, & Read, 2005; Kahler, Hustad, Barnett, Strong & Borsari; 2008).
Participants’ perceptions of the typical alcohol consumption by peers of the same age and gender were assessed baseline using the Drinking Norms Rating Form (DNRF; Baer, Stacy, & Larimer, 1992). The use of behavioral strategies to reduce consequences from drinking was assessed baseline using the Protective Behaviors Strategies Scale (PBSS; Martens et al., 2005).

**Treatment Conditions**

**Personal Normative Feedback (PNF).** The PNF condition \( (n = 89) \) contained only a comparison of the participant’s drinking behavior and his or her normative perceptions to the relevant gender-specific norms (see Appendix F). This comparison was created from participants’ baseline responses to the DDQ, the DNRF, and the social norms published in Chan et al. (2007; 2009).

**Personal Normative plus Personalized Drinking Feedback (PNF+PDF).** The PNF+PDF condition \( (n = 98) \) contained the same normative comparisons included in the PNF as well as personalized information derived from the participant’s responses to the baseline assessments (see Appendix G). Specifically, the PNF+PDF included the participant’s Blood Alcohol Content (BAC) on typical drinking days and peak drinking occasions and how these BAC levels compare to known risk levels (e.g., \( \geq .08 \) = legal intoxication, \( \geq .35 \) = risk of death). BAC feedback was calculated from the DDQ and the participant’s weight as reported in the demographic questionnaire (see below). The PNF+PDF included a list of self-reported alcohol-related problems as reported on the BYAACQ and the participant’s use (or lack) of protective behavioral strategies that can limit alcohol use and alcohol-related problems as reported on the PBSS. Also, the PNF+PDF included estimates of (a) the participant’s monthly expenditures on alcohol
and (b) number of calories consumed each month from alcohol, calculated from his or her responses to the DDQ.

**Control.** Participants in the control condition \((n = 89)\) completed the same measures as did participants in the two intervention conditions, i.e., the DDQ, DNRF, B-YAACQ, and PBSS. However, these participants were only sent educational materials with definitions of low- and high-risk drinking, and potential risks and consequences from binge drinking and heavy alcohol use (see Appendix H). The content did not include any personalized feedback whatsoever.

**Instruments**

**Daily Drinking Questionnaire.** The DDQ (Collins et al. 1985; see Appendix B) asks participants to estimate their typical alcohol consumption and the amount of time spent drinking each day of the week over the past 30 days. Additional questions assess the peak quantity of alcohol consumed in the past month and the frequency of heavy episodic (i.e., “binge”) drinking, commonly defined as consuming five or more drinks for men or four or more drinks for women on one occasion (e.g., Meilman, Leichliter, & Presley, 1999). The sum of reported drinks per week was used as a measure of drinking quantity. The range of drinks per week reported in the present study was 0 to 140 at baseline and 0 to 62 at follow up.

The DDQ was chosen because it has been widely used in studies examining feedback interventions (e.g., Collins et al., 2002; Doumas et al., 2009; Larimer et al., 2004; Neighbors et al., 2004; Walters et al., 2009). In one study, the test-retest reliability for the DDQ was .87 for an index of quantity and .52 for an index of frequency after 2 months (Neighbors, Dillard, Lewis, Bergstrom, & Nei, 2006). Research has also
demonstrated that the DDQ is highly correlated with other measures of self-reported alcohol consumption (Kivlahan, Marlatt, Fromme, Coppel, & Williams, 1990). Also, the DDQ has been significantly associated with relevant variables in many studies, including alcohol-related problems (e.g., .53-.57; Martin et al., 2008), drinking motives (e.g., .44-.73; Martens, Rocha, Martin, & Serrao, 2008), and it has been used to assess change following alcohol related interventions (e.g., $\Delta R^2 = .013$; Neighbors et al., 2004).

**Brief Young Adult Alcohol Consequences Questionnaire.** The 24-item B-YAACQ (Kahler et al., 2005; see Appendix C) assesses the number of alcohol-related consequences that the respondent experienced in the past year. The format is yes/no, and items are summed to yield a total score (range from 0 to 24). Examples include: “I have had a hangover (headache, sick stomach) the morning after I had been drinking,” “I have driven a car when I knew I had too much to drink to drive safely,” and “I have felt like I needed a drink after I’d gotten up (that is, before breakfast).” Item wording is relevant to young adults outside a school setting (e.g., “I have neglected my obligations to family, work, or school because of drinking”).

The authors aimed to improve an existing alcohol problems scale by including items reflecting less severe alcohol consequences typically experienced by a young adult population. Rasch modeling, a method based on item response theory, was used to choose items that (a) represented a one-dimensional continuum of alcohol-related problems, (b) discriminated varying levels of alcohol problem severity, and (c) were consistent across gender. A greater number of items reflecting the less severe end of the alcohol-problem continuum may allow for more sensitivity in assessing the effects of brief interventions. Items are ordered in terms of severity, with those endorsed by
progressively smaller percentages of the sample, such that an individual who receives a lower score is relatively less likely to endorse items reflecting greater problem severity.

The B-YAACQ has been shown to have good internal consistency ($\alpha = .83$) and validity as a measure of alcohol-related problems (Kahler et al., 2005). The B-YAACQ was highly correlated with the 48-item YAACQ on which it was based ($r = .95$; Read, Kahler, Strong, & Colder, 2006), and with the Rutgers Alcohol Problem Index ($r = .78$) (RAPI; White & Labouvie, 1989), a measure of alcohol problems designed to be used with adolescents. The B-YAACQ demonstrated significant but smaller correlations with measures of alcohol use, as expected (frequency in the past 90 days, typical quantity of consumption, frequency of heavy episodic drinking, and frequency of drinking to intoxication) with $r$s ranging from .31 to .46. In another sample, reliability and validity were similar. Internal consistency was high ($\alpha = .90$), and correlations with drinking variables were significant, ranging from .53 to .57 (Martin, Martens, Serrao, & Rocha, 2008).

Kahler, Hustad, Barnett, Strong & Borsari (2008) assessed the validity of a 30-day version of the B-YAACQ. In addition to examining a shorter time frame, the authors sampled college students who were mandated to an alcohol intervention (rather than a sample of volunteer college students). Internal consistency for the 30-day version, as measured by coefficient $\alpha$, was .84 at baseline and .89 at the 6-week follow up. Test-retest reliability was .70 ($p < .001$) indicating high stability over time. Repeated measures analyses indicated the scores significantly decreased from baseline to 6 weeks after a brief intervention ($p < .05$). Semi-partial coefficients ($r^2$s) for changes in B-YAACQ scores based on changes in drinking variables (i.e., drinks per week, heavy
drinking frequency, and peak BAC) were significant, ranging from .07 to .11. Simple
correlations between the B-YAACQ and theoretically-relevant variables (e.g., alcohol use
variables and AUDIT scores) measured at the same time point were significant and
ranged from .35 with 6-week peak BAC, and .73 for 6-week AUDIT scores. Rank order
of item severity was generally well-preserved across the assessment (rank-order
coefficient, \( r_s \), of .96) and in comparison to the 12-month version (Kahler et al., 2005; \( r_s \)
= .88). In the current sample, internal consistencies were .89 at baseline and .88 at the
one-month follow up; test-retest reliability was .50 (\( p < .001 \)).

**Drinking Norms Rating Form.** The DNRF (Baer et al., 1991; see Appendix D)
parallels the DDQ, asking respondents to estimate how many drinks typical, same-gender
peers drink on each day of the week. The DNRF also asks the participant to estimate
same-gender peers’ typical frequency of drinking, peak number of drinks, and frequency
of heavy drinking. The results of a study examining the validity of the DNRF indicated
that most college students reported that their close friends drink slightly more than
themselves and that other college students consume even more (Baer et al., 1991).
Across several samples, 77% of participants reported that other members of their living
group (e.g., fraternity) drank more than they did themselves (Baer et al., 1991). The
range of normative drinks per week reported in the current study was 0 to 250.

The parallel format of the DNRF allows for easy administration and for the
generation of feedback that can compare participants’ alcohol use to normative
perceptions. Modified versions of the DNRF have been used in several normative
feedback studies (e.g., Collins et al., 2002; Larimer et al., 2007; Neighbors et al., 2004).
The DNRF has also been used to assess changes in perceived norms as a result of PNF
interventions, and normative perceptions have been supported as the mechanism through which PNF leads to a reduction in alcohol use (Neighbors et al., 2004).

Neighbors et al. (2006) also explored the temporal precedence of normative perceptions as measured by the DNRF. The authors found that test-retest correlations after 2 months were high (.70 for quantity and .51 for frequency). Normative perceptions of others’ alcohol use were consistently greater than quantity and frequency measures of alcohol use at both time points. Their data generally supports a mutual influence relationship between normative perceptions and drinking behavior though perceptions about drinking frequency seem to have more influence on future drinking behavior.

**Protective Behaviors Strategies Scale.** The PBSS (Martens et al., 2005; see Appendix E) is a 15-item measure that assesses the frequency with which respondents engaged in a variety of protective behaviors while using alcohol. Three subscales derived from exploratory factor analysis comprise the PBSS: Limiting/Stopping Drinking (e.g., “alternate alcoholic and non-alcoholic drinks”), Manner of Drinking (e.g., “avoid drinking games”), and Serious Harm Reduction (e.g., “use a designated driver”). Responses are scored on a 6-point Likert-type scale ranging from 1 (never) to 6 (always), with a possible range of 15 to 90. Internal consistency measured by coefficient α was .81 for Limiting/Stopping Drinking, .73 for Manner of Drinking, and .63 for Serious Harm Reduction (Martens et al., 2005). Internal consistencies for the subscales in other samples were similar (αs = .63 - .89; Martens, Cimini, et al., 2007; αs = .67 - .87, Martens et al., 2008; αs = .67 - .92, Martens, Martin, Littlefield, Murphy, & Cimini, 2011; αs = .59 - .82, Martens, Pederson, LaBrie, Ferrier, & Cimini, 2007). Internal consistency was
.86 for the total scale (Walters et al., 2009) and .89 for a modified version (Neighbors et al., 2009). Internal consistency for the total scale in the present sample was .82.

Each subscale correlated significantly in the expected negative direction with measures of alcohol use (heavy drinking episodes, drinks per week, peak number of drinks, drinking days in the past month; \( r_s = -.21 \) through \(-.54\)) and alcohol-related problems (\( r_s = -.22 \) through \(-.39\)), supporting convergent validity (Martens et al., 2005). Additionally, after controlling for relevant demographic variables to assess incremental validity, the subscales accounted for between 1% and 10% of unique variance in alcohol use and alcohol-related problems. A confirmatory factor analysis conducted by Martens, Pederson et al. (2007) supported the 3-factor structure of the measure. Validity assessments of the subscales were similar, with correlations ranging from -.15 to -.34 with alcohol use variables and from -.21 and -.27 with alcohol-related problems. The PBSS accounted for 2% of the unique variance in alcohol problems after controlling for relevant demographics and alcohol consumption.

Although the PBSS has been significantly related to alcohol use and related problems, it has not yet been found to mediate brief intervention outcomes (Walters et al., 2009), as has been found in similar studies using other measures of protective behaviors (Barnett et al., 2007; Larimer et al., 2007). However, increased scores on the Manner of Drinking subscale have been found to prospectively predict reduced alcohol use and increased scores on the Serious Harm Reduction subscale were related to fewer alcohol-related problems after six and twelve months (Martens et al., 2011). The scale has practical utility in the research and dissemination of brief interventions such as those used
in the present study for creating feedback content and the “menu” of options for changing alcohol use.

**Comprehension check.** After participants completed the baseline survey and received their intervention materials (by e-mail), they were asked to answer several brief questions to ensure that they attended to and understood the intervention materials. Specifically, participants in both the PNF and the PNF+PDF conditions were asked to report their percentile rank for drinks per week. Participants in the PNF condition were asked what the actual norm is for individuals of their same age and gender. Participants in the PDF condition were asked to report their peak BAC and their financial expenditure from alcohol. Participants in the control condition were asked low-risk drinking limits, one potential risk from heavy drinking, and the average number of calories in a regular beer. All participants were also asked if they were surprised by the information that was provided to them.

**Salience of feedback.** At the follow up assessment, all participants were asked what they “remember most” about the intervention and “how helpful” the information was for them. Information gathered from these open-ended questions was used to inform the interpretation of the results.

**Demographic questionnaire.** The baseline survey asked all participants to provide their age, gender, race/ethnicity, marital status, education, and occupation. Weight was also assessed in order to estimate participants’ blood alcohol content (BAC), which was used to create the feedback content (see Appendix I).
Procedure

All data were collected online using www.psychdata.com. Potential volunteers were identified through advertisements on www.facebook.com and on www.google.com (see Appendix J). On www.facebook.com, advertisements offering personalized alcohol use information were displayed to individuals who are between the ages of 18-35. Other advertisements were displayed selectively to individuals in the target age group who listed “drinking” among their interests on their personal networking page, and were posted on relevant drinking-related group pages. On www.google.com, advertisements were targeted to individuals who entered a variety of related search terms such as “alcohol questionnaire,” “alcohol information,” or “take a survey.” The advertisement heading asked, for example, “Are you a drinker?” and contained brief text offering an opportunity to receive alcohol use feedback and enter into a raffle.

Each advertisement was linked to a page on a secure website that contained additional information about the study. The page contained a consent form (see Appendix K) with the ethical considerations including confidentiality, University at Albany Institutional Review Board approval certification, the investigator’s contact information, and the opportunity for eligible volunteers to participate in a raffle for a $200 gift card at the first assessment and a $300 gift card at the second assessment, and, for later participants (explained below; see Appendix M), a $1 gift card for completing the screening assessment.

Risks were outlined in the consent form, including potential loss of confidentiality, and potential emotional discomfort. That is, although efforts to protect confidentiality were emphasized, the consent explained the potential for loss of
confidentiality due to the use of internet. Volunteers were also informed of their right to withdraw from the study at any time. Eligibility criteria, including part-time (but not full-time) student status, were also outlined. Volunteers were informed that they may not meet criteria to participate after the screening assessment. Volunteers provided their consent by clicking a button to continue to the screening questionnaires.

Two procedures were used to collect screening and baseline data to improve the poor retention rates from screening to baseline using the first recruitment procedure, and to improve recruitment among emerging adults ages 18 to 25 who were not participating at similar rates as older participants. In the first method ($n = 143$ baseline participants), the link following the consent form connected participants to an assessment that screened volunteers for inclusion criteria (i.e., age, educational status, and amount of alcohol use and related problems measured by the AUDIT). Individuals who completed the screening provided an e-mail address in order to be contacted with a personalized invitation to participate in the study. Ineligible individuals received an e-mail thanking them for their interest and inviting them to share the weblink for the assessment with others. Eligible individuals were e-mailed a randomly-assigned, unique identification number used to assign their treatment group and with the link to the electronic consent form (see Appendix L) and baseline assessment.

Ethical considerations were repeated, with eligibility to participate in the raffle clarified. Participants consented to the study by again clicking a button to continue to the assessment. All individuals received a list of online resources to obtain additional information or support regarding problem drinking (e.g., Appendices F, G, & H).
In the second recruitment method \((n = 133\) baseline participants), the link following the consent form (see Appendix M) connected participants to an assessment that contained the screening questionnaires as well as the baseline assessment. Ineligible individuals in this group also received an e-mail thanking them for their interest and inviting them to share the weblink for the assessment with others. Eligible individuals in this group were then randomly assigned to a treatment group using the next in a list of randomly ordered unique identification numbers.

After the baseline assessment was completed by either method, the content relevant to their randomly assigned treatment condition was generated from their assessment responses. The feedback interventions or educational information was e-mailed to participants, and a link to the comprehension check questions was provided.

All participants were entered in a raffle for a $200 gift card at the first assessment and a $300 gift card at the second assessment. The gift cards were sent through a major retailer that offers electronic gift cards, www.amazon.com. Participants were informed that they would be entered into the first raffle after they completed the comprehension check questions. Participants were contacted by email four weeks later to complete the follow up assessments and to be entered into the second raffle. All 133 participants in the second group received a $1 gift certificate to www.amazon.com after they had completed the screening and baseline assessment.

**Hypotheses and Research Questions**

(1) Participants in both the PNF and PNF+PDF conditions will report significantly less alcohol use at the follow up than will participants in the control condition, after controlling for baseline alcohol use.
(2) Participants in the PNF+PDF condition will report significantly less alcohol use at the follow up than will participants in the PNF condition, after controlling for baseline alcohol use.

(3) There will be a significant interaction effect, age x treatment intervention, after controlling for baseline alcohol use. Age is hypothesized to moderate the effectiveness of the interventions, such that the PNF will be relatively more effective for younger participants (i.e., “emerging adults”), and the PNF+PDF will be relatively more effective for older participants (i.e., “adults”). Specifically, at the follow up (a) in the PNF condition, emerging adults will report significantly less alcohol use than adults, and participants in both experimental conditions will report significantly less alcohol use than will participants in the control condition, and (b) adults in the PNF+PDF condition will report significantly less alcohol use than those in the PNF condition, whereas emerging adults in the PNF+PDF condition will report alcohol use similar to emerging adults in the PNF condition.

These hypotheses only pertained to alcohol use, not to self-reported alcohol-related problems (as measured by responses to the B-YAACQ). Instead, the analyses for alcohol-related problems were exploratory. These research questions will be included to inform future research, but no specific hypotheses are included, due to the limited effect found for personalized feedback interventions on drinking-related problems in prior research (e.g., Agostinelli et al., 1995; Collins et al., 2002; Walters et al., 2000).

**Analyses**

**Preliminary analyses.** Characteristics of the sample were calculated, and $F$ and $\chi^2$ tests were conducted to determine whether random assignment resulted in equal
distributions of participants by age, gender, race/ethnicity, and education. It was expected that some participants would only complete the baseline assessment; therefore, characteristics of these individuals were compared with those of participants who completed the one-month follow up measures in order to assess which characteristics of the sample may have contributed to attrition. Additionally, the baseline characteristics of participants recruited by the first method were compared to the characteristics of participants recruited by the second method to assess systematic differences in the sample resulting from the use of different recruitment methods.

Internal consistency reliabilities of the continuous measures (i.e., AUDIT, BYAACQ, and PBSS) were analyzed using coefficient alpha. Means and standard deviations of scores on the major variables were calculated, along with skewness, kurtosis, and bivariate intercorrelations.

**Major analyses.** To test the hypotheses and research questions, the three experimental conditions (PNF, PNF+PDF, and Control) were contrast coded (Cohen, Cohen, West, & Aiken, 2003), and two hierarchical multiple regressions were performed, each with alpha = .05. The two criterion variables were (a) total drinks per week, computed from the DDQ post-test score, and (b) level of alcohol problems, assessed by the BYAACQ total post-test score.

The pre-scores on alcohol use (i.e., total drinks per week computed from the DDQ) and alcohol-related problems (i.e., the BYAACQ total score), age, and gender were entered in Step 1, treatment condition (PNF, PNF+PDF, and control, indicated by two contrast-coded variables) was entered in Step 2, and the interaction variables (age x
treatment condition) were entered in Step 3. For all analyses, $F$ values were reported, and the strength of association will be described by $R^2$ and adjusted $R^2$.

It was expected that Hypothesis 1 would be supported if the main effect for experimental condition (Step 2) were significant in the first regression analysis and the test of the parameters on the first contrast coded variable were significant, indicating a significant difference between the two experimental conditions and the control condition. Hypothesis 2 would be supported if the main effect for experimental condition were significant, and if the test of the parameters on the second contrast coded variable were significant, indicating a significant difference between the two experimental conditions. Similarly, the research questions regarding problematic alcohol use would be supported if the main effect for experimental condition (Step 2) were significant in the second regression analysis and tests of the parameters of the two contrast coded variables indicated significant differences between the two experimental conditions and the control condition.

**Follow-up analyses.** If the interaction effect was significant, follow-up analyses would be used to determine whether Hypotheses 3a and 3b are supported. First, the contrast coded results of the initial regression would be examined for group differences. To illustrate patterns in the data, regression lines would be plotted for each treatment condition (control, PNF, and PNF+PDF), with age on the X-axis and alcohol use at post-test on the Y-axis. Next, participants would be divided into two groups: an “emerging adult” group (ages 18-25) and an “adult” group (ages 26-35). ANOVA would be performed with a 3 x 2 design to examine significant differences between the groups.
It was expected that Hypothesis 3a would be supported if post-hoc tests indicated that the PNF-Emerging Adult group reported significantly less alcohol use at post-testing than the PNF-Adult group. Hypothesis 3b would be supported if post-hoc tests indicated that the PNF+PDF-Adult group reports significantly less alcohol use at post-testing than the PNF-Adult group, but no significant difference in post-test alcohol use were found between the PNF and PNF+PDF groups of emerging adults. Likewise, the research questions related to problematic alcohol use would be supported if a similar pattern of group differences were found for alcohol-related problems at post-testing.
Chapter 3

Results

Preliminary Analyses

Results indicated that random assignment resulted in balanced treatment groups. There were no significant differences between treatment groups on age ($F(2, 274) = .59, p = .55$), gender ($\chi^2 = .77, p = .70$), race/ethnicity ($\chi^2 = 2.08, p = .35$) education, $F(2, 273) = .02, p = .98$; or screening AUDIT scores, $F(2, 273) = .81, p = .45$.

The demographic characteristics of the 129 individuals (46.74%) who completed the baseline survey but did not complete the follow up survey were compared with the characteristics of the 147 participants who completed the follow up measures in order to assess which characteristics may have contributed to attrition (see Table 1). These analyses indicated that participants who completed the follow up assessment differed from non-completers on all demographic characteristics. The completers were more likely to be female, $\chi^2(1) = 10.325, p = .001$; white, $\chi^2(1) = 11.308, p = .001$; older, $F(1, 274) = 21.703, p < .001$; and more educated, $\chi^2(7) = 71.708, p < .001$. Completers also had lower screening AUDIT scores, $F(1, 274) = 37.839, p < .001$. These results suggest that the systematic differences in participants’ willingness to complete the follow-up survey needed to be considered in the interpretation of the outcome analyses.

Demographic characteristics of the 143 individuals (51.81%) who were recruited through the first method were compared with the characteristics of the 133 participants recruited using the second method. These analyses indicated that individuals recruited by the second method tended to be younger, $F(1, 274) = 63.29, p < .001$; less educated, $F(1, 274) = 72.37, p < .001$; and had higher screening AUDIT scores, $F(1, 274) = 21.79 p <$
.001. There were no differences between recruitment groups in terms of gender, $\chi^2(1) = 10.325, p = .001$; or race/ethnicity, $\chi^2(1) = 10.325, p = .001$.

**Descriptive Analyses**

Participants’ ($N = 276$) average screening AUDIT score was 13.54 ($SD = 6.99$) with a low of 6, the minimum inclusion criterion for women, and a high of 40, the maximum score on this measure. The average number of drinks per week reported at baseline was 22.14 ($SD = 21.03$), with a range of 0 to 140. The interquartile range was 8 and 28 drinks, which indicates that the average participant was drinking at or above the 90th percentile for both men and women between the ages of 18 and 35 (Chan et al., 2007; 2009). Participants estimated that others of their same age and gender drink 19.90 drinks per week ($SD = 22.69$). As found in similar studies with college students (e.g., Lewis et al., 2007; Neighbors et al., 2004; 2006), participants in the current study estimated the alcohol use of an average person their same age and gender to be similar to their own levels of heavy drinking ($r = .25, p < .001$). The average number of drinks per week reported by participants ($N = 147$) at follow up was 13.32 ($SD = 11.64$), with a minimum of 0 and a maximum of 62, and an interquartile range of 5 to 18.75 drinks per week. Thus, less drinking overall was reported at follow up; however, the group that completed the follow up assessment tended to drink less ($M = 16.73, SD = 15.57$) than non-completers ($M = 28.28, SD = 24.51$) at baseline, $F(1,273) = 22.27, p < 0.001$.

Means, standard deviations, internal consistency, skewness, and kurtosis for continuous measures and alcohol use variables are reported in Table 2. The PBSS exhibited unremarkable skewness and kurtosis. Analysis of the screening AUDIT scores...
### Table 2

*Means, Standard Deviations, Internal Consistency, Skewness, and Kurtosis*

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>M</th>
<th>SD</th>
<th>Skewness Statistic</th>
<th>Skewness SE</th>
<th>Kurtosis Statistic</th>
<th>Kurtosis SE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AUDIT - Screening</strong></td>
<td>959</td>
<td>10.21</td>
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<td>.08</td>
<td>.74</td>
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<tr>
<td><strong>Baseline</strong></td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>AUDIT</td>
<td>276</td>
<td>13.54</td>
<td>6.99</td>
<td>1.16</td>
<td>.15</td>
<td>.84</td>
<td>.29</td>
</tr>
<tr>
<td>BYAACQ</td>
<td>271</td>
<td>7.95</td>
<td>5.61</td>
<td>.58</td>
<td>.15</td>
<td>-.62</td>
<td>.29</td>
</tr>
<tr>
<td>PBSS</td>
<td>274</td>
<td>49.69</td>
<td>14.34</td>
<td>-.04</td>
<td>.15</td>
<td>-.33</td>
<td>.29</td>
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<tr>
<td>DDQ drinks per week</td>
<td>275</td>
<td>22.14</td>
<td>21.03</td>
<td>2.02</td>
<td>.15</td>
<td>5.31</td>
<td>.29</td>
</tr>
<tr>
<td>DNRF drinks per week</td>
<td>276</td>
<td>19.10</td>
<td>22.69</td>
<td>5.56</td>
<td>.15</td>
<td>45.77</td>
<td>.29</td>
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<tr>
<td><strong>Follow up</strong></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DDQ drinks per week</td>
<td>147</td>
<td>13.32</td>
<td>11.64</td>
<td>1.60</td>
<td>.20</td>
<td>2.82</td>
<td>.40</td>
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<tr>
<td>BYAACQ</td>
<td>142</td>
<td>3.97</td>
<td>5.02</td>
<td>.09</td>
<td>.20</td>
<td>8.41</td>
<td>.40</td>
</tr>
</tbody>
</table>

*Note.* AUDIT = Alcohol Use Disorders Identification Test (Saunders et al., 1993). BYAACQ = Brief Young Adult Alcohol Consequences Questionnaire (Kahler et al., 2005). PBSS = Protective Behaviors Strategies Scale (Martens et al., 2005). DDQ = Daily Drinking Questionnaire (Collins et al. 1985). DNRF = Drinking Norms Rating Form (Baer et al., 1991).
suggests some positive skew as well as a leptokurtic curve, indicating that the majority of the screening scores lay at the lower end of the range. Both the baseline and follow up BYAACQ scores were also leptokurtic, with the follow up scores extremely so. The baseline BYAACQ was also positively skewed. These results from both the AUDIT and BYAACQ likely reflect the relatively infrequent endorsement of higher severity problem items in the sample (e.g., “How often during the last year have you needed a first drink in the morning to get yourself going after a heavy drinking session?” or “My physical appearance has been harmed by my drinking.”).

Correlations between major variables (see Table 3) were in expected directions in most instances. Men tended to report heavier drinking, more alcohol-related problems, and the use of fewer protective strategies than women (rs = -.24 to -.50). Age was negatively correlated with alcohol use and alcohol-related problems, but positively correlated with the use of protective behavioral strategies (rs = .22 to .34). Age was not related to alcohol use and alcohol-related problems at the follow up assessment (rs = .05 and -.03). The AUDIT, a measure of both alcohol use and related problems, displayed strong, positive correlations with drinks per week and BYAACQ scores at both time points (rs = .52 to .73). The PBSS was negatively related to measures of alcohol use and related problems (rs = -.19 to -.53). The correlations for estimated norms (rs = .02 to .25) were generally smaller in magnitude than the correlations among the self-report variables. Gender was not related to estimated normative drinks per week (r = -.10).

**Comprehension Check**

Forty-one percent of the baseline participants (n = 112) completed the comprehension check survey, and 97 of those also completed the follow up assessment
### Table 3

**Bivariate Correlations among Study Variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Age</td>
<td></td>
<td>-</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>2. Gender</td>
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<td>-</td>
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<td></td>
</tr>
<tr>
<td>3. AUDIT</td>
<td>-.30**</td>
<td>-.41**</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Baseline drinks per week</td>
<td>-.23**</td>
<td>-.43**</td>
<td>.62**</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Estimated drinks per week norms</td>
<td>-.22**</td>
<td>-.10</td>
<td>.19**</td>
<td>.25**</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Baseline BYAACQ Total</td>
<td>-.27**</td>
<td>-.26**</td>
<td>.73**</td>
<td>.39**</td>
<td>.06</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. PBSS</td>
<td>.34**</td>
<td>.42**</td>
<td>-.53**</td>
<td>-.49**</td>
<td>-.19**</td>
<td>-.45**</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Follow up drinks per week</td>
<td>.05</td>
<td>-.50**</td>
<td>.65**</td>
<td>.72**</td>
<td>.02</td>
<td>.49**</td>
<td>-.32**</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>9. Follow up BYAACQ Total</td>
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<td>-.24**</td>
<td>.52**</td>
<td>.40**</td>
<td>-.08</td>
<td>.50**</td>
<td>-.19*</td>
<td>.61**</td>
<td>-</td>
</tr>
</tbody>
</table>

*Note.* **p < .01; * p < .05. For gender, men = 1, woman = 2.
(66% of the follow up sample). Analyses indicated that there was a significant between-group difference in comprehension check completion between the experimental groups, \( \chi^2(2) = 10.83, p < .01 \), with 30% of the PNF+PDF participants \( n = 30 \), 38.2% of the PNF participants \( n = 34 \), and 53.9% of the control participants \( n = 48 \) completing the comprehension check. Qualitatively, 64% of the PNF participants, 57% of the PNF+PDF participants, and only 15% of control participants were surprised by the information they received. A repeated measures ANOVA revealed a significant interaction between time and survey completion in terms of alcohol use from baseline to follow up, \( F(1,145) = 7.82, p < .01 \). Although participants who did not complete the comprehension check reported more drinking at baseline than those who did complete it, the non-completers reported a more dramatic reduction in their alcohol use at follow up, with the resulting alcohol use similar between both groups (see Table 4). There was no significant interaction between time and comprehension check completion for alcohol-related problems, \( F(1,141) = .66, p = .41 \).

Cost Analyses

A total of $3906.33 was spent on advertisements and recruitment costs for the current study. The total included $220.49 on participant payments, $500 on raffles, and $3185.84 on advertisements. The total cost per follow up participant was $26.57, whereas the cost per completed screening questionnaire was $4.07.

Major Analyses

Follow up weekly drinking calculated by the DDQ was the dependent variable in the main hierarchical regression analysis (see Table 5), with age, gender, and baseline weekly drinking entered as covariates in Step 1; two contrast-coded variables representing comparisons between experimental conditions in Step 2; and two variables
Table 4

*Alcohol Use and Alcohol-Related Problems by Confirmation Survey Completion*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Complete n = 97</th>
<th></th>
<th>Incomplete n = 50</th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Drinks per week</td>
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<tr>
<td>Baseline</td>
<td>14.82</td>
<td>12.36</td>
<td>20.68</td>
<td>19.95</td>
</tr>
<tr>
<td>Follow up</td>
<td>13.05</td>
<td>11.81</td>
<td>13.72</td>
<td>11.50</td>
</tr>
<tr>
<td>Cohen’s d</td>
<td>0.15</td>
<td></td>
<td>0.43</td>
<td></td>
</tr>
<tr>
<td>BYAACQ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline total</td>
<td>5.80</td>
<td>4.46</td>
<td>7.02</td>
<td>5.40</td>
</tr>
<tr>
<td>Follow up total</td>
<td>3.80</td>
<td>4.18</td>
<td>4.30</td>
<td>6.46</td>
</tr>
<tr>
<td>Cohen’s d</td>
<td>0.46</td>
<td></td>
<td>0.46</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* BYAACQ = Brief Young Adult Alcohol Consequences Questionnaire.
Table 5

**Summary of Hierarchical Multiple Regression Analysis of Age, Gender, Treatment Condition, and the Age X Treatment Condition Interaction Predicting Alcohol Use**

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SEB</th>
<th>β</th>
<th>p</th>
<th>(sr)</th>
<th>(R^2)</th>
<th>(ΔR^2)</th>
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</thead>
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<tr>
<td><strong>Step 1</strong></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>-6.05</td>
<td>1.36</td>
<td>-.26</td>
<td>.00</td>
<td>-.23</td>
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<tr>
<td>Age</td>
<td>.72</td>
<td>.24</td>
<td>.28</td>
<td>.00</td>
<td>.16</td>
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<td></td>
</tr>
<tr>
<td>Baseline drinks per week</td>
<td>.37</td>
<td>.03</td>
<td>.67</td>
<td>.00</td>
<td>.59</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contrast 1: Control vs. Feedback</td>
<td>.96</td>
<td>7.48</td>
<td>.04</td>
<td>.90</td>
<td>.01</td>
<td>.62</td>
<td>.01</td>
</tr>
<tr>
<td>Contrast 2: PNF vs. PNF+PDF</td>
<td>9.45</td>
<td>8.90</td>
<td>.33</td>
<td>.29</td>
<td>.06</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
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</tr>
<tr>
<td>Age by Contrast 1 Interaction</td>
<td>-.35</td>
<td>.35</td>
<td>-.37</td>
<td>.32</td>
<td>-.05</td>
<td>.63</td>
<td>.00</td>
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<tr>
<td>Age by Contrast 2 Interaction</td>
<td>.06</td>
<td>.32</td>
<td>.06</td>
<td>.86</td>
<td>.01</td>
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<td></td>
</tr>
</tbody>
</table>

*Note. \(s_r\) = the semi-partial correlation coefficient. Step 1: \(F(3,143) = 74.71, p < .001.\) Step 2: \(F(5,141) = 46.74, p < .001.\) Step 3: \(F(7,139) = 33.47, p < .001.\)*
representing the interaction between age and experimental condition entered in Step 3. Results indicated that the covariates in Step 1 accounted for a significant portion of the variance for follow up weekly drinking, $\Delta F(3, 143) = 74.71, p < .01, \Delta R^2 = .61, R^2_{adj} = .60$. Gender, age, and baseline weekly drinking all contributed independently to the variance in follow up drinking, with semi-partial $r^2$s = .05, .03, and .35, respectively. Neither the main effect for experimental condition, $\Delta F(2, 141) = 2.48, p = .09, \Delta R^2 = .01, R^2_{adj} = .61$, nor the interaction effect, $\Delta F(2, 139) = .73, p = .48, \Delta R^2 = .00, R^2_{adj} = .61$, was significant. Thus, Hypotheses 1, 2, and 3 were not supported.

However, a repeated measures ANOVA indicated that all participants, including those in the control condition, significantly reduced their alcohol use from baseline to follow-up, $F(1,146) = 15.54, p < .001$. Means and standard deviations for each group are reported below (see Table 6).

To answer the research questions, the dependent variable, alcohol-related problems as measured by follow up BYAACQ scores, was used in a second, exploratory hierarchical regression analysis (see Table 7). Age, gender, and baseline BYAACQ scores were entered in Step 1; the contrast coded, experimental condition variables were entered in Step 2; and the interaction (age X experimental condition variables) was entered in Step 3. Results indicated that the covariates in Step 1 accounted for significant portion of the variance for follow up alcohol-related problems, $\Delta F(3, 139) = 18.20, p < .01, \Delta R^2 = .28, R^2_{adj} = .27$. Gender and baseline alcohol-related problems each contributed unique variance to follow up alcohol-related problems, with semi-partial $r^2$s = .02 and .22, respectively. Age was not independently related to follow up alcohol-related problems. Again, neither the main effects for experimental condition, $\Delta F(2, 137) = .62, p = .54, \Delta R^2 = .01, R^2_{adj} = .26$, nor the interaction effect, $\Delta F(2, 135) = 1.77, p = .18, \Delta R^2 =$
Table 6

*Alcohol Use and Alcohol-Related Problems by Treatment Group and Time*

<table>
<thead>
<tr>
<th>Variable</th>
<th>PNF</th>
<th>SD</th>
<th>PNF+PDF</th>
<th>SD</th>
<th>Control</th>
<th>SD</th>
<th>Total</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td></td>
<td>M</td>
<td></td>
<td>M</td>
<td></td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>Drinks per week&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>16.52</td>
<td>17.40</td>
<td>17.11</td>
<td>14.45</td>
<td>16.84</td>
<td>14.89</td>
<td>16.82</td>
<td>15.55</td>
</tr>
<tr>
<td>Follow up</td>
<td>11.46</td>
<td>9.49</td>
<td>14.01</td>
<td>12.54</td>
<td>14.40</td>
<td>12.76</td>
<td>13.28</td>
<td>11.67</td>
</tr>
<tr>
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<td>0.23</td>
<td></td>
<td>0.18</td>
<td></td>
<td>0.26</td>
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</tr>
<tr>
<td>BYAACQ&lt;sup&gt;b&lt;/sup&gt;</td>
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<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline total</td>
<td>6.61</td>
<td>5.35</td>
<td>5.29</td>
<td>4.21</td>
<td>6.63</td>
<td>4.71</td>
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<tr>
<td>Follow up total</td>
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<td>6.06</td>
<td>3.56</td>
<td>4.24</td>
<td>4.59</td>
<td>4.56</td>
<td>3.97</td>
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<td>0.44</td>
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<td>0.45</td>
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</tr>
</tbody>
</table>

*Note.* BYAACQ = Brief Young Adult Alcohol Consequences Questionnaires.

<sup>a</sup>Drinks per week: PNF, n = 50; PNF+PDF, n = 47; Control, n = 50.  
<sup>b</sup>BYAACQ: PNF, n = 49; PNF+PDF, n = 45; Control, n = 49.
### Table 7

**Summary of Hierarchical Multiple Regression Analysis of Age, Gender, Treatment Condition, and the Age X Treatment Condition Interaction Predicting Alcohol-Related Problems**

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SEB</th>
<th>β</th>
<th>p</th>
<th>sr</th>
<th>R²</th>
<th>ΔR²</th>
<th>f²</th>
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</tr>
<tr>
<td>Gender</td>
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<td>-1.16</td>
<td>.04</td>
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<td>.17</td>
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<td>Baseline BYAACQ Score</td>
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<td>.00</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Contrast 1: Control vs. Feedback</td>
<td>1.94</td>
<td>4.49</td>
<td>.18</td>
<td>.67</td>
<td>.03</td>
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<td></td>
</tr>
<tr>
<td>Contrast 2: PNF vs. PNF+PDF</td>
<td>9.71</td>
<td>5.32</td>
<td>.80</td>
<td>.07</td>
<td>.13</td>
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<td><strong>Step 3</strong></td>
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<td></td>
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<tr>
<td>Age by Contrast 1 Interaction</td>
<td>-.30</td>
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<td>-.72</td>
<td>.17</td>
<td>-.10</td>
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<td></td>
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<tr>
<td>Age by Contrast 2 Interaction</td>
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<td>.20</td>
<td>.68</td>
<td>.03</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

0.02, \( R^2_{\text{adj}} = .27 \) was significant. However, a repeated measures ANOVA indicated that all participants reported significantly fewer alcohol-related problems from baseline to follow up, \( F(1,142) = 29.79, p > .001 \). Means and standard deviations for each group are reported in Table 5.

**Summary**

No significant differences emerged between the control and experimental conditions at the follow up for either outcome variables (alcohol use and alcohol-related problems), and age did not moderate the outcomes. That is, Hypotheses 1, 2, and 3 were not supported. The research question regarding problematic alcohol use indicated no significant differences between the two experimental conditions and the control condition on alcohol-related problems at the follow up. Also, there was no interaction effect, i.e., age did not moderate the effect of treatment condition on alcohol-related problems. However, all participants, regardless of age and experimental condition, reported less alcohol use and fewer alcohol-related problems at the follow up assessment.
Chapter 4

Discussion

The initial goal of the current study was to use internet-based procedures to target non-college, young adult problem drinkers who may benefit from a brief motivational feedback intervention. This first aim was achieved, with over 900 young adults screened for problem drinking, a large percentage of whom reported clinically significant levels of problem drinking. This was one of the first studies to specifically target young adults outside a university setting for a brief alcohol intervention, and the first to use entirely online procedures to do so. The resulting heavy drinking sample was educationally diverse, with nearly 50% of participants having less than a bachelor’s degree, and 14% possessing a graduate or professional degree. Participants reported a variety of occupations in areas such as construction and labor, retail, engineering, health care, IT, food service, business, factory work, mental health, teaching, military, and child care, including stay-at-home mothers. The study demonstrated the efficiency of the internet to reach a large, varied population of problem drinkers who may otherwise not be reached for secondary prevention efforts, with low cost per participant.

Second, the study was designed to assess whether personalized feedback interventions were more effective than an educational control condition in reducing participants’ drinking at follow up. This aim was not achieved; rather, although on average participants in all groups significantly decreased their drinking at the one-month follow up, there were no significant differences between the personalized feedback groups and the control group.
One reason for the nonsignificant result may have been the general effect of the assessment and interventions drawing participants’ attention to their alcohol use. Several comments by participants at the follow up survey support this hypothesis:

- **Helpful.** It helped me look back at those times when I drank more than I should have and reevaluate why I did what I did. (PNF Participant 1062 24-year-old man)

- **[I learned] that I drink much more than the average woman in my age group!** Very helpful. It really made me more mindful about how much alcohol I've been consuming. (PNF Participant 1083 – 29-year-old woman)

- **I remember most reading and thinking that even though I was very well controlled there were still too many drinks for me over the course of a week. It was helpful to me in an internally cognitive way....helping me to further limit how socially I drink and how many I choose to have.** (PNF+PDF Participant 2084 – 30-year-old man)

- **[I learned] how bad it is for your brain. Helped me identify that I did feel guilty after I drank, and tried to cut that depressed feeling out by not drinking so much** (Control Participant 3054 – 26-year-old woman)

As Sobell et al. (2002) concluded after finding similar reductions in alcohol use among groups of adult heavy drinkers who received educational information or personalized feedback, it is possible that educational information is just as salient as personalized information for non-college young adults and the additive effect of personalized information is smaller than it is for college students. The comments highlighted above suggest that all three interventions may have initiated the self-regulatory process of using the provided information to assess the discrepancy between
one’s current and desired behavior (Miller et al., 2000). In other words, educational material may be as helpful as personalized feedback for individuals who have a capacity or desire to apply new information to modify their alcohol use.

Also, in several studies, intervention effects differed at follow ups of different lengths. In one case, although no treatment differences were found after three months, an in-person BMI was more effective than written feedback only after 15 months (White, Mun, Pugh, and Morgan, 2007). In another case, the effect of an MI with feedback on reducing a variety of drinking outcomes was stronger after six months than after three months as compared to a control condition and two other intervention conditions (Walters et al. 2009). A meta-analysis of brief alcohol interventions with college students indicated that the effect size tended to diminish over longer follow up periods, but this result was largely explained by control participants reporting reduced drinking at later time points (Carey et al., 2007). In contrast, a comparison of a computerized feedback intervention and a control condition with adults was effective at three and six months, but there was no intervention effect after 12 months, largely because participants in the intervention condition increased their drinking (Cunningham, Wild et al., 2010). In the current study, it is unclear how the impact of the intervention conditions may have differed over time, particularly whether the personalized information would have had a more lasting effect.

One difficulty with non-contact feedback studies conducted online is that it is unclear how much participants attend to, process, and recall the information that they receive, which may limit the differential effects of the interventions. Several of the present participants’ comments at the follow up suggested that their recollection of the feedback was poor or inaccurate. For example, PNF Participant 1049, a 23-year-old man, commented that he recalled the effects of excessive drinking on his health and weight,
despite receiving only normative information and accurately commenting on that information in the confirmation survey at baseline. Other participants, such as Control Participant 3085, a 26-year-old woman, reported at the follow up that she did not recall receiving information despite accurately completing the confirmation survey.

Research conducted by Jouriles and colleagues (2010) suggested that efforts to increase the retention and recall of personalized feedback information by having some participants spend 20 minutes reviewing or recalling the information did improve retention of the feedback information after two weeks. Participants in these enhanced-recall conditions reported less alcohol use at follow-up and the amount of information recalled at the follow up partially mediated drinking outcomes. Although the participants who spent time reviewing the information at baseline recalled more information at the follow up, all participants recalled very little of the information provided, ranging from 1% to 23% of the feedback information recalled, with an average of 9% of the details recalled.

In contrast, results of the current study indicated that the effect of efforts to improve processing and retention of the material by including a confirmation survey was inconsistent. Response rates to the confirmation survey varied among the treatment groups, with the control group exhibiting the highest response rate and the PNF+PDF group exhibiting the lowest response rate. Despite overall reductions in drinking, participants who did not complete the comprehension check reported greater reductions in drinking at follow up than those who did complete it. Thus, the amount or accuracy of the information recalled may have exerted less influence on drinking behavior than the cognitive and emotional self-regulatory processes initiated when individuals first received the information.
A third goal of the study was to test differences between the effectiveness of personalized normative feedback and the effectiveness of personalized normative feedback plus personalized drinking feedback in order to further our understanding of effective feedback intervention components with adults (Cunningham, Khadjesari, et al., 2010). It was hypothesized that the PNF+PDF combined feedback, which provided information regarding typical and peak BAC, caloric and financial costs of alcohol, and alcohol-related problems in addition to normative information, would have a greater effect on drinking at follow up than the PNF alone, due to increased intervention dosage. It was also hypothesized that age would interact with these differences such that the PNF+PDF would be relatively more effective with older participants’, and the PNF would be relatively less effective with younger participants. The drinking feedback portion of the PNF+PDF was expected to be more salient for adults in this study than for the emerging adults because it better highlighted a discrepancy between how participants’ behavior compared to behavior expected from adults, whereas emerging adults were expected to be more influenced by the social comparisons in the PNF. Neither of these hypotheses was supported; there were no significant differences between the two groups, and no interaction with age was found.

A possible explanation for the similarity between groups is that the normative information appeared to be highly salient for participants, regardless of age or intervention condition. Comments by several participants in the PNF+PDF condition illustrate this possible explanation:

- *The statistic that surprised me was that based on this survey 80% of women my age report drinking no more than one drink per week. Even if only 'partying' on the weekends or one day per week, I'd have expected most women aged 26-29 to...*
drink more than one total drink. (PNF+ PDF Participant 2059 – 28-year-old woman at baseline)

• [I] did not expect to be in the 97th percentile. I was expecting somewhere around 80th percentile. Everything else was about what I expected. (PNF+ PDF Participant 2012- 26-year-old man at baseline)

• I thought most 20 somethings drank a bit more, I knew I might be on the high end but thought myself somewhat normal. (PNF+ PDF Participant 2091- 27-year-old woman at baseline)

• I remember that a large percentage of the population drinks less often than me. (PNF+ PDF Participant 2074 – 28-year-old woman at follow up)

The interaction analysis explored theoretical assumptions regarding the transition to adulthood and the importance of injunctive norms regarding responsible adult behavior, because adult identity is associated with avoiding risk taking behavior that is more acceptable when one is younger (Arnett, 2001). The absence of a significant interaction effect suggests that this theoretical assumption may be incorrect, supported by the qualitative observation that most participants commented on the normative feedback, with few comments regarding other information provided in the PNF+PDF condition. Contrary to results reported by Arnett (2000), the majority of participants in the current study (80%) reported that they considered themselves to be adults, including 73% of emerging adults ages 18 to 25. This may be explained by the lack of full-time college students in the present study in contrast to most other studies with this age group. Thus, it is notable that although most of the participant identified themselves as adults, few of them commented on the PDF portion of the PNF+PDF feedback.
Two problems exist with concluding that the results of the current study indicate that the theoretical assumption about injunctive norms in adulthood is incorrect. First, the current study was not a direct test of injunctive norms, which would involve asking participants how they believe adults should act. Feedback based on injunctive norms would then provide normative information regarding how others believe adults should act, rather than providing information about how other adults actually act, as in descriptive norms. Frone and Brown (2010) examined workplace-related descriptive and injunctive substance use norms among a national sample of employed adults with an average age of 39 who responded to a telephone survey. These authors found that individuals’ own descriptive and injunctive norms regarding workplace alcohol use were related to workplace-related alcohol use and impairment; however, only injunctive norms regarding workplace alcohol use predicted alcohol use and impairment that occurred away from work. These authors speculated that descriptive norms are more related to individuals’ behavior in a specific situation such as work, whereas injunctive norms may be more internalized, relating to behavior in a variety of contexts. The ability to examine the theoretical importance of injunctive norms for adults more closely and investigate their utility in a personalized feedback study would depend on having a sufficiently large and representative sample regarding injunctive norms about acceptable alcohol-related behaviors as an adult that could be used in similar ways as have descriptive norms.

An additional problem with drawing theoretical conclusions about injunctive norms is that, although participants did not appear to find the information provided by the PDF portion of the PNF+PDF intervention notable, the normative information did appear to be salient for many participants in both feedback conditions. The interaction effect also explored theoretical assumptions regarding the phase of emerging adulthood and the
salience of social information for younger participants, but the results suggested that normative information may have been just as salient for the older participants in the study. For many individuals, the phase of emerging adulthood may persist for longer than originally anticipated and they may share more characteristics with college students than anticipated. Longitudinal research indicates that the individuals who take longer to “mature out” of drinking may display greater levels of impulsivity and less developed coping and self-regulation skills (Costanzo et al., 2007; Littlefield et al, 2010; Patrick & Schulenberg, 2011). Participants in the present study were selected for heavier drinking, which suggests that the older participants in the study may have had higher levels of those characteristics that are typically associated with younger age and risk-taking behavior, such as neuroticism and impulsivity (Littlefield et al, 2009; 2010). These older adults may also have alcohol-promoting social networks that caused them to make incorrect assumptions about descriptive norms, as was demonstrated among college students and with a population of adults in a large, metropolitan city (Cunningham, Neighbors, Wild, & Humphreys, 2012). Several comments by participants, which refer to heavy drinking social networks, support this explanation:

- I was surprised to see this because in my personal experience, heavy drinking on weekends is more the norm. To have only 3 or 4 drinks on a night where I'd be out for an extended period of time, I'd probably (make that DEFINITELY) not even feel buzzed... So that would defeat the purpose of drinking at all, in truth. (PNF Participant 1093 – 19-year-old man at baseline)

- Most of the information was not surprising, with the exception that the study found almost half of men my age drink no more than one drink per week. Typically when I go to a bar on the weekends, most people seem to be in my age
range and having multiple drinks. (PNF+ PDF Participant 2029 – 24-year-old man at baseline)

- I know a lot of other women that consume way much more alcohol than me. I don’t think the comparative figures are all that right. I don’t know to what extent people lie when taking those tests (even to themselves) or if the season at which the tests are taken are taken into account. (PNF+ PDF Participant 2005 – 26-year-old woman at baseline)

- Seems very low, would think a lot more would have a multiple drinks on weekends especially. (PNF Participant 1065 – 28-year-old woman at baseline)

Participants’ questions about the validity of the norms that were provided highlight the problem of how to develop normative feedback that is relevant to non-college young adults. College students have several clearly defined social networks which have typically been used in studies about normative drinking, including students at the same college or university, students in the same class year, fraternity or sorority members, or intercollegiate athletes.

A potential method for increasing the relevance of feedback outside of a university setting is to include context-specific drinking. Lewis and colleagues (2011) recently explored college students’ estimations of peer drinking across drinking contexts such as at a bar, party, or sporting event. These authors found that students consistently overestimated others’ alcohol use in the various contexts and that these estimations were related to individuals’ level of drinking in those contexts. The authors highlighted the visibility and salience of context-specific drinking in public locations in particular, and noted that overestimations of alcohol use were smallest for drinking at home.
Participants’ comments in the present study regarding others’ behaviors at bars, on the weekend, or in specific seasons of the year point to the importance of context in their assessment of the relevance and believability of the feedback. In social norms feedback with college students, the university context may be a more active ingredient than the developmental salience of social norms. Thus, providing feedback with the framework of relevant contexts, such as at a bar, on the weekend, on a date, at home, during the summer, or watching a sports game may provide young adult drinkers with norms that are more proximal and that appear more realistic and believable, particularly because many individuals appeared to assume that they drink more than average.

A final aim of the current study was to explore the effect of the three intervention conditions on rates of alcohol-related problems. The results paralleled those regarding alcohol use: There were no significant differences between the three groups and all participants reported significantly fewer alcohol-related problems at the one-month follow up. A reduction in alcohol-related problems was found in response to other feedback interventions with emerging adults (Monti et al., 2007) and with adults (Koski-Jannes et al., 2007). Feedback interventions with college students typically have a smaller and more delayed effect on alcohol-related problems (Carey et al., 2007); thus the current results suggest that the relationship between alcohol use and rates of alcohol-related problems may be stronger among non-college young adults than among college students. If the relationship between alcohol use and alcohol-related problems are is demonstrated to be stronger in future research with non-college young adults, brief online feedback interventions would be promising from a public health perspective regarding a reduction in alcohol use disorders and such a result warrants further exploration. In addition to being responsive to various types of information, adults with greater self-
regulatory capacity may also be better able to apply what they have learned to change how they drink as well as how much they drink.

Practically, the overall decline in alcohol use and alcohol-related problems across conditions suggests that non-college, young adult problem drinkers respond to relatively low doses of either educational or normative information, delivered online using anonymous procedures. Buscemi and colleagues (2010) found that college students reported a preference for receiving information about alcohol use from informal (e.g., talking to friends and family) or anonymous sources (e.g., computer or internet programs) more than from other sources, such as talking to a counselor. Targeting young adults for a brief, anonymous assessment and feedback program (e.g., www.checkyourdrinking.net; Cunningham, Wild, et al., 2009; 2010) could reach a large population of problem drinkers who may be receptive to such an intervention.

The initial response to the screening survey suggests that many individuals are interested in using the internet to get more information about alcohol use; indeed, nearly a quarter of the screening sample did not meet criteria for problem drinking based on their AUDIT scores. This group likely included individuals who were regular, non-problem drinker curious about the feedback they would receive, and some responded to the second recruitment method in which they received payment for completing the survey. However, many participants, particularly younger participants, were lost through attrition at each stage of the study (i.e., screening, baseline survey, confirmation survey, and follow up survey). Despite their promise for influencing alcohol use, demonstrating the effectiveness of internet-based interventions among the general public is a significant challenge because recruitment and retention to follow-up has typically been low, whereas
individuals who participate in face-to-face trials may self-select for higher compliance due to the increased effort involved in those studies (Cunningham & Van Mierlo, 2009).

Indeed, two recruitment procedures were used in the current study to improve retention rates from screening to baseline, including combining the two surveys and adding small, definite compensation (i.e., $1) rather than raffles for a larger amount of money (i.e., $200). Although this improved recruitment rates, attrition to the follow up survey continued to be high. Several reasons have been posed for the high attrition rate for trials of internet-based interventions, including the lack of connection between researchers and participants and lower incentives to participate (Cunningham & Van Mierlo, 2009), and increased compensation has been suggested as a method to improve response rates (e.g., Cunningham et al. 2009). In a survey of college students who did not complete all assessments for an online intervention research study, the most common reasons provided for not completing assessments were being too busy (75%) and assessment length being too long (51%). Neither confidentiality (5%) nor computer access (8%) was reported frequently (Cunningham, Khadjesari, et al., 2010). Results of the current study suggest that keeping assessment and feedback as brief as possible while providing small, definite incentives rather than raffles for participation in both baseline and follow up surveys may increase our knowledge about the effectiveness of internet-based interventions through improved recruitment and retention rates for intervention trials.

Despite research suggesting individuals’ preferences for anonymous information (Buscemi et al., 2010), interventions lacking face-to-face contact may not accurately convey the empathic and affirmative “spirit” of motivational interviewing (Miller & Rollnick, 2002). College students’ follow up preferences for an in-person BMI versus
two computerized interventions indicated that participants found the in-person intervention more interesting, credible, and useful than the computerized interventions and participants in the in-person intervention exhibited greater reductions in drinking at follow-up (Murphy, Dennhardt, Skidmore, Martens, & McDevitt-Murphy, 2010). Although support for in-person interventions over feedback-only interventions has not been consistent (e.g., Doumas & Hannah, 2008; Monti et al., 2007; Murphy et al., 2004; Walters et al., 2000; White et al., 2006), some individuals may respond negatively to the feedback provided. Several comments from several participants in the current study indicated that the feedback and educational materials fostered some resistance:

- Yes, [it was helpful] for bragging rights. (PNF Participant 1023 – 26-year old man at follow up)
- I don't feel like my drinking is ever a problem. I'm one of the more responsible drinkers out of my friends. These results make me feel like I do have a problem. (PNF+PDF Participant 2036 – 25-year-old woman at baseline)
- I drink a lot, as do most of my peers. I enjoy it and it does not interfere with my lifestyle. (PNF+PDF Participant 2097 – 32-year-old man at baseline)
- The preachy tone and obvious attempt to use shock value of quantity of calories to make me think it would be a good idea to drink less. Like any reasonably intelligent person can’t figure out that a night of drinking is going to drop 3k calories on them. That’s what the gym is for. (Control Participant 3042 – 28-year-old man at follow up)

It is possible that many of the young adults in the current study were already aware of their status as a heavy drinker prior to receiving the feedback, whereas such feedback may be more novel information for many college students, who see their heavy drinking...
as average. Not surprisingly, defensiveness moderated drinking outcome for students who were mandated to receive an alcohol intervention after an alcohol-related infraction (Palmer, Kilmer, Ball, & Larimer 2010). More exploration is needed to investigate whether the same is true for internet-based feedback interventions, and for interventions with non-college young adults. Finding ways to reduce defensiveness and resistance with an online intervention is a challenge. For example, more sophisticated computerized procedures may allow participants to choose the types of information they are interested in learning more about, thereby increasing participants’ engagement and autonomy.

Another method for creating feedback that is more in keeping with the “spirit” of MI may be to include assessment and feedback regarding the positive experiences associated with alcohol use, echoing the decisional balance exercise used in many motivational interventions (Miller & Rollnick, 2002). Previous experiences of positive consequences were found to be as strongly associated to alcohol use as negative consequences were among a group of recent high school graduates (Lee, Maggs, Neighbors, & Patrick, 2010). Part of the rationale behind motivational interviewing is that when a counselor reflects the positive aspects of continuing a problem behavior such as heavy alcohol use, an ambivalent individual is more likely to discuss the negative aspects and, as such, argue for change. Presenting feedback that includes a list of positive consequences alongside a list of negative consequences may be an effective intervention for problem drinkers, while reducing resistance by acknowledging the positive consequences that promote alcohol use.

Finally, participants’ comments pointed to another area of future research regarding the influence of relationships on alcohol in young adulthood, particularly for women. Given the lower levels of safer drinking for women and their greater risk for
alcohol-related consequences, it may be particularly important to understand how heavy drinking male peers influence women’s alcohol use:

- *I know all this stuff, it’s just difficult to drink the right amount as a women (sic) when the majority of your friends are male. (Control Participant 3018 – 24-year-old woman baseline)*

- *I know that I drink more than I should - but i (sic) find myself in situations where I go out a lot and entertain and go to tons of concerts. I think it's definitely a factor that my boyfriend drinks at least 1-2 beers almost every day, so I'll enjoy one with him. (Control Participant 3025 – 24-year-old woman at baseline)*

- *Didn’t think I drank that much. I live with someone that drives me to drink. When I leave him I'll quit. (PNF Participant 1039 – 31-year-old woman at baseline)*

Longitudinal studies with young, heterosexual dating couples (Mushquash et al., 2011) as well as with young newly married couples (Leonard & Mudar, 2003: 2004) suggest that partners influence each other’s alcohol use and alcohol-using peer networks over time. Little is understood about how peer or dating relationships affect the alcohol use of non-college young adults. Feedback regarding the effect of relationships on one’s alcohol use and strategies for managing this is not typically addressed in feedback interventions for college students, but it may be a useful way to tailor interventions to reflect the lives young adults in the general population.

**Implications**

The study expanded the literature on alcohol interventions in several ways. First, the current study was one of the first to specifically target non-college young adult problem drinkers for a brief alcohol intervention; only two previous studies have done so (Doumas & Hannah, 2008; Monti et al., 2007), and this population is noted to be largely
absent from the intervention literature (Kaner et al., 2009). Second, no previous study has attempted to use online advertisements and social networking sites, such as Facebook, to reach problem drinkers for secondary prevention interventions. Third, the study added to knowledge about the short-term effects of feedback interventions on alcohol-related problems, which has exhibited contrasting results in similar studies with college students (e.g., Agostinelli et al., 1995; Collins et al., 2002; Walters et al., 2000) and adults (e.g., Cunningham et al., 2005; Monti et al., 2007; Wild et al., 2006). The current study suggested that non-college young adults may exhibit reductions in alcohol-related problems sooner after an intervention than is typically observed among college students.

The present study demonstrated the feasibility of using online advertisements to screen young adult problem drinkers and extended the findings of previous research with college students to the general population of young adults. The study added to our knowledge regarding the relative impact of feedback components, increasing knowledge about which components are necessary for the intervention to be successful. The results of the current study suggested that providing simple educational or normative feedback may be sufficiently powerful to influence young adults’ alcohol use and their experience of alcohol-related consequences after one month. Because the proposed interactions were not effective, results suggested that differences between college students and non-college individuals warrant further investigation. The results did not provide support for the influence of injunctive norms on the behavior of the relatively older participants in the study. On the other hand, the nonsignificant results suggested that, in relation to alcohol use, emerging adults do not differ from relatively older adults in the salience of social norms to influence their behavior.
Limitations

First, the current study relied solely on self-report measures, which threatens internal validity through common method variance and mono-method bias. Every effort was made to ensure confidentiality, including limiting contact information to first names and email addresses only and password protecting all study data, thus decreasing participants’ motivation to misrepresent themselves or their alcohol use. On the other hand, use of an internet survey may enhance participants’ sense of privacy and willingness to share sensitive information (Del Boca & Darkes, 2003).

Although the majority of research addressing alcohol use relies on self-report data, underreporting is often a concern. This method has been demonstrated to generally be reliable and valid, however, and it continues to be the primary source of alcohol use data in the literature, particularly for populations that are not treatment seeking (Del Boca & Darkes, 2003; Laforge, Borsari, & Baer, 2005). Participants’ use of cognitive heuristics to estimate and unintentionally misrepresent their alcohol use is a more salient concern; however, heuristics may just as likely lead to overreporting as underreporting alcohol use (Del Boca & Darkes, 2003; Kraus et al., 2005). The study did not directly measure participants’ alcohol use and related behavior, therefore subjecting the data to the weaknesses and inconsistencies inherent in self-report data.

Second, the self-report measures that were used for this study were designed for use with college students. The reliability and validity of the measures when used with non-college young adults remains untested, although in the current study, internal consistencies were acceptable for all measures, and all correlations were in expected directions. Although the characteristics of the participants in the study varied widely, the measures do not include wording that is specific to college students. For example,
questions are generic (e.g., “the typical person your same age and gender”) or include wording that can apply to a variety of circumstances (e.g., “My drinking has created problems between myself and my boyfriend/girlfriend/spouse, parents, or other near relatives”).

Third, participants were self-selected and potentially more motivated to examine their drinking behavior than other adults who drink to excess but are not motivated to self-reflect. Because the procedures were relatively anonymous and not limited to a specific environment, it was impossible to know how the characteristics of people who read the study advertisements or descriptions and then chose not to volunteer might differ systematically from those who do volunteer, or how people who do not spend time online differ from those who do. One such potential variable is internet access, which has the potential to limit the generalizability of the results across social class, for example. Also, although the current study did include individuals with a range of educational and occupational levels, the sample was heavily White/non-Hispanic (83%). Very few participants identified as members of racial minority groups, with Hispanic/Latino as the largest minority group represented in the sample (11%).

An additional limitation was the high rate of attrition to follow-up (53%) and the significantly different demographic characteristics of completers and non-completers. Non-completers tended to be male, non-White, younger, less educated, and heavier drinkers. Women have been found to be more likely to respond to web-based surveys than men (Kypri, Stephenson, & Langley, 2004; Larimer et al., 2007). Although the sample in the current study was relatively balanced by gender, women were more likely to complete the follow-up survey than were men. Such differences at follow up limit the generalizability of the intervention results, particularly because participants’ reasons for
not completing the follow up are unknown. Also, the final sample resulted in low power to detect the hypothesized main effects and interaction effects; however, group differences were so small that additional participants would not have significantly increased the power of the current study.

Finally, it was difficult to know how much attention participants paid to the intervention materials and then used the feedback provided to them. Use of the internet to intervene with problem drinkers in their normal environment increases the external validity of the study results and can be easily replicated. However, these procedures reduce the internal validity of the study because ensuring that the experimental conditions are differentiated as intended is difficult. Although a confirmation survey was used to increase participants’ attention to and processing of the information provided, most participants did not complete the survey. Also, questions were asked at the follow up assessment to determine participants’ recollection of and reaction to the intervention, a number of participants’ recollections were poor or inaccurate. Thus, there was little experimental control for potential variations in use of the information provided in the intervention, thus reducing the power to detect differences between the intervention conditions.

**Future Directions**

The current study found overall reductions in alcohol use and alcohol-related problems in response to assessment and intervention, regardless of condition. Although the hypotheses regarding group differences and interaction effects were not supported, the results point to several rich areas for future research. First, assessing alcohol use and alcohol-related problems after a longer delay would provide an understanding of the duration of the interventions’ effects, and whether group differences emerged over time.
By demonstrating potential similarities between college students and non-college young adults up to age 35 in their drinking behavior and response to normative feedback, the results emphasize the importance of validating measures of alcohol use, alcohol-related problems, and other drinking constructs such as protective behaviors, drinking motives, positive and negative expectancies, and positive consequences, that have been used with college students for use with non-college young adults. Such future studies can increase our knowledge about how these constructs influence the behavior of all young adults.

The current study suggested modifications to feedback interventions typically used with college students that may increase their effectiveness among young adults. First, future research may examine the effectiveness of normative feedback alone in direct comparison to a briefer educational control. Second, data regarding positive consequences from drinking could be used to create feedback that is less likely to generate resistance in some individuals. Feedback could follow the outline of the decisional balance exercise often used in motivational interventions, with the positive and negative consequences of current alcohol use outlined from survey responses, along with suggested pros and cons of changing alcohol use suggested.

Normative data in a variety of areas could be gathered to use in creating feedback interventions that are relevant and believable for young adults outside a college setting. For example, data regarding context-specific drinking could be used to create normative interventions that reflect more proximal normative reference groups (e.g., young adults who go to bars) that may be more powerful. Additional data may be gathered about specific geographic regions (e.g., Cunningham et al., 2012). Exploring how peer groups and dating relationships influence young adults’ alcohol use, particularly women’s, is another area that warrants more exploration. It may be useful to provide women with
behavioral strategies specifically for managing drinking while socializing with men because of women’s increased susceptibility to the influence of alcohol. Finally, gathering data regarding injunctive norms about young adults’ alcohol use would provide the means to investigate the effect of feedback interventions that include injunctive norms, as well as to more directly test theoretical assumptions about the transition to adulthood.
References


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Appendix A

AUDIT

How often do you have a drink containing alcohol?
0. Never
1. Monthly or less
2. 2-4x/month
3. 2-3x/week
4. 4 or more x/week

How many drinks containing alcohol do you have on a typical day when you are drinking?
0. 1 or 2
1. 3 or 4
2. 5 or 6
3. 7 to 9
4. 10 or more

How often do you have six or more drinks on one occasion?
0. Never
1. Less than monthly
2. Monthly
3. Weekly
4. Daily or almost daily

How often during the last year have you found that you were not able to stop drinking once you had started?
0. Never
1. Less than monthly
2. Monthly
3. Weekly
4. Daily or almost daily

How often during the last year have you failed to do what was normally expected from you because of drinking?
0. Never
1. Less than monthly
2. Monthly
3. Weekly
4. Daily or almost daily

How often during the last year have you needed a first drink in the morning to get yourself going after a heavy drinking session?
0. Never
1. Less than monthly
2. Monthly
3. Weekly
4. Daily or almost daily

How often during the last year have you had a feeling of guilt or remorse after drinking?
   0. Never
   1. Less than monthly
   2. Monthly
   3. Weekly
   4. Daily or almost daily

How often during the last year have you been unable to remember what happened the night before because you had been drinking?
   0. Never
   1. Less than monthly
   2. Monthly
   3. Weekly
   4. Daily or almost daily

Have you or someone else been injured as a result of your drinking?
   0. No
   2. Yes, but not in the last year
   4. Yes, during the last year

Has a relative, friend, doctor or other health worker been concerned about your drinking or suggested that you cut down?
   0. No
   2. Yes, but not in the last year
   4. Yes, during the last year
Appendix B

Daily Drinking Questionnaire

Directions: Please indicate the number of drinks that you typically consumed on each day of the week over the past 30 days, and how many total hours you spent consuming alcohol. A drink is considered a 12oz beer (i.e., most bottled or canned beer), a 5oz glass of wine (i.e., a regular-sized glass of wine), or a 1.25oz (one shot) drink of hard alcohol.

<table>
<thead>
<tr>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
<th>Saturday</th>
<th>Sunday</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drinks:</td>
<td>Drinks:</td>
<td>Drinks:</td>
<td>Drinks:</td>
<td>Drinks:</td>
<td>Drinks:</td>
<td>Drinks:</td>
</tr>
<tr>
<td>Hours:</td>
<td>Hours:</td>
<td>Hours:</td>
<td>Hours:</td>
<td>Hours:</td>
<td>Hours:</td>
<td>Hours:</td>
</tr>
</tbody>
</table>

- In the past 30 days, what is the most number of drinks you have had on any one occasion? __________
- On that occasion, over how many hours did you consume alcohol? __________
- In the past 2 weeks, how many times have you had 5 or more drinks at one sitting (if you are a male), or 4 or more drinks in one sitting (if you are a female)? __________
- At what age did you have your first drink of alcohol? __________
Appendix C

Brief Young Adult Alcohol Consequences Questionnaire

Below is a list of things that sometimes happen to people either during or after they have been drinking alcohol. Next to each item below, please mark an “X” in either the NO or the YES column to indicate whether that item describes something that has happened to you IN THE PAST MONTH.

<table>
<thead>
<tr>
<th>In the past month…</th>
<th>NO</th>
<th>YES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I have had a hangover (headache, sick stomach) the morning after I had been drinking.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. I have taken foolish risks when I have been drinking.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. I’ve not been able to remember large stretches of time while drinking heavily.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. The quality of my work or school work has suffered because of my drinking.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. I have had less energy or felt tired because of my drinking.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. My drinking has gotten me into sexual situations I later regretted.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. I often have ended up drinking on nights when I had planned not to drink.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. My physical appearance has been harmed by my drinking.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. While drinking, I have said or done embarrassing things.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. I have felt very sick to my stomach or thrown up after drinking.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. I have not gone to work or missed classes at school because of drinking, a hangover, or illness caused by drinking.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. When drinking, I have done impulsive things I regretted later.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. I have been overweight because of drinking.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. I have woken up in an unexpected place after heavy drinking.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. I have spent too much time drinking.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. I have felt badly about myself because of my drinking.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. My drinking has created problems between myself and my boyfriend/girlfriend/spouse, parents, or other near relatives.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. I have felt like I needed a drink after I’d gotten up (that is, before breakfast).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. I have driven a car when I knew I had too much to drink to drive safely.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. I have neglected my obligations to family, work, or school because of drinking.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
21. I have often found it difficult to limit how much I drink.

22. I have passed out from drinking.

23. I have become very rude, obnoxious, or insulting after drinking.

24. I have found that I needed larger amounts of alcohol to feel any effect, or that I could no longer get high or drunk on the amount that used to get me high or drunk.
Appendix D

Drinking Norms Rating Form

Directions: Please indicate the number of drinks that you think the typical person your same age and gender consumed on each day of the week over the past 30 Days. A drink is considered a 12oz beer (i.e., most bottled or canned beer), a 5oz glass of wine (i.e., a regular-sized glass of wine), or a 1.25oz (one shot) drink of hard alcohol.

<table>
<thead>
<tr>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
<th>Saturday</th>
<th>Sunday</th>
</tr>
</thead>
</table>

How many days in the past 30 do you think the typical person your same age and gender consumed alcohol? ______

In the past 30 days, what is the most number of drinks you think the typical person your same age and gender has had on any one occasion? ______

In the past two weeks, on how many occasions do you think the typical person your same age and gender has had five or more drinks (for men) or four or more drinks (for women) at one sitting? ______
### Appendix E

#### The Protective Behaviors Strategies Scale

**Instructions:** Please indicate the degree to which you engage in the following behaviors when using alcohol or “partying.”

<table>
<thead>
<tr>
<th></th>
<th>Neve</th>
<th>Rare</th>
<th>Occas</th>
<th>Someti</th>
<th>Usuall</th>
<th>Alway</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Use a designated driver</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>2. Determine not to exceed a set number of drinks</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>3. Alternate alcoholic and non-alcoholic drinks</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>4. Have a friend let you know when you have had enough to drink</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>5. Avoid drinking games</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>6. Leave the bar/party at a predetermined time</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>7. Make sure that you go home with a friend</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>8. Know where your drink has been at all times</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>9. Drink shots of liquor</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>10. Stop drinking at a predetermined time</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>11. Drink water while drinking alcohol</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>12. Put extra ice in your drink</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>13. Avoid mixing different types of alcohol</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>14. Drink slowly, rather than gulp or chug</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>15. Avoid trying to “keep up” or “out-drink” others</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>
Appendix F

Your Drinking – Participant 1023

- According to the information you gave us, you drink on 7 occasions in a typical week.
- On the weekends, you drank an average of 12 drinks.
- You drank an average of 44 drinks per week.

Weekly Drinking Pattern

![Number of Drinks Per Day](chart)

- Your percentile rank (comparing you to other men your age) is 100%, which suggests that you drink more than over 99% of other men ages 26-29. Based on the same survey, 53% of men your age reported drinking no more than 1 drink per week.

Drinking Norms

You completed questionnaires asking you what you believed the average quantity of alcohol is consumed by other men your age. You told us that you believed that the average man drank 2 drinks each occasion.

The actual drinking norm for men your age is about 2.91 drinks on each occasion.
Online Resources
If you are concerned about your drinking, online resources are provided below. Some websites will provide more information about changing your drinking. Other websites will provide information about finding treatment or support groups in your area.

Additional information about changing your drinking:
http://rethinkingdrinking.niaaa.nih.gov
Alcoholics Anonymous: www.aa.org
Rational Recovery: www.rational.org
Moderation Management: www.moderation.org
SMART Recovery: www.smartrecovery.org
Treatment center locator: http://dasis3.samhsa.gov
Other:
www.alcoholscreening.org
www.addictionsearch.com

Normative drinking information from Chan et al., 2007.
Appendix G

Your Drinking – Participant 2091

- According to the information you gave us, you drink on 7 occasions in a typical week.
- On the weekends, you drank an average of 3.5 drinks.
- You drank an average of 35 drinks per week.

Weekly Drinking Pattern

Your percentile rank (comparing you to other women your age) is 99%, which suggests that you drink more than 99% of other women ages 26-29. Based on the same survey, 80% of women your age reported drinking no more than 1 drink per week.

Drinking Norms

You completed questionnaires asking you what you believed the average quantity of alcohol consumed by other women your age. You told us that you believed that the average woman drank 1.67 drinks each occasion.

The actual drinking norm for women your age is about 1.53 drinks on each occasion.
Blood Alcohol Content

The charts below provide information on blood alcohol content (BAC). The first column provides your BAC the last time you partied/socialized, the second column provides your typical BAC when drinking on the weekend, and the third column provides your BAC for the occasion you drank the most in the past month.

<table>
<thead>
<tr>
<th>BAC</th>
<th>Last Time Partied/Socialized</th>
<th>Typical Weekend</th>
<th>Peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.13</td>
<td>0.13</td>
<td>0.18</td>
<td>0.18</td>
</tr>
</tbody>
</table>

- BAC >= .02 = relaxed, minimal to no impairment in functioning
- BAC >= .04 = initial "buzz"
- BAC >= .06 = cognitive judgment impaired
- BAC >= .08 = legally intoxicated
- BAC >=.15 = at risk for blacking out
- BAC >= .35 = at risk for loss of consciousness/death

• It would take approximately 11 hours for your past month peak BAC to return to .00.
• It would take approximately 8.4 hours for your typical weekend BAC to return to .00.

Point of Diminishing Returns

The Point of Diminishing Returns (.055 BAL or less) usually gives people the experience they want from drinking. It is also the point when drinking more will not make you feel better or have a better time. You will just get more intoxicated and the negative risks of drinking will increase.
Problems Related to Alcohol

You indicated the following alcohol-related consequences had occurred at least once in the past three months:

- I have had a hangover (headache, sick stomach) the morning after I had been drinking.
- I have taken foolish risks when I have been drinking.
- I’ve not been able to remember large stretches of time while drinking heavily.
- The quality of my work or school work has suffered because of my drinking.
- I have had less energy or felt tired because of my drinking.
- My drinking has gotten me into sexual situations I later regretted.
- I often have ended up drinking on nights when I had planned not to drink.
- My physical appearance has been harmed by my drinking.
- While drinking, I have said or done embarrassing things.
- I have felt very sick to my stomach or thrown up after drinking.
- I have not gone to work or missed classes at school because of drinking, a hangover, or illness caused by drinking.
- When drinking, I have done impulsive things I regretted later.

Calories from Alcohol

- Number of calories per week from alcohol: 5,184.
- It would require 4.7 hours (28.4 miles) of light jogging (6MPH or 10:00/mile) to expend this number of calories each week.
- It would require 3.5 hours (28.1 miles) of running (8MPH or 7:30/mile) to expend this number of calories each week.

The calories you ingest from alcohol use are "empty" in that they provide no nutritional value. Additionally, alcohol use can inhibit nutrient absorption and cancel out any fitness gains made by your workouts.

Financial Costs of Alcohol

Based upon your typical alcohol use, you are spending the following per week, depending upon your choice of alcohol:

- Domestic Beer ($3.00/drink): $108.00 per week.
- Premium Beer ($4.00/drink): $144.00 per week.

You can minimize the negative effects of alcohol by choosing to drink less or not at all.
**Protective Factors**

These are some things you are doing to avoid negative consequences from drinking:
- Use a designated driver.
- Determine not to exceed a set number of drinks.
- Alternate alcoholic and non-alcoholic drinks.
- Have a friend let you know when you have had enough to drink.
- Avoid drinking games.
- Leave the bar/party at a predetermined time.
- Make sure that you go home with a friend.

These are some other strategies that can help you to reduce heavy drinking and negative consequences from drinking:
- Know where your drink has been at all times.
- Avoid drinking shots of liquor.
- Stop drinking at a predetermined time.
- Drink water while drinking alcohol.
- Put extra ice in your drink.
- Avoid mixing different types of alcohol.
- Drink slowly, rather than gulp or chug.
- Avoid trying to "keep up" or "outdrink" others.

Research has shown that using these strategies is associated with reduced likelihood of experiencing negative consequences from your use of alcohol. We encourage you to think about how you can engage in these behaviors if and when you do decide to drink alcohol.

**Online Resources**

If you are concerned about your drinking, online resources are provided below. Some websites will provide more information about changing your drinking. Other websites will provide information about finding treatment or support groups in your area.

Additional information about changing your drinking:
- Alcoholics Anonymous: [www.aa.org](http://www.aa.org)
- Rational Recovery: [www.rational.org](http://www.rational.org)
- Moderation Management: [www.moderation.org](http://www.moderation.org)
- SMART Recovery: [www.smartrecovery.org](http://www.smartrecovery.org)
- Other: [www.alcoholscreening.org](http://www.alcoholscreening.org)
  - [www.addictionsearch.com](http://www.addictionsearch.com)

Normative drinking information from Chan et al., 2007.
Appendix H

What’s “low-risk” drinking?

A major nationwide survey of 43,000 U.S. adults by the National Institutes of Health shows that only about 2 in 100 people who drink within both the "single-day" and weekly limits below have alcoholism or alcohol abuse.

<table>
<thead>
<tr>
<th>Low-risk drinking limits</th>
<th>MEN</th>
<th>WOMEN</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>On any single DAY</strong></td>
<td>No more than 4 drinks on any day</td>
<td>No more than 3 drinks on any day</td>
</tr>
<tr>
<td><strong>AND</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Per WEEK</strong></td>
<td>No more than 14 drinks per week</td>
<td>No more than 7 drinks per week</td>
</tr>
</tbody>
</table>

To stay low risk, keep within BOTH the single-day AND weekly limits.

“Low risk” is not “no risk.” Even within these limits, drinkers can have problems if they drink too quickly, have health problems, or are older (both men and women over 65 are generally advised to have no more than 3 drinks on any day and 7 per week). Based on your health and how alcohol affects you, you may need to drink less or not at all. To stay low risk, keep within BOTH the single-day AND weekly limits.

What’s “heavy” or “at-risk” drinking?

For healthy adults in general, drinking more than the single-day or weekly amounts shown above is considered “at-risk” or “heavy” drinking. About 1 in 4 people who drink this much already has alcoholism or alcohol abuse, and the rest are at greater risk for developing these and other problems. It makes a difference both how much you drink on any day and how often you have a “heavy drinking day”—that is, more than 4 drinks in a day for men or more than 3 drinks for women. The more drinks in a day and the more heavy drinking days over time, the greater the chances for problems.

Why are women’s low-risk limits different from men’s?

Research shows that women start to have alcohol-related problems at lower drinking levels than men do. One reason is that, on average, women weigh less than men. In addition, alcohol disperses in body water, and pound for pound, women have less water in their bodies than men do. So after a man and woman of the same weight drink the same amount of alcohol, the woman’s blood alcohol concentration will tend to be higher, putting her at greater risk for harm.
What’s the harm?

Not all drinking is harmful. You may have heard that regular light to moderate drinking (from ½ drink a day up to 1 drink a day for women and 2 for men) can even be good for the heart. With at-risk or heavy drinking, however, any potential benefits are outweighed by greater risks.

Injuries. Drinking too much increases your chances of being injured or even killed. Alcohol is a factor, for example, in about 60% of fatal burn injuries, drownings, and homicides; 50% of severe trauma injuries and sexual assaults; and 40% of fatal motor vehicle crashes, suicides, and fatal falls.

Health problems. Heavy drinkers have a greater risk of liver disease, heart disease, sleep disorders, depression, stroke, bleeding from the stomach, sexually transmitted infections from unsafe sex, and several types of cancer. They may also have problems managing diabetes, high blood pressure, and other conditions.

Birth defects. Drinking during pregnancy can cause brain damage and other serious problems in the baby. Because it is not yet known whether any amount of alcohol is safe for a developing baby, women who are pregnant or may become pregnant should not drink.

Alcohol use disorders. Generally known as alcoholism and alcohol abuse, alcohol use disorders are medical conditions that doctors can diagnose when a patient’s drinking causes distress or harm. In the United States, about 18 million people have an alcohol use disorder.

Can you “hold your liquor”? For some people, it takes quite a few drinks to get a buzz or feel relaxed. Often they are unaware that being able to “hold your liquor” isn’t protection from alcohol problems, but instead a reason for caution. They tend to drink more, socialize with people who drink a lot, and develop a tolerance to alcohol. As a result, they have an increased risk for developing alcoholism. The higher alcohol levels can also cause liver, heart, and brain damage that can go unnoticed until it’s too late. And all drinkers need to be aware that even moderate amounts of alcohol can significantly impair driving performance, even when they don’t feel a buzz from drinking.
Based on this information, it sounds like you’re saying my friends and I are all drunks or alcoholics!

Not at all. There’s a lot of mistaken “all or nothing” thinking about alcoholism. Many people assume there are two options: Either you don’t have a problem with drinking, or you’re a “total alcoholic” whose life is falling apart. The reality is not a simple black or white, but more of a spectrum with shades of gray. An “alcohol use disorder”—that is, alcohol abuse or alcoholism—can be mild, moderate, or severe. People with an alcohol use disorder can be highly functioning, highly compromised, or somewhere in between. One of the main purposes of this information is to help people to become aware of the risks of heavy drinking and the early symptoms of a problem, so they can prevent more serious problems down the road.

A related "all or nothing" misconception is that all heavy drinkers are automatically alcoholics. Some are, some aren't. Those without problems at this point are still at risk for developing alcoholism and other conditions such as liver disease in the future.

The concept of risk is sometimes difficult to grasp. An example is high cholesterol, which increases the chances for a heart attack. Similarly, heavy drinking raises the chances for developing alcoholism. Your individual risk depends in part on how much, how often, and how quickly you drink, along with how young you were when you had a first drink, and whether you have a family history of alcoholism.

In any case, you can reduce your chances for harm in the future. If you do not already have symptoms of an alcohol-related problem, then cutting down to within the low-risk limits is a reasonable first step. If you already have symptoms of an alcohol problem, it’s safest to quit.

**Calories from Alcohol**

Alcoholic beverages supply calories but few nutrients and may contribute to unwanted weight gain. If you need to lose weight, looking at your drinking may be a good place to start. Below are calorie amounts for some typical alcoholic beverages.

<table>
<thead>
<tr>
<th>Beverages</th>
<th>Serving Size (fl. oz.)</th>
<th>Calories (avg.)</th>
<th>Beverages</th>
<th>Serving Size (fl. oz.)</th>
<th>Calories (avg.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beer</td>
<td></td>
<td></td>
<td>Wine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regular</td>
<td>12</td>
<td>149</td>
<td>Red</td>
<td>5</td>
<td>96</td>
</tr>
<tr>
<td>Light</td>
<td>12</td>
<td>110</td>
<td>Dry white</td>
<td>5</td>
<td>90</td>
</tr>
<tr>
<td>Cocktails</td>
<td></td>
<td></td>
<td>Sweet</td>
<td>5</td>
<td>126</td>
</tr>
<tr>
<td>Martini (traditional)</td>
<td>2.25</td>
<td>124</td>
<td>Sherry</td>
<td>2</td>
<td>75</td>
</tr>
<tr>
<td>Martini (extra dry)</td>
<td>2.25</td>
<td>139</td>
<td>Port</td>
<td>2</td>
<td>90</td>
</tr>
<tr>
<td>Cosmopolitan</td>
<td>2.75</td>
<td>146</td>
<td>Champagne</td>
<td>4</td>
<td>84</td>
</tr>
<tr>
<td>Mojito</td>
<td>6</td>
<td>143</td>
<td>Vermouth, sweet</td>
<td>3</td>
<td>140</td>
</tr>
<tr>
<td>Margarita</td>
<td>4</td>
<td>168</td>
<td>Vermouth, dry</td>
<td>3</td>
<td>105</td>
</tr>
<tr>
<td>Piña Colada</td>
<td>9</td>
<td>460</td>
<td>Distilled spirits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manhattan</td>
<td>3.5</td>
<td>164</td>
<td>80-proof gin, rum, vodka, whiskey, tequila</td>
<td>1.5</td>
<td>98</td>
</tr>
<tr>
<td>Daquiri</td>
<td>4</td>
<td>122</td>
<td>Brandy, cognac</td>
<td>1.5</td>
<td>98</td>
</tr>
<tr>
<td>Whiskey sour</td>
<td>3</td>
<td>122</td>
<td>Liqueurs</td>
<td>1.5</td>
<td>188</td>
</tr>
</tbody>
</table>
Online Resources

If you are concerned about your drinking, online resources are provided below. Some websites will provide more information about changing your drinking. Other websites will provide information about finding treatment or support groups in your area.

Additional information about changing your drinking:

http://rethinkingdrinking.niaaa.nih.gov
Alcoholics Anonymous: www.aa.org
Rational Recovery: www.rational.org
Moderation Management: www.moderation.org
SMART Recovery: www.smartrecovery.org
Treatment center locator: http://dasis3.samhsa.gov
Other:

www.alcoholscreening.org
www.addictionsearch.com

Appendix I

Demographic Questionnaire

Gender: Male Female Other: _________

Race/Ethnicity: White (non-Hispanic) Black (non-Hispanic) Asian/Pacific Islander Native American Hispanic/Latino(a) Multiracial Other: _________

Age: _________

Do you consider yourself an adult?
Yes
No
In some ways yes, in some ways no

What is the highest level of education you have achieved?
Less than high school
High school diploma
Some college
2-year degree (Associates)
4-year degree (Bachelors)
Some graduate/professional school
Graduate/professional degree
Other: _________

Are you a student now? Full-time Part-time No

Residential (live at school)? Yes No

Type of school: High school
2 year college/community college
4 year college/university
Graduate/professional school
Other: _________

Are you working? Full-time Part-time No

What is your job? _________
What is your marital/relationship status?
   Single/never married
   Living together/committed relationship (How long? ________)
   Married
   Divorced
   Widowed
   Other: ________

Do you have children?    Yes    No

If yes, how many? ________

In order for us to calculate your blood alcohol level, we need to get your current weight. What is your best estimate of your current weight (in pounds)? ________

We are interested to know the areas where our survey reached. What is your ZIP code? ________
Facebook ad #1: Curious?

Thinking about your drinking? Click here to learn more about your alcohol use. Complete free surveys and enter into prize drawings.

Facebook ad #2: How is your alcohol use?

Thinking about your drinking? Click here to learn more about your alcohol use. Complete free surveys and enter into prize drawings.

Facebook ad #3: Are you a drinker?
Thinking about your drinking? Click here to learn more about your alcohol use. Complete free surveys and enter into prize drawings.

Facebook ad #4: **Is your drinking normal?**

Thinking about your drinking? Click here to learn more about your alcohol use. Complete free surveys and enter into prize drawings.

Google Ad #1: **Are you a drinker?**
Learn more about your drinking. Complete surveys & win prizes!

Google Ad #2: **Just graduated?**
Still drinking like you haven't? Complete surveys & win prizes!

Google Ad #3: **Curious?**
Wonder how your drinking compares? Complete surveys & win prizes!
Appendix K

Screening Consent Form

Investigator Identification: This research study is being conducted by Tracey L. Rocha, a graduate student in the Division of Counseling Psychology, University at Albany, State University of New York under the supervision of Dr. Myrna Friedlander and Dr. Matthew Martens. Dr. Friedlander is a Professor in the Division of Counseling Psychology, University at Albany. Dr. Martens is an Associate Professor in the Department of Educational, School, and Counseling Psychology, University of Missouri.

Study Description: The purpose of this research study is to screen for problem alcohol use. As part of this study you will be expected to complete the following questionnaires that ask for demographic information and information on alcohol consumption and negative alcohol-related consequences. Completing the questionnaires should take approximately 5-10 minutes. After completing the questionnaires, you will also be asked to provide contact information (email) if you are interested in possibly participating in the second phase of the study. We will contact you to inform you if you are eligible for the second phase. Your contact information will then be deleted if you are not eligible for the second phase of the study. The second phase of the study would involve completing two additional short questionnaires and receiving an email with more information about problem drinking. If you do not wish to participate in this project, you can close this web page at this time.

Possible Risks and Benefits: A possible risk for this research study involves loss of confidentiality of your data, which would allow others to obtain information about your drinking habits and alcohol-related problems. All of your information will be encrypted and password protected to minimize this risk. It is also possible that you may become upset when filling out the questionnaires. A possible personal benefit of this study is that by filling out the questionnaires you will gain more insight into your alcohol consumption habits. Another benefit of this study would be that if you are a high-risk drinker you may be eligible to receive more information about problem drinking. We also hope that information from this study will help in developing more effective alcohol interventions in the future, although this will most likely not be a direct benefit to you.

Participant Information: Your participation in this research project is voluntary. Even after you agree to participate in the research or provide your informed consent, you may decide to leave the study at any time without penalty or loss of benefits to which you may otherwise have been entitled. You may also choose to not answer any question(s) that you do not wish to, for any reason. All information obtained in this study is strictly confidential unless disclosure is required by law. In addition, the Institutional Review Board and University or government officials responsible for monitoring this study may inspect these records. If you provide any demographic information that could be identifying (e.g., the only member of a particular ethnic group), then this information will be combined with other participants.
On-Line Data Collection: This research project has been approved by the University at Albany Institutional Review Board. Approval of this project only signifies that the procedures adequately protect the rights and welfare of the participants. Please note that absolute confidentiality cannot be guaranteed due to the limited protections of internet access. Please be sure to close your browser when finished so no one will be able to see what you have been doing.

Questions or Concerns

In the event that you have any questions or concerns about this research study, you may contact Tracey Rocha at (518) 442-5040, tracey.rocha@gmail.com, or Dr. Myrna Friedlander at (518) 442-5040, mfriedlander@albany.edu. If you have any questions about your rights as a participant that have not been answered by the investigator, or if you wish to report any concerns about the study, you may contact the University at Albany Office of Regulatory Research Compliance at 518-442-9050 (toll free 800-365-9139) or at orrc@uamail.albany.edu.

Electronic Consent

Please indicate your choice below. Clicking on the "continue" button below indicates that you have read and understand the terms of this study and thus voluntarily agree to participate. If you do NOT wish to participate in the study, please decline participation by closing the window.

I have read the information about this study. I hereby consent to participate in the study.
Appendix L

Study Consent Form

Investigator Identification: This research study is being conducted Tracey L. Rocha, a graduate student in the Division of Counseling Psychology, University at Albany, State University of New York under the supervision of Dr. Myrna Friedlander and Dr. Matthew Martens. Dr. Friedlander is a Professor in the Division of Counseling Psychology, University at Albany. Dr. Martens is an Associate Professor in the Department of Educational, School, and Counseling Psychology, University of Missouri.

Study Description: The purpose of this research study is to assess the effect of several types of alcohol use feedback. You were invited to participate in the second phase of this study because you met minimum criteria for high risk alcohol use. Participation in this phase will entail completing several questionnaires today that ask for demographic information, information about your alcohol consumption, your thoughts about others’ alcohol consumption, and alcohol-related behaviors. You will be asked to complete a shorter, similar questionnaire one month from now. Completing the questionnaires should take approximately 10-20 minutes.

After completing the questionnaire today, you will be emailed with one of three different types of alcohol use information. Two types include different feedback information about your alcohol use. The third type contains educational information about high risk alcohol use. You will be asked to respond to 2 brief questions by email to ensure that you received the alcohol use information. At the end of the study, you will have the option to request the information provided to other groups (for example, personalized information).

You will have the opportunity to enter a prize drawing after you complete each survey. The first drawing is for $200 and you will be entered after you confirm that you received the emailed alcohol use information. The second drawing is for $300 and you will be entered after you complete the second questionnaire one month from now. Prizes will be awarded through an online retailer that offers electronic gift cards (e.g., amazon.com). If you do not wish to participate in this research project, you can close this web page at this time.

Possible Risks and Benefits: A possible risk for this research study involves loss of confidentiality of your data, which would allow others to obtain information about your drinking habits and alcohol-related problems. This information may include admission of alcohol-related crimes, such as driving while intoxicated. If you are under 21, this also may include your report of illegal underage drinking. All of your information will be encrypted and password protected to minimize this risk. We have provided you with a random ID number to enter in the questionnaire. In this way, your contact information (i.e., email address and first name) will not be directly linked to the data and will be stored separately. After completion of the study and the prize drawings, your contact information will be deleted.
It is also possible that you may become upset when filling out the questionnaires and answering questions about negative consequences. A possible personal benefit of this research study is that by filling out the questionnaires you will gain more insight into your alcohol consumption habits. Another possible benefit of this study is that you may experience fewer negative consequences as a result of learning more about problem drinking. We also hope that information from this study will help in developing more effective alcohol interventions in the future, although this will most likely not be a direct benefit to you.

**Participant Information:** Your participation in this project is voluntary. Even after you agree to participate in the research or provide your informed consent, you may decide to leave the study at any time without penalty or loss of benefits to which you may otherwise have been entitled. You may also choose to not answer any question(s) that you do not wish to, for any reason.

All information obtained in this study is strictly confidential unless disclosure is required by law. In addition, the Institutional Review Board and University or government officials responsible for monitoring this study may inspect these records. If you provide any demographic information that could be identifying (e.g., the only member of a particular ethnic group), then this information will be combined with other participants.

**On-Line Data Collection:** This project has been approved by the University at Albany Institutional Review Board. Approval of this project only signifies that the procedures adequately protect the rights and welfare of the participants. Please note that absolute confidentiality cannot be guaranteed due to the limited protections of internet access. Please be sure to close your browser when finished so no one will be able to see what you have been doing.

**Questions or Concerns**

In the event that you have any questions or concerns about this study, you may contact Tracey Rocha at (518) 442-5040, tracey.rocha@gmail.com, or Dr. Myrna Friedlander at (518) 442-5040, mfriedlander@albany.edu. If you have any questions about your rights as a participant that have not been answered by the investigator, or if you wish to report any concerns about the study, you may contact the University at Albany Regulatory Research Compliance at 518-442-9050 (toll free 800-365-9139) or orrc@uamail.albany.edu.

**Electronic Consent**

Please indicate your choice below. Clicking on the "continue" button below indicates that you have read and understand the terms of this study and thus voluntarily agree to participate. If you do NOT wish to participate in the study, please decline participation by closing the window.

I have read the information about this study. I hereby consent to participate in the study.
Appendix M

Consent Form

Investigator Identification: This research study is being conducted by Tracey L. Rocha, a graduate student in the Division of Counseling Psychology, University at Albany, State University of New York under the supervision of Dr. Myrna Friedlander and Dr. Matthew Martens. Dr. Friedlander is a Professor in the Division of Counseling Psychology, University at Albany. Dr. Martens is an Associate Professor in the Department of Educational, School, and Counseling Psychology, University of Missouri.

Study Description: The purpose of this research study is to assess the effect of several types of alcohol use feedback. Participation will entail completing several questionnaires today that ask for demographic information, information about your alcohol consumption, your thoughts about others’ alcohol consumption, and alcohol-related behaviors. After completing the questionnaires, you will also be asked to provide contact information (email) if you are interested in possibly participating in the second phase of the study. We will contact you to inform you if you are eligible for the second phase. If you are not eligible for the second phase, you will be emailed with educational information about alcohol use and a $1 amazon.com gift card.

You will be invited to participate in the second phase of this study if you meet minimum criteria for high risk alcohol use. If you are eligible for the second phase, we will email you with a $1 amazon.com gift card and one of three different types of alcohol use information. Two types include different feedback information about your alcohol use. The third type contains educational information about high risk alcohol use. You will be asked to respond to a brief survey to ensure that you received the alcohol use information. At the end of the study, you will have the option to request the information provided to other groups (for example, personalized information).

If you are eligible for the second phase, you will have the opportunity to enter a prize drawing after you complete each additional survey. The first drawing is for $200 and you will be entered after you confirm that you received the emailed alcohol use information. The second drawing is for $300 and you will be entered after you complete the second questionnaire one month from now. Prizes will be awarded through an online retailer that offers electronic gift cards (e.g., amazon.com). If you do not wish to participate in this research project, you can close this web page at this time.

Possible Risks and Benefits: A possible risk for this research study involves loss of confidentiality of your data, which would allow others to obtain information about your drinking habits and alcohol-related problems. This information may include admission of alcohol-related crimes, such as driving while intoxicated. If you are under 21, this also may include your report of illegal underage drinking. All of your information will be encrypted and password protected to minimize this risk. We will assign you a random ID number to enter in the questionnaire. In this way, your contact information (i.e., email address and first name) will not be directly linked to the data and will be stored.
separately. After completion of the study and the prize drawings, your contact information will be deleted. It is also possible that you may become upset when filling out the questionnaires and answering questions about negative consequences.

A possible personal benefit of this research study is that by filling out the questionnaires you will gain more insight into your alcohol consumption habits. Another possible benefit of this study is that you may experience fewer negative consequences as a result of learning more about problem drinking. We also hope that information from this study will help in developing more effective alcohol interventions in the future, although this will most likely not be a direct benefit to you.

**Participant Information**: Your participation in this project is voluntary. Even after you agree to participate in the research or provide your informed consent, you may decide to leave the study at any time without penalty or loss of benefits to which you may otherwise have been entitled. You may also choose to not answer any question(s) that you do not wish to, for any reason.

All information obtained in this study is strictly confidential unless disclosure is required by law. In addition, the Institutional Review Board and University or government officials responsible for monitoring this study may inspect these records. If you provide any demographic information that could be identifying (e.g., the only member of a particular ethnic group), then this information will be combined with other participants.

**On-Line Data Collection**: This project has been approved by the University at Albany Institutional Review Board. Approval of this project only signifies that the procedures adequately protect the rights and welfare of the participants. Please note that absolute confidentiality cannot be guaranteed due to the limited protections of internet access. Please be sure to close your browser when finished so no one will be able to see what you have been doing.

**Questions or Concerns**

In the event that you have any questions or concerns about this study, you may contact Tracey Rocha at (518) 442-5040, tracey.rocha@gmail.com, or Dr. Myrna Friedlander at (518) 442-5040, mfriedlander@albany.edu. If you have any questions about your rights as a participant that have not been answered by the investigator, or if you wish to report any concerns about the study, you may contact the University at Albany Regulatory Research Compliance at 518-442-9050 (toll free 800-365-9139) or orrc@uamail.albany.edu.

Electronic Consent

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